To the Graduate Council:

I am submitting herewith a dissertation written by Rufus Morison entitled "The Acute Sublethal Effects of the Pesticides, Carbaryl and Malathion on Partial Ethograms of the Yellow Bullhead (*Ictalurus natalis* (Lesueur)) After Exposure to the Pesticide Carbaryl and Malathion." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Ecology.

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THE ACUTE SUBLETHAL EFFECTS OF THE PESTICIDES CARBARYL AND MALATHION ON PARTIAL ETHOGRAMS OF THE YELLOW BULLHEAD (*Ictalurus natalis* (Lesueur)) AFTER EXPOSURE TO THE PESTICIDE CARBARYL AND MALATHION

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Rufus Morison

March 1984

DEDICATION

To the "least" of these creatures,
who are fulsome with ugly features.
May I always remain so humble
to accept with grace that,
they are my most profound teachers.

ACKNOWLEDGEMENTS

I would like to acknowledge the support, encouragement, patience and warm friendship of my advisor, Professor Edward E. C. Clebsch. "It was a long time in a-borning."

I also wish to acknowledge the continuing encouragement, support, good counsel and help and most of all genuine friendship of Dr. Patricia A. Lane of Dalhousie University, Halifax, Nova Scotia without whose encouragement and confidence, this work would have been impossible. Pat, you made it much easier.

To Dewey, you have my admiration, and affection for your support, loyalty and help during some hard times.

To Dr. Charles Cleland, you have my respect and thanks for your honesty, patience and persistence.

To Ets who first suggested the sublethal effects studies. This was a good idea and it went a lot further than I ever thought it would.

To the members of my doctoral committee for their support and advice.

My special thanks and appreciation to you, Adele for your help and encouragement and for being my friend.

To John Wright whose genius with the data analysis and to Terry Collins whose persistence with data analysis made breathing easier.

To Roy Dean for your help and fairness.

To my children who can truly say: "I gave at home."

To the many who have supported, encouraged and been my friend.

To Jelle Atema, friend and colleague, who kindly allowed me to use his excellent drawings of yellow bullheads "behaving" in Figures 2, 3, 4, 5, 6 and 7.

In particular to Ms. Ann E. Johnson who thought "this was just a little 20 page manuscript." Truly without her prodigious and recent effort this document would not have been produced. Ann, you are a pro.

ABSTRACT

"The acute sublethal effects of the pesticides carbaryl and malathion on partial ethograms of the yellow bullhead, *Ictalurus natalis* (Lesueur).

The dominant fish of pair colonies of adult yellow bullheads, *Ictalurus natalis* (Lesueur) were acutely exposed (48 hours) to sublethal levels 1, 2, and 4 mg l^{-1} of carbaryl and 1, 2, and 4 mg l^{-1} malathion. The alterations of social behaviors in a partial ethogram (reproductive behaviors were excluded) were recorded in a geometric time series and analyzed. Analyses of Variance and Multiple Classification Analyses of transformed data demonstrated clear alterations of field substantiated social behaviors with both chemicals. Carbaryl altered abilities to maintain dominance temporarily. In some malathion exposed animals dominance was apparently not maintained over approximately 10 days, when compared with untreated yellow bullheads. An interference with feeding (ingestion) reactions by carbaryl was not accompanied by a corresponding inhibition of sensory ability in detecting food. Social behaviors in non-treated bullheads were generally "opposite" to the treated fish. Social behavior alterations provided more sensitive indications to toxicants than physiological reactions.

The ethological methods employed revealed a level of damage and extent of risk to a species heretofore generally unappreciated. The exposure levels of these short-lived common pesticides were reasonably

ABSTRACT (Continued)

close to detected ambient levels in forested watersheds, estuaries and agroecosystems.

The implications of alterations of social behavior and structure on short-term adaptive ability of species are not known; however, these effects may be much more profound than acute large scale mortalities.

The hypothesis that possible ambient environmental levels of two pesticides altered social behavior was substantiated.

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I. INTRODUCTION

There has been increasing concern for the impacts of massive chemical pollution on the biological quality of the aquatic environment. Much of the research resulting from this concern has involved laboratory toxicity studies to establish acute lethal levels under fixed and partially dynamic conditions (static versus flowing) in several species of fish and invertebrates. The acutely lethal levels of toxicants in the environment produce dramatic impacts which are often well publicized. These impacts affect large numbers of organisms; fish kills of 10-20 million individuals have been reported. These episodes, whose sources are quite varied (agricultural run-off, accidental industrial discharges, petroleum spills, effluents from waste dump sites and others) probably represent only a minor portion of the total biological damage. Beyond these local areas of acute damage, there are many toxic chemicals and ubiquitous subacute levels of pollutants. It is safe to assume that greater numbers of organisms are exposed to these subacute concentrations. Food web magnifications of a variety of toxicants are known in areas remote from specific sources. For example, non-migratory species in the Antarctic contain detectable levels of chlorinated hydrocarbons.

In recent years, the field of aquatic toxicology has dealt with physiological, toxicological and behavioral aspects of contaminant exposure in fish. The behavioral aspects have received little attention; they are the most difficult to quantify because of high inherent variability and lack of use of objective criteria. There is ample evidence, however, that subacute toxic exposure produces various stresses in fish: decreasing their ability to withstand the challenges of survival (feeding, maintenance of hierarchy and territory, mating, etc.). Both social behavior patterns and individual behaviors in fish are influenced by exposure to low level toxicants. Chemicals (pesticides) such as cholinesterase inhibitors which interfere with neural function interfere with orientation behavior and locomotor performance. A fish community or colony of interacting social individuals is a complex system which exhibits both macro and micro changes in response to a disturbance or perturbation. The subtlety of these behavior changes creates problems in quantifying and identifying causal relations to contaminants. Potential ecological and evolutionary ramifications are poorly understood.

So that these potential evolutionary alterations can be placed in a more specific context, a synopsis of the aquatic toxicology of some common pesticides including malathion and carbaryl follows. Additionally, the literature on behavioral toxicology which is principally in the area of heavy metal toxicity is included. This information provides background against which the importance of ethological methodology can be evaluated.

A. Statement of the Problem

The function of these studies was to quantify alterations (where possible), and changes in frequencies and intensity of social behaviors, of yellow bullheads acutely exposed to sublethal concentrations of carbaryl and malathion.

Social behaviors were selected as quantifiable parameters for several reasons:

1. The behavior of organisms represents the final (integrated) summation of a diversity of reactions (biochemical, metabolic and physiological).
2. Patterns of behavior are highly sensitive to changes in homeostasis of an organism.
3. Behavioral measurements can be made without alteration of the physical well being of the organism.

B. Review of the Literature

1. Metals and Behavior

Effects of substances on behavior were probably first investigated in fish exposed to metal ions. Weir and Hine (1970) studied the effects of arsenic, mercury, lead and selenium on conditioned avoidance in trained goldfish (*Carassius auratus*). At one percent of the LC50, all ions produced significant impairment of the avoidance reaction in the fish. The no-effect levels estimated (0.25 - 0.001 of the LC) were well below the experimental exposure levels for each metal ion. Sparks *et al*. (1972) compared the effects of shelters on the resistance of dominant and submissive bluegills (*Lepomis macrochirus*) following zinc intoxication. Sparks found that socially dominant fish survived exposure of 32 mg l^{-1} (32,000 ug l^{-1}) to zinc longer than non-dominants. (The 96-hour LC50 for zinc in bluegills is 2.9 mg l^{-1} - 2,900 ug l^{-1}). The shelters apparently reduced the number of aggressive encounters (stress) between fish. This study used a perceptive behavior response in quantifying the action of a toxicant on agonistic behaviors.

Kania and O'Hara (1974) found that normal escape behavior in mosquitofish (Gambusia affinis) was impaired by exposure to mercury in sublethal concentrations (0.1, 0.05, 0.01, and 0.005 mg l^{-1}) when treated and untreated fish were mixed in equal numbers and exposed to predators. The treated fish were more heavily preyed upon, except for the fish dosed at 0.005 mg l^{-1}. In this study, Kania and O'Hara have also described actions which involve a separate set of social perceptive behaviors, e.g., avoidance-escape.

Henry and Atchison (1979a) demonstrated effects on social hierarchies in adult bluegills of sublethal exposure to two metals, cadmium and zinc, together at several concentration levels. The frequencies with which nine behaviors occurred in treated and untreated fish formed the basis for a sensitive bioassay of heavy metal toxicity in bluegills (Henry and Atchison, 1979b).

Some of the actions classified as behaviors in the previous study were physiological responses, rather than ethologically identifiable behaviors. However, this does not detract from the sensitivity of the technique.

Increased prey vulnerability of fathead minnows, (Pimephales promelas to largemouth bass (Micropterus salmoides) was demonstrated in acute (24-hour) and subacute (21-day) cadmium exposure. The lowest acute and subacute concentrations of cadmium to affect increased prey vulnerability were 375 ug l^{-1} and 25 ug l^{-1}, respectively. Twenty-five ug l^{-1} is well below the maximum acceptable toxicant concentration. The exposed fathead minnows showed altered behavior patterns including altered schooling behavior (Sullivan _et al._, 1978). Sullivan _et al._ utilized a model to calculate maximum likelihood estimators of predation effects for treatments in both acute and subacute groups.

The toxicity of heavy metal cations of mercury, zinc, lead and cadmium with respect to several nitrogen metabolism enzymes in rainbow trout (_Salmo gairdneri_) and the polychaete, _Eudistylia vancouveri_ was related to degree of inhibition according to exposure levels (Brown, 1976). These findings relate the levels of toxicity to the levels of enzymatic activity. While metals are only a model for general toxic pathways in fish and other aquatic animals, they serve to illustrate the idea that toxicants far below levels generally accepted as non-damaging can be detected by behavioral effects.

2. Carbaryl

Since world-wide use began in 1958, much information has accrued on the impact of carbaryl* (1-naphthyl N-methylcarbamate) insecticide on the environment. Although selectively toxic to certain organisms, applications of carbaryl generally are reputed to have short-lived effects on individuals of non-target species.

*Carbaryl is also known as Sevin, Union Carbide.

Carbaryl appears to have a relatively low order of toxicity to both aquatic and terrestrial vertebrates (Johansen, 1977). The recommended use rates of carbaryl rarely cause dramatic adverse effects on large or small mammals, birds or fish. However, Pomeroy and Barrett (1975) reported inhibition of reproduction by carbaryl at 2 lb ac^{-1} in field populations of rodents. Lillie (1979) reported that caged pullets fed carbaryl had significantly reduced weights; reproductive performance was unaffected. Carbaryl has been reported to be weakly mutagenic in mammalian cell cultures, bacteria and *Drosophila* (Dellarco, 1981).

Among the invertebrate animals, earthworm populations were temporarily reduced by heavy applications of carbaryl (Atlavinyte, 1975; Thompson, 1971). Clam populations were generally reduced under heavy treatment regimes; crabs and shrimp were highly susceptible to carbaryl (Armstrong *et al.*, 1974) while its hydrolytic product 1-naphthol was more toxic to mollusks and fish (Stewart *et al.*, 1967).

Spraying large areas for forest insect pest control has resulted in gradual declines in forest bird numbers, species and diversity for insectivorous birds, (Moulding, 1976) and selective loss of aquatic insect species and amphipods (*Gammarus* sp.) has been observed in some lentic and stream communities in carbaryl treated forests in Maine (Courtemanch and Gibbs, 1979). (Burdick *et al.*, 1960) reported substantial reduction of benthic insects in two New York streams treated with carbaryl.

Carbaryl was considered to be highly toxic to honeybees and had some adverse effects on certain beneficial insect parasites and predators (Johansen, 1977; Morse, 1961). Johansen rated it as the number one bee-killing chemical. It was metabolized by soil microorganisms but persistent in soils; however, Gauer and Misra (1970) reported reduced soil bacterial populations at high soil levels of 100 - 5,000 ppm.

Spray residues of carbaryl were not persistent, having a half-life from several days up to two weeks depending on temperature, pH and organic materials present. Sikka et al. (1975) reported that carbaryl was more resistant to degradation than 1-naphthol by selected marine microorganisms. Both degradations were pH dependent. In a spray field test, carbaryl (Sevin-4-oil) showed little loss of activity against Douglas Fir tussockmoth larvae after 14 days (Markin et al., 1978). Other studies indicated that carbaryl may be more persistent than originally thought. Kanazawa et al. (1975) followed the distribution of carbaryl in an aquatic microcosm containing algae, soil, water, crayfish, catfish, daphnids and snails. They reported that carbaryl (37 percent) resided in the soil sediments and bioaccumulated in catfish (140x) after approximately 22 days. Carbaryl appeared to be highly biodegradable in a model ecosystem (a microcosm 56L aquarium containing fish, snails, higher plants, sand, algae and insects) but had persistent residual products which bioconcentrated in fish, snails and insects (Sangha, 1972).

Stanley and Trial (1980) reported that the disappearance rate of 0.028 hr^{-1} of carbaryl applied aerially at 0.84 kg ha^{-1} in Maine streams in forested areas did not differ greatly from those reported elsewhere (Kanazawa, 1975). Tagatz _et al_. (1979) reported that the composition of the estuarine invertebrate larval community was altered (reduced number of species) by the presence of carbaryl at 1.1, 11.1 and 103 ug l^{-1}.

The fate of carbaryl insecticide in farm pond waters was studied under laboratory conditions. Carbaryl was found to chemically hydrolyze to 1-naphthol very rapidly in pond water. This hydrolysis was catalyzed by organic and inorganic constituents in the pond water with substantial enhancement of the hydrolysis reaction resulting from shaking. In waters and sediments containing native bacteria in addition to the insecticide-decomposing bacterium, _Flavobacterium_, only the latter proliferated with most other bacteria disappearing. This indicated a lack of tolerance to the insecticide. Thin layer chromatography showed three intermediate degradative products of carbaryl in addition to 1-naphthol. Two compounds, _o_-hydroxycinnamic acid and salicyclic acid, were identified. One compound was not identified. Lack of accumulation of any product indicated further decomposition of the intermediates (Hughes, 1971).

The effects of carbaryl on both vertebrate and invertebrate animals have been extensively studied. Henderson _et al_. (1960), using carbaryl reported a 96-hour TLm to fathead minnows of 6.7 - 7.0 ppm (6.7 - 7.0 mg l^{-1}) in hard water and 12 - 13 ppm (12 - 13 mg l^{-1}) in soft water. Values for bluegills were 5.3 - 5.6 ppm in soft water, while 50 percent wettable powder used under the same conditions produced a 96-hour TLm of 5.5 ppm. Cope (1963) reported a 24-hour TLm of 3.5 ppm and a 48-hour TLm of 2.0 ppm for rainbow trout, based upon work by Bridges and Andrews (1958).

Burdick _et al_. (1960) indicated no apparent losses of trout and stream fishes when carbaryl was applied for forest insect control at 1.38 kg ha^{-1} but concluded that fish production could not be maintained where spray drift was present. Laboratory studies conducted later by Burdick _et al_. (1965) on the toxicity of carbaryl to fingerling brown trout (_Salmo trutta_) indicated that acute toxicity would probably not be a factor at the application rate of 1.1 - 1.38 kg ha^{-1}. The toxic level of 1.5 ppm would not be reached in application to water averaging over four inches deep. Haynes _et al_. (1958) reported that 28 ppm of technical carbaryl produced an LD50 in goldfish in 48 hours.

Katz (1961) tested 95 percent carbaryl and reported the 48-hour LC50 in rainbow trout, coho salmon (_Oncorhynchus kisutch_), bluegill, and threespine stickleback (_Gasterosteus aculeatus_) to be 1.3, 0.99, 5.3, and 10.45 ppm (mg l^{-1}), respectively. The toxicity of carbaryl to fingerlings of four salmonid species in static tests was reported by Post and Schroeder (1971) who found only small species differences among the species with similar weights.

Macek and McAllister (1970) reported a 96-hour TL50 of 20,000 ug 1^{-1}; 18,000 - 24,000 ug 1^{-1} (95 percent Confidence Interval) for black bullheads (Ictalurus melas) and 15,800 ug 1^{-1}; 13,900 - 18,000 ug 1^{-1} (95 percent Confidence Interval) for channel catfish (Ictalurus punctatus) in fish weighing 0.6 - 1.7 grams at 18°C in static bioassays. Across the 12 species tested, the bullheads were least susceptible to acute carbamate toxicity. However, other toxicity parameters such as behavior and physiology were not reported and extrapolations between fish families has not received general support. Korn and Earnest (1971) reported the acute 96-hour toxicity of carbaryl to 0.4 gm striped bass (Morone saxitilis) in flowing 30 ‰ saline water to be 1,000 ug 1^{-1} at 17°C.

Lowe (1967) reported that juvenile spot (Leiostomus xanthurus) chronically exposed to 100 ug 1^{-1} (0.1 ppm) in flowing sea water exhibited the same mortality as unexposed fish over five months. Histopathological examination of the brains of the exposed fish showed a sporozoan parasite infestation not present in the control population. Growth was comparable in both groups. Fathead minnows exposed to five concentrations (0.008, 0.017, 0.062, 0.206, 0.681 mg 1^{-1}) of carbaryl for nine months throughout a life cycle showed decreased reproduction and decreased survival at the highest concentrations (Carlson, 1971).

Korn (1973) reported that chronic dietary and exposure persistence of carbaryl in channel catfish over 56 days resulted in no mortality. The dietary doses were 0.28 and 2.8 mg kg^{-1} $week^{-1}$ and the external exposure (bath) concentrations were 50 and 250 ug l^{-1}. He reported that both dietary and external exposure concentrations were rapidly eliminated. However, the combination of pH and temperature reported might have accounted for rapid degradation of the ambient concentrations in the aquarium.

Kanazawa (1975) reported that the tissue level of carbaryl in the Motsugo (Pseudorasbora parva) dosed at 1 ppm (1,000 ug l^{-1}) was 7.5 ppm after one day. This degraded more than 95 percent in six days. The pH was 6.4 - 6.8, and temperature was 23 $\pm$ 2°C and the test fish were 2 - 5 gm body weight. These results were at variance with other reports. Lunn et al. (1976) reported that three of ten rainbow trout weighing approximately 120 gm each exposed to 2,000 ug l^{-1} (2.0 mg l^{-1}) carbaryl died and the respiration rate was depressed. Ten of ten fish survived exposure to 1,000 ug l^{-1} (1.0 mg l^{-1}) carbaryl without noticeable physiological effects. The values in Table 1 are representative of carbaryl toxicity in very small fish mostly and some general inter-species comparisons can be made. These toxicities serve to contrast to the more sensitive methods as shown later in this thesis.

Carbamates (carbaryl) poison animals by inhibition of the enzyme acetylcholinesterase which modulates amounts of the neurotransmitter acetylcholine at nerve cell junctions (synapses). Inhibition of the enzyme by carbamates or their metabolites results in accumulation of acetylcholine and disruption of neurotransmission. Coppage (1977)

TABLE 1

Some Comparative Values of Acute Toxicity for Carbaryl in Very Small Fish-Fingerlings from Johnson and Finley (1980)

Test Organism	Stage or wt (g)	Temp (C)	96-hLC50 95% CI (ug 1)$^{-}$)
Coho salmon	1.0	13	4,340 3,310-5,690
Chinook salmon	F	12	2,400 1,620-3,550
Cutthroat trout	0.5	12	7,100 5,240-9,620
Rainbow trout	1.5	12	1,950 1,450-2,630
Atlantic salmon	0.4	12	4,500 3,820-5,310
Brown trout	0.6	12	6,300 5,520-7,190
Brook trout	0.8	12	2,100 1,680-2,620
Lake trout	1.7	12	690 520-910
Goldfish	0.9	18	13,200 8,310-20,800
Carp	0.6	18	5,280 4,620-6,050
Fathead minnow	0.8	18	14,600 11,700-19,800
Black bullhead	1.2	18	20,000 18,000-24,000
Channel catfish	1.5	18	15,800 13,900-18,000
Green sunfish	1.1	18	11,200 8,140-15,500
Yellow perch	0.6	12	5,100 4,520-5,760
Brook trout	1.3	12	4,500 3,948-5,066
Bluegill	0.7	17	39,000 29,732-51,157

F = Fingerling

reported at a TLm (median kill 40 - 60 percent lethality), acetylcholinesterase inhibition of 77 - 98 percent occurred, regardless of species or period of exposure, within 4 - 48 hours. Inhibition of acetylcholinesterase *in vitro* by a carbamate inhibitor is progressive but reaches an equilibrium in contrast to organophosphate inhibitors, e.g., malathion (Obrien *et al.*, 1966). The decarboxylation rate was more rapid than dephosphorylation. Reiner (1971) and Carter (1971) reported that inhibition of channel catfish brain acetylcholinesterase by carbamates *in vivo* lasted 5.5 - 9 days after exposure. Coppage (1977) concluded that mechanisms of injury in fishes by carbamates were quantifiable in the environment.

Statham and Lech (1975) concluded that a non-lethal exposure level of rainbow trout to carbaryl potentiated the toxicity of 2,4 dichlorophenoxyacetic acid, m-butyl ester (2,4-DB), dieldrin, rotenone, and pentachlorophenol. Atropine blocked this effect.

The inability to avoid carbaryl and malathion at concentrations as low as 100 ug 1^{-1} (0.1 mg 1^{-1}) by untrained mosquitofish and untrained sheepshead minnows (*Cyprinodon variegatus*) was reported by Hansen (1969) and Hansen *et al.* (1972), respectively. Weis and Weis (1974) observed that exposing juvenile silverside (*Menidia menidia*) to 100 ug 1^{-1} (0.1 mg 1^{-1}) resulted in a doubling of the size of the area occupied by a school when compared to an untreated school. Three days after transfer to clean water the area occupied by the treated school was virtually the same as that occupied by untreated a strategy against predation. The exposure level was extremely low, yet the behavioral effect was pronounced.

Marancik (1975) observed that carbaryl applied at 1.12 kg ha^{-1} was detected in stream waters and fish tissues in Maine spruce budworm control areas. Post-spray trout had stomachs engorged with aquatic insects compared to empty prespray stomachs in stream fish. Tissue levels of carbaryl gradually decreased 48 hours after application in brook trout (Salvelinis fontanalis) and Atlantic salmon (Salmo salar). Marancik also reported that carbaryl was present in the ug l^{-1} range in fish tissue and waters. Under the conditions of application, the pesticide reached streams biota and fish tissues in measurable quantities.

3. Malathion

Since the 1950's when malathion [(S-1,2 bis-(ethoxycarbaryl) ethyl) 0,0-dimethyl phosphorodithioate] was introduced, it has been widely and liberally used for a variety of insect and other arthropod pests. Its use has been in millions of kilograms per year over 30 or more years. In 1972 EPA estimated production was 1.7×10^7 kg. Malathion was slightly to moderately toxic to mice (LD50 approximately 1,500 mg/kg) and moderately toxic to chickens, (LD50 - 500 mg kg^{-1}, administered intra-peritoneally.) Maloxon, its principal metabolite, was significantly more toxic (approximately 50 - 100 times) to these vertebrates.

Its principal toxic mode was through inhibition of the enzyme cholinesterase. As a general indication of systemic toxicity, brain cholinesterase was measured. The level of brain cholinesterase inhibition was related to systemic toxicity in chickens and mice as reported in a study by Murphy et al. (1968). Maloxon was an even more potent brain cholinesterase inhibitor according to Murphy.

General environmental toxicities were variable. Davis and Hidu (1969) studied the effects of malathion and other pesticides on the embryonic development of the hard clam (*Mercenaria mercenaria*) and the American oyster (*Crassostrea virginica*) and on their larvae. Most of the chemicals affected embryonic development more than survival or growth of larvae. Malathion was characterized as one of three insecticides which appear to be least lethal to survival to oysters and clams.

Sanders (1970) studied the toxicity of malathion to four and five week-old tadpoles of Fowler's toad (*Bufo woodhousii fowleri*) in static bioassays at 15.5°C. Under these conditions, the estimated TL50 values for malathion were 1.9 mg l^{-1} at 24-hour, 0.5 mg l^{-1} at 48-hour, and 0.42 mg l^{-1} at 96-hour.

Tagatz et al. (1974) reported that malathion applied in Florida salt marshes for mosquito control at low concentrations caused no mortality in confined blue crabs (*Callinectes sapidus*), grass shrimp (*Palaemonetes vulgaris*), pink shrimp (*Penaeus duorarum*) or the snail (*Littorina irrorata*).

Coppage (1974) determined the toxicity of malathion to pink shrimp (Penaeus duorarum) in flowing seawater at 28° - 29°C and 18 °/oo - 20 °/oo salinity. After 24-hour exposure to malathion at the concentration of 14 ppb (.014 mg l^{-1}), 32 percent of the test animals were dead or affected, and up to 60 percent inhibition of acetylcholinesterase in the ventral nerve cord was measured.

Bejer-Petersen et al. (1972) studied the effects of spray treatments of malathion and other insecticides in forests on birds living in nest boxes. Malathion spraying was carried out in 1965 and in 1967 at a time when nestlings of European tits, Parus major and P. ater were most numerous. The malathion treatments did not significantly affect the birds' breeding success nor result in loss of nestlings. However, reduced brain cholinesterase activity was observed in one or two of the broods of each species.

Randall et al. (1967) studied the biodegradation of malathion in activated sludge. Microbial systems could assimilate single shock loadings of 10 mg l^{-1} (10,000 ug l^{-1}) without apparent effect. The toxicity of malathion to mixed aquatic biota depended on the organic material present. A low ratio of malathion to microorganisms stimulated microbial activity, whereas large ratios (1:5 or greater) inhibited respiration. Microbial systems acclimated to malathion had a greater resistance to its toxic effects and were more efficient in utilizing malathion as an energy source. The authors concluded that the danger of severe stream pollution problems resulting from malathion is minimal. The insecticide was dissipated by aeration and subject to microbial degradation. However, the authors point out possible short-term toxic effects should not be ignored.

Matsumura and Boush (1971) reported that malathion (and other organophosphate insecticides) has not thus far presented a serious persistence or build-up problem in soils. Matsumura and Boush (1966) found that malathion was quickly metabolized by the soil fungus, *Trichoderma viride*, and the bacterium *Pseudomonas* sp., which had been isolated from Ohio soils previously heavily treated with insecticides. The breakdown capabilities of 16 variants of *T. viride* were studied. Certain colonies from this species had a marked ability to degrade malathion through the action of one or several carboxylesterase enzymes.

In 1974, Wolfe *et al.* reported that malathion could form relatively persistent and possibly toxic degradation products in water. Laboratory tests showed that malathion breaks down in water by two competing pathways, one yielding compounds that are considered non-toxic to aquatic organisms. The second pathway, favored in colder water (35°F), resulted in the formation of malathion acids which may possess some of the toxic properties of malathion and appeared to be more persistent in the environment than the parent compound. No specific information was found on which malathion metabolites were produced by the cold water degradative pathway.

Konrad *et al.* (1969) studied the effect of pH on malathion degradation in aqueous and soil systems. In seven days malathion degraded 100 percent at pH 11, 25 percent at pH 9, and 0 percent at pH 6, 4 and 2.

Kennedy and Walsh (1970) studied the effects of malathion on aquatic invertebrates. Ponds were treated with malathion at 0.02 and 0.002 ppm four times over an 11-week period. In the ponds treated at the lower rate, the total number of aquatic insects was not significantly lower than in the untreated ponds. In the ponds treated at the higher rates, the number of organisms was significantly lower than that in untreated ponds. At both treatment rates, benthic organisms (Chironomidae and mayflies) were significantly reduced in numbers.

As reported by Giles (1970), an application of malathion at the rate of 0.78 kg ha^{-1} to a forested watershed in Ohio resulted in a marked reduction of the numbers of aquatic insects in the stream environment, but recovery occurred rapidly. Reptiles and amphibians were unaffected. Giles studied the effects on the faunal ecology of an aerial application of malathion to an 8.2 ha^{-1} watershed covered by deciduous forest in Ohio. Fishes and crayfishes which were sensitive to malathion in laboratory tests were unaffected in the stream environment.

Kerswill and Edwards (1967) monitored the survival of young Atlantic salmon and eastern brook trout sprayed with malathion for budworm control. The trout, found in New Brunswick and Connecticut streams, were studied in their natural habitat and in caged environments. Malathion at 0.89 kg ha^{-1} had no apparent short-term effects on salmon yearlings but killed many under a year old.

Wilson (1966) investigated the toxicity of malathion and several of its metabolites to the fathead minnow The following 96-hour LC50 values (ppm) were obtained: malathion, 14; diethyl succinate, 18; malic acid, 25; mercapto succinic acid, 30; diethyl fumarate, 38; diethyl maleate, 41; dimethyl phosphite, 225; and dimethyl phosphate, 250. By contrast, Bender (1969) reported that the "basic hydrolysis product" of malathion, diethyl fumarate, was more toxic than malathion itself to fathead minnows. Interestingly, this author found a pronounced synergistic effect between malathion and its two basic hydrolysis products. Continuous exposure of 14 days decreased the mean lethal time concentration of malathion as well as of its hydrolysis products.

Weiss (1961) observed that concentrations as low as 0.1 mg l^{-1} of organic phosphorus insecticides inhibit fish brain cholinesterase. The enzyme regeneration period may be as long as 30 days. Weiss (1959) reported that the elapsed time for detectable brain enzyme activity was approximately four hours for malathion in goldfish and speed of response was related to fish size: smaller fish react more rapidly.

Macek and McAllister (1970) reported that ictalurids were generally more resistant to the organic phosphorus insecticides than other species and calculated the toxicity of malathion to black bullheads as 12,900 ug l^{-1} (10,700 - 15,600 ug l^{-1}) in a static

96-hour test using fish weighing 0.6 - 1.7 grams. Bender (1969) in studies to evaluate malathion breakdown products in the fathead minnow found diethyl fumarate to be more toxic than malathion and that a potentiation effect exists between malathion and its breakdown products.

Bluegills exposed to 66 ug l^{-1} and 28 ug l^{-1} were dead after 16 and 54 days, respectively. This life cycle examination of bluegills revealed spinal deformations at lower concentrations (Eaton, 1970).

Malathion concentrations of 31.5 ug l^{-1} and 24.7 ug l^{-1} had detrimental effects on first generation survival in the flagfish (*Jordanella floridae*) in life cycle studies of acute toxicity. The 96-hour LC50 was 349 ug l^{-1} (Hermanutz, 1978). Kanazawa (1975) reported that malathion was taken up and metabolized rapidly by Motsugo.

Some representative values for malathion toxicity to fishes are presented in Table 2 which follows. These values are in close agreement with many published elsewhere. The mechanism of action for malathion is similar to those already discussed for carbaryl on page 12; however, the metabolites of malathion may cause enzyme inhibition in pinfish (*Lagodon rhomboides*) for several weeks after malathion disappears from water (Cook *et al.*, 1976).

Coppage and Duke (1971) monitored the effects of malathion sprayed by aircraft for mosquito control purposes over two Louisiana

TABLE 2

Some Comparative Values of Acute Toxicity for Malathion in Very Small Fish-Fingerlings from Johnson and Finley (1980)

Test Organism	Stage or wt(g)	Temp (C)	96-hLC50 95% CI $(ug/l)^{-1}$
Coho salmon	0.9	12	170 160-180
Cutthroat trout	1.0	12	280 270-310
Rainbow trout	1.4	12	200 160-240
Brown trout	1.1	12	101 84-115
Lake trout	0.3	12	76[a] 47-123
Goldfish	0.9	18	10,700 8,340-13,800
Carp	0.6	18	6,590 4,920-8,820
Fathead minnow	0.9	18	8,650 6,450-11,500
Black bullhead	1.2	18	12,900 10,700-15,600
Channel catfish	1.5	18	8,970 6,780-12,000
Green sunfish	1.1	18	175 134-228
Bluegill	1.5	18	103 87-122
Redear sunfish	3.2	24	62 58-67
Largemouth bass	0.9	18	285 254-320
Yellow perch	1.4	18	263 205-338
Walleye	1.3	18	64 59-70

[a]Tested in hard water (162-272 ppm $CaCO_3$).

lakes. Three species of fish, spot, Atlantic croaker (Micropogonias undulatus), and striped mullet (Mugil cephalus), were collected and assayed for brain cholinesterase activity. Fish from the lake that was treated at the rate of three ounces of malathion per acre exhibited significant inhibition, ranging from about 20 - 80 percent. Fish kills were reported during the spraying period, and moribund fish were collected. Malathion at the same rate was also applied around a second lake, but in this case not over open waters. Only a few fish collected from this lake were found to have significant inhibition.

Hansen (1969) and Hansen et al. (1972) studied the capacity of fish to avoid pesticides, including malathion. Sheepshead minnows did not avoid the test concentrations of malathion, while they were able to avoid several other pesticides tested in the same manner. Mosquitofish showed a real, but not pronounced, ability to avoid water contaminated with malathion, although the results were somewhat inconclusive.

Malathion has a definite effect on the ability of goldfish to learn the light avoidance response at sublethal concentrations. Trained fish exposed at 1,000 ug l^{-1} and 5,000 ug l^{-1} scored a lower number of avoidance responses compared to untreated fish (Woodward, 1968).

4. Pesticides and Behavior

For many years, behavior has been in the category of those activities of organisms which cannot or will not be conveniently classified elsewhere. As Eisler (1979) so aptly observed, behavior has been used to label activities (in marine poikilotherms) which are principally reflexive rather than perceptive in nature. He defined reflexive as "external manifestations of physiological or biochemical effects rather than integration into higher brain centres for recognition of the inimical nature of the contaminant, i.e., learning conditioned paradigms." To that I will add that the ethological paradigm must be considered also.

The use of behavior in the study of pesticides has been spotty throughout the last 25 years. However, there have been a few studies which point out the sensitivity and importance of behavioral alteration as an adaptive or rather maladaptive result of organic chemicals, pesticides, toxic effluents and heavy metal ion contamination of the environment.

One of the early studies by Ogilvie and Anderson (1965) was corroborated when differential thermally induced mortality of Atlantic salmon exposed to DDT was noticed in the field (Anderson, 1971). In the laboratory study by Ogilvie and Anderson, it was observed that fish exposed to relatively high levels (30 and 50 ug l^{-1}) of dichlorodiphenyl trichloroethane (DDT) exhibited a marked avoidance response whenever they swam into a cold region (5°C or less) of a horizontal gradient chamber. Holding fish at reduced temperatures resulted in death. This use of temperature preference after exposure to DDT was more a physiological response than a behavioral response. However, it did involve a component of perceptual activity.

Warner *et al*. (1966) in an important study demonstrated behavioral pathology in conditioned avoidance reactions of goldfish, to chlorinated camphenes (toxaphene) at levels 1/25 of the 96-hour TLM (TLM = LC50). The LC50 for toxaphene (a pesticide) in goldfish is 11 ug l^{-1}. Sublethal levels of this pesticide were demonstrated to have quantifiable effects. The behavior in this case was a conditioned learning one but, nevertheless, involved more than reflexive activity. This study also incorporated the conditioned avoidance of a light stimulus and subsequent reversal (extinction) of the learned avoidance. Anderson and Peterson (1969) reported that sublethal levels of DDT affect the thermal acclimation mechanism in brook trout and prevent establishment of a visual conditioned avoidance response. This study illustrated two phenomena as separate effects resulting from pesticide exposure: (1) a clearly learned and behavioral effect and (2) a clearly physiological adaptation. Welsh and Hanselka (1972) in a contradictory report that methyl parathion (an organic phosphorus insecticide), at sublethal and partially lethal levels, affected the display times of treated Siamese fighting fish (*Betta sphendens*) in reacting to an untreated conspecific. However, the untreated fish showed similar regression in reaction times. A behavioral alteration was indicated when Atlantic salmon parr were light-attraction conditioned and subsequently treated with two organic phosphorus pesticides, sumithion (fenitrothion) and abate and two chlorinated hydrocarbon pesticides at sublethal levels. Learning in these salmon was retarded by organic phosphates and enhanced by the chlorinated hydrocarbons. Lower concentrations had no apparent effect on learning speed at concentrations 10 percent of the 96-hour LC50 (Hatfield and Johansen, 1972). These compounds, abate and fenitrothion, are similar to malathion in chemical structure. Wildish and Lister (1973) described feeding experiments in which brook trout demonstrated hierarchy reversal of the dominant fish at high stocking densities, fed dietary fenitrothion at 10,000 ug g^{-1} of fish weight daily for four weeks, they subsequently regained dominance after 23 weeks of depuration. The dominance was measured by food partitioning. Generally, dietary inputs of toxicants to fish have been found to be significantly less lethal than water exposure (Wildish and Lister, 1977). However, the ecological implication of sublethal dietary inputs from food organisms may be significant.

Symons (1973) reported that exposure of young Atlantic salmon to 1 mg l^{-1} (1,000 ug l^{-1}) of fenitrothion for 15 - 16 hours resulted in a 50 percent decrease in the number holding territories six days post treatment. In the same study when young salmon were force fed mealworms (Tenebrio sp.) containing 2 - 5 ul of 100 percent fenitrothion, 50 percent were regurgitated in eight to twelve hours. After the third or fourth feeding, avoidance of capture with a dip net ceased.

At this environmentally reasonable level (fenitrothion, 1 mg l^{-1}), the severely affected fish regained territories after two to three weeks. This corroborates some of the findings of Bull (1971) who reported reduced aggressive and territorial behavior. Both of these studies indicated the effects of greatly reduced concentrations of cholinesterase-inhibiting organic phosphorus insecticides on gross behavior.

Dill and Saunders (1974) reported on the effects of an exposure of sublethal DDT exposure to gastrulated "eggs" of Atlantic salmon. DDT delayed the time of first appearance of behavior patterns, and at higher exposures the development and appearance of these behaviors were not observed. These DDT induced behavior latencies and gaps may have subjected young fish (alevins) to increased predation. This study indicated the latent effects of toxicants on behavioral sequencing, and behavior ontogeny suggested disruption of subcellular and endocrine systems.

Bull and McInerney (1974) exposed wild under yearling (weight 0.4 - 5.5 g) coho salmon to fenitrothion at 100, 230, 480 and 750 ug l^{-1}. The 96-hour LC50 for fenitrothion in coho salmon is 1300 ug l^{-1}. At low concentrations, 100 and 230 ug l^{-1}, the mean frequencies of comfort behaviors increased while social and feeding activities were largely suspended. At the higher concentrations, physiological impairment was evident. Suppression of agonistic behaviors at the low concentration was evident: frontal and lateral displays, chases, nips, flights, etc. decreased in frequency. As Symons (1973) and Bull and McInerney (1974) found, coho salmon stopped defending territory at the lowest concentration of fenitrothion (7.3 percent of the LC50). This study is one of the first in which ethological behavior units were employed in an assessment of chemical effects. Farr (1977) reported on the effects of sublethal exposures of grass shrimp (Palaemonetes pugio) to ethyl and to methyl parathion. This shrimp apparently lost anti-predator behavior in the presence of a known predator, the killifish (Fundulus grandis). The grass shrimp of the Gulf of Mexico Coast is a principal salt marsh detritivore.

Lingaraja et al. (1979) reported on subacute exposure to DDT on the feeding rate of the tigerfish (Terapon jarbua) on juvenile mullets. The exposed predator consumed more prey. The behaviors affected in predator fish were orientation, feeding, aggression and comfort behaviors.

Fisher et al. (1980) reported on the acute toxicity and sublethal effects of hydrazine on the dorsal light response and aggression in bluegills. Their study correctly claimed that there have been few ethological field studies of bluegills and then assumed that the dorsal light response, positive phototropism, was a perceptive rather than reflexive behavior. Aggressiveness was demonstrated by attacks on artificial prey objects increasing relative to concentration of hydrazine exposure.

Dodson and Mayfield (1979) reported on the rheostatic behavior of rainbow trout exposed to 2,4-dichlorophenoxy acetic acid (2,4-D), an extensively used herbicide. 2,4-D was lethal to trout at a level only twice the suggested field application rate. At lower doses the trout were lethargic and did not avoid capture. However, the rheotaxis referred to here is an optically stimulated rheotactic response. The animals were not orienting to flow; they oriented to a moving lateral background. These authors also reported greater lethal sensitivity to 2,4-D in larger than smaller fish. The larger fish died before smaller fish after 24-hour exposure to toxic concentrations.

Wildish and Lister (1977) reported that the hierarchy of brook trout was not affected by dietary fenitrothion at exposures (10,000 ug kg^{-1} wetfood).

Kleerekoper (1976) emphasized, ". . . the need to study behavioral responses not in reaction to a single variable but to naturally occurring combinations of variables which, surely, prevail in the natural environment . . ."

C. Natural History of Yellow Bullheads (*Ictalurus natalis*)

The catfishes of the genus *Ictalurus* are widely distributed in North America. They are inhabitants of both temperate and tropical fresh waters. They were indigenous to the area east of the Rocky Mountains and have been introduced to the west coast. They are successful in quite varied habitats and have remained relatively unchanged morphologically in recent geologic times.

The yellow bullhead is characteristically found in the heavy aquatic vegetation of slow-moving rivers and lakes and is primarily a bottom feeding omnivore (Scott and Crossman, 1973). These fish are found in social aggregations except in breeding season. Adult fish are found in locations also containing the brown bullhead (*I. nebulosus*) and probably the black bullhead. All are closely related species, and they are not known to hybridize in the wild.

Some species in this group (*I. natalis* and *I. nebulosus*) have dominance hierarchies and recognition between individuals. These and other behaviors have been shown to be dependent largely upon olfaction (Todd, 1968). Work on bullheads indicated that sophisticated behavior based on individual experience may be correlated with olfactory dominance in the brain (Atema *et al.*, 1969). It is evident that complex or behaviorally sophisticated species, such as the bullheads, depend upon the maintenance of hierarchies and social stability for reproductive success (Timms and Kleerkoper, 1972).

II. MATERIALS AND METHODS

A. Preliminary Activities

1. Construction of Facilities

The laboratory was constructed in a ground level room and the basement of the University of Tennessee Aquatic Biology Building at 2102 Terrace Avenue, Knoxville in September and October 1974. Some initial observations were made in tanks set up in the ground level room. Temperature and light controls were inadequate, and there were periodic human disturbances which appeared to influence fish behavior on that floor (level) of the building. Subsequently, all of the observations used in this thesis were made in the basement laboratory with the exception of the field observations.

The 1,050 ft^2 laboratory was supplied with hot and cold municipal water, floor drains, a sink and several storage shelves. External light sources were blocked and illumination was supplied by two 40-watt daylight fluorescent lights with 12-hour light and 12-hour dark cycle controlled by a timer (Utico Model ATI 24-hour timer). This provided an uneven, low light intensity throughout the laboratory beginning at 6:30 a.m. Temperature was variable and control was initially difficult. Ambient basement temperatures were somewhat more stable than first floor temperatures since that laboratory was below grade. In cold weather the temperature was stabilized because the building and basement laboratory were heated by recirculating hot water and some convection from a gas hot water heater. Later, cooling was provided by window-mounted, 10,000 BTU air conditioner. Temperature for the laboratory controls proved to be adequate, although coincidental variations in temperature and light caused problems on at least one occasion.

Thirty aquaria ranging in size from 18.9L - 378L were used to house the fish. In addition, four holding pools -- one child's wading pool approximately 2,780L capacity (3.048 by 0.381 meters), one pool approximately 1800L (2.44 by 0.381 meters), and two approximately 176L (1.4 by .8 meter) pools; were modified for fish culture. Commercial aquarium box filters and siphon filters (magnetic impeller flow) with activated charcoal and fiber glass filter floss were used on recirculating tank water systems. Aquaria were aerated with commercially available aquarium air pumps and air stones. Aquaria substrates were composed of 1.0 - 4.0 cm of sandstone river gravel approximately 1 - 3 cm in diameter (no limestone was used).

Wading pools were supplied with a continuous flow (6 - 10L day^{-1}) as make up water for leaks. The water was dechlorinated and filtered using a 37L bubbling filter containing approximately 15L of sand, 10L gravel and 10L of activated charcoal. The filter was also connected by a "Y" fitting to recirculating pool water. This charcoal was periodically (every two weeks) autoclaved at 44 - 58 kg cm^{-2} and 120 - 125°C to remove organic contaminants. Pools were aerated with small submersible pumps creating a fountain effect. Two seven-day thermographs were installed to record water and air temperature in the laboratory. The liners for the pools were scoured with a detergent solution, rinsed with hypochlorite, wiped with acetone and rinsed with water to remove the trace phenolic anti-oxidants and phthalate plasticizers used in the flexible vinyl liners. The liners were rinsed for several days with water. This leaching and cleaning was done to reduce the likelihood of interactions between the fish (behavior) and these compounds.

Light intensity was measured between 0.016 and 0.13 foot candles (0.17 - 1.4 lux) incident upon tanks and pools during the "daylight" part of the light, dark cycle. At these light levels, the fish were active. (When observations were being made, the light intensities were varied using a rheostat). The color of the light made little difference. A red incandescent and a yellow incandescent light were used, and the shelter seeking frequency was approximately the same for each of these at higher intensities as for white light. The depth of the water in the tanks did not have noticeable extinction effect on the light.

2. Collection of the Yellow Bullhead

The location and trapping of yellow bullheads provided a considerable challenge. The task of obtaining suitable numbers of the desired species proved to be time-consuming. The Holston River at Phipp's Bend near Surgoinsville, Tennessee, (Figure 1) had an ample population of I. natalis. This site was trapped using double-chambered hoop nets with wing nets deployed. This location was collected on six occasions between November 10 and December 14, 1974

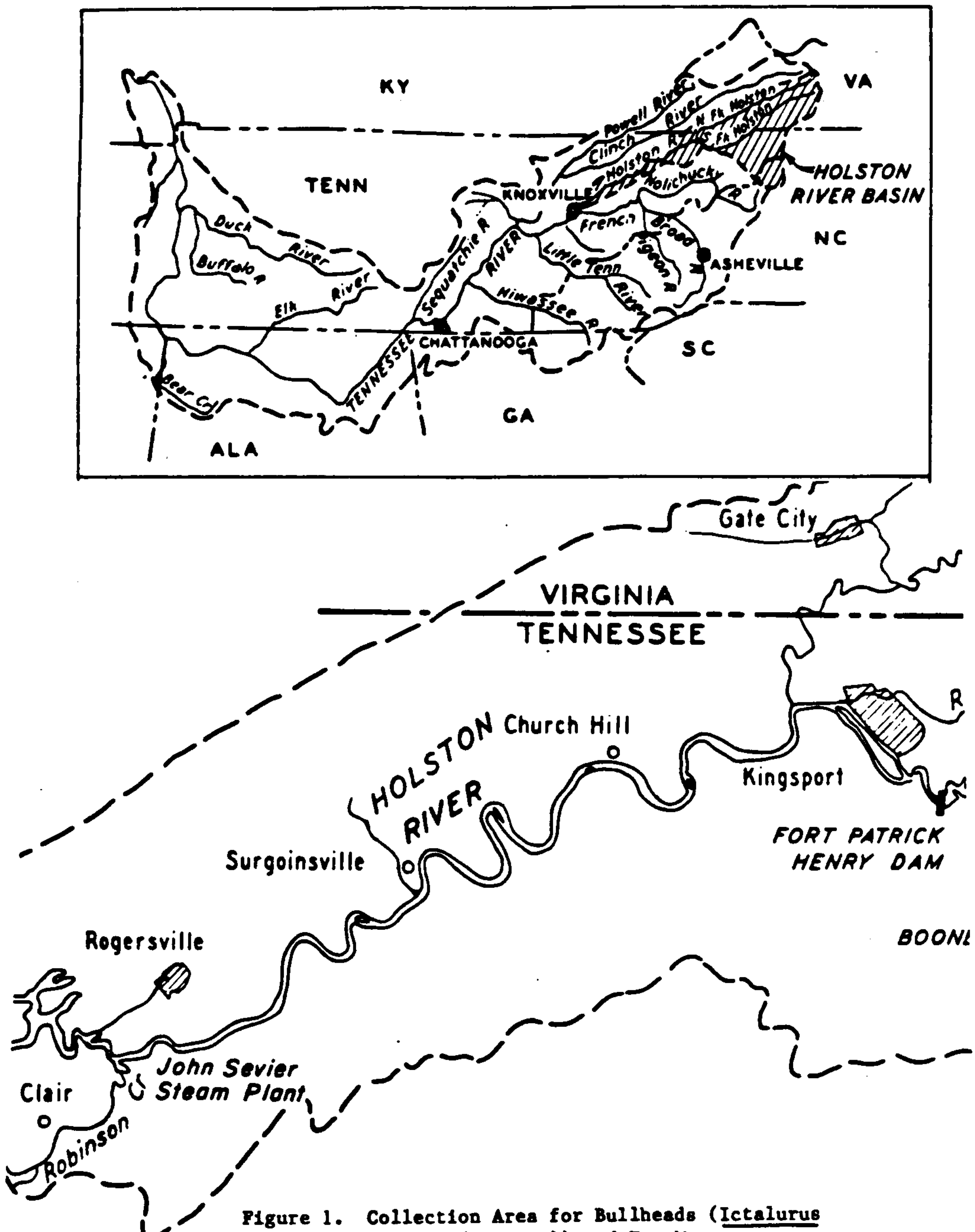

Figure 1. Collection Area for Bullheads (Ictalurus natalis (Lesueur)) and Key Map

and February 10 through February 13, 1975. The nets were baited with liver, set for at least 48 hours and then visited every other day. On one occasion a net had been cut and was repaired. One hundred thirteen yellow bullheads ranging in size from 55 - 405 grams in weight and 170 mm - 310 mm in length were collected.

Ictalurus natalis was the only bullhead collected from this site. Their identification was tentatively made by the whitish color of the lower barbels. Identity was subsequently confirmed by Dr. David A. Etnier of the University of Tennessee, Department of Zoology.

3. Laboratory Culture of Fish

Some of the bullheads were transported to the Aquatic Biology Building basement laboratory at 2102 Terrace Avenue, Knoxville, in aerated coolers. They were removed from coolers and some were released into aquaria containing dechlorinated filtered tap water at ambient temperature. Others were released in wading pools containing dechlorinated tap water. The water in these pools and aquaria was aerated. The pools were not initially filtered and this presented some difficulties when tap water was added. The pools were subsequently filtered and aerated.

Twenty bullheads were released in the 45,000L spring-supplied pool at the Tennessee Valley Authority Fisheries Laboratories at Norris, Tennessee in November 1974 for observation in an ecological community setting at a later date.

Approximately six weeks were required for the fish to become acclimated to laboratory culture conditions. The aquaria and wading pools had shelters and gravel substrates. The shelters were clay drain tiles and bricks with flat marble stones placed over them to form cavities. The use of shelters reduced the intensity and frequency of aggressive behavior in aquaria and pools housing two or more fish. This observation corroborates those of Sparks _et al_. (1972) in bluegills. During the initial acclimation period, fish were found dead on the floor beside aquaria and wading pools. These dead fish showed evidence of fighting. Subsequently, screen or plywood covers were used.

The fish were initially fed pelletized commercial trout food. However, considerable difficulty was encountered with disintegration of the pellets and fouling of the filters and water. Uneaten food was removed from the aquaria or pools within four hours of feeding. The trout food was discontinued because of the heavy fungal growth in tanks and some indication that these growths might have been contributory to disease in the colony. The bullheads showed a distinct preference for liver, kidney and live slugs of the genus _Limax_. They were fed weekly in quantities according to weight. The bullheads were weighed and measured periodically. All fish showed increases in length and weight (approximately one to three percent gain in weight) and in larger fish negligible increases in length. In the smaller fish increases in length were 0.5 - 1.0 percent. These increases were within the normal limits of growth when compared to data in Carlander (1969). These bullheads were estimated at time of capture to range in age from 1 1/2 - 5 years.

In the initial stages of fish culture during December 1974 and January 1975, diseases were a problem, but not a serious one. Diseases recognized in the laboratory colony were principally tail and fin rot and whirling disease. The tail and fin rot was caused by a fungus and was controlled with tetracycline. Whirling disease was generally fatal. The aquaria which housed the infected fish were emptied, washed with disinfectant detergent, and sprayed with a 10 percent solution of formalin. The treatments abated further outbreak of disease. Mortality from disease in the colony was less than four percent, and it was concluded that yellow bullheads are hardy and able to adapt to laboratory culture for fairly long periods of time.

The fish were housed in aquaria in which activated charcoal was used to filter water in recirculating systems. Both siphon and box type filters were used. The filter charcoal and filter floss were replenished regularly.

Water quality determinations (Table 3) were performed in the laboratory using a Hach Water Quality Test Kit for some determinations. Water quality at the collection site was analyzed by the Tennessee Valley Authority Water Quality Branch, Chattanooga, Tennessee on the days that the fish were collected (Appendix A).

Three bullheads which died or were killed soon after capture were analyzed for heavy metal content by the Tennessee Valley Authority Water Quality Laboratory in Chattanooga. Mercury levels were elevated in these fish (0.39, 0.87 and .55 ug gm^{-1} of flesh,

TABLE 3

Water Quality Values With Holding Tanks
and Fish Culture Pools

From 1/8/75 to 4/15/75	$\bar{x}$(mg l^{-1})	SD	(n)	From 4/6/75 to 11/30/75	$\bar{x}$(mg l^{-1})	SD	(n)
D.O.	7.648	± 0.455	29	D.O.	6.386	± 0.219	28
pH	6.46			pH	6.339	0.195	23
Alkalinity	68.1	6.78	6	Alkalinity	61.2	8.21	8
Phenol.	129.88	42.7	11	Phenol.	--		--
Hardness as $CaCO_3$/Total	70/79	23.88	25	Hardness as $CaCO_3$/Total	61.6	16.21	20
Cond mhos	--			Cond mhos	121.62	0.16	7
Acid	--			Acid	--		
Turbid fmu	--			Turbid fmu	--		
SO_4	12.3	6.82	7	SO_4	15.2		5
Temp °C	18.39	0.548	10	Temp °C	18.52	0.721	14
CO_2	4.81		8	CO_2	6.2		
Ca	< 0.02			Ca	< 0.02		
Cl_2	0			Cl_2	0		
PO_4	--			PO_4	--		
Meta	--			Meta	--		
NO_3	0.1172	0.115	26	NO_3	< 0.15		8
NO_2	< 0.1		8	NO_2	< 0.02		8
NH_4	< 0.05		5	NH_4	< 0.01		8
Flow				Flow			
Vol				Vol			

Standard deviation not calculated on values which were ranges or reported

390, 870, 550 ppb) and in sediments and water column at the collection site. (This contamination originated from a manufacturer which had used chloralkalai process at Saltville, Virginia.)

B. Fish Behavior

1. Observational Techniques

Only adult bullheads were used in these studies. Although juvenile fish exhibit social behaviors, the completely developed set of social behaviors occurs principally in adult bullheads (Bryant, 1983). In addition, Eberhardt (1975) reported that uptake and retention of heavy metal ions and organic chlorine compounds in small versus large fish were quite different as calculated by uptake and depuration models. Eberhardt also demonstrated that in the model using data from larger fish, variances were reduced.

Social behavior hierarchy and territory formation are a significant part of the ecology of this species. The establishment of dominance and territory in yellow bullheads was the principal component in the design of these studies.

Initially, an ethogram of three-member bullhead colonies was attempted in a first floor laboratory of the Aquatic Biology Building. This location and use of three fish was abandoned. The final method used employed two fish per colony. Results proved to be less ambiguous. The bullhead colonies were established in 189L (30.48 x 40.68 x 152.40 cm) and 380L (38.1 x 60.96 x 182.8 cm) tanks with shelters, filters, aerators, etc. as previously described. The dimensions of the tanks permitted the formation of territories and establishment of an hierarchy with observable individual distances (Atema, 1975; Bryant, 1977).

The criteria for selection of fish was modified from Sprague (1969), Atema (1969), and Todd (1968). The size ratio between the two fish was less than 1.5. The temperature changes between the dosing apparatus and the holding and observation tanks were generally not abrupt, (< 2.5°C) and water supply for these tanks was from the same source. The bullheads were not fed two days prior to exposure.

2. Behavior Methods

The two fish in each experiment were initially selected from the wading pool populations and allowed to acclimate and stabilize for at least eight weeks during which period the range of behaviors was substantiated. Dominance was usually established within the first hour after introduction, and the bullheads selected "home" shelters (territories).

The evidence of dominance was determined and the alpha and beta fish were each identified by behavior, home shelter location, external body characteristics and size.

The identity of individual behaviors (subcategories) was recognized and scaled from November 1974 to May 1975. Behavior units were unique and most were discrete. Observation of behavior was replicable once the patterns and component units were described for this species. The behavioral units of yellow bullheads as described by Todd (1968) with the modifications of Atema (1969) and developed during this investigation were the basis for these studies. Categories of behavior such as aggressive, feeding, neutral, etc. were used to describe the behavior categories. During this period, the behavior recording technique was developed. The ethological observation techniques were modified after Myrberg (1972a), Atema (1969), Jenkins (1969), Todd (1968), Nelson (1964a,b) and Wiepkema (1961). Individual behaviors are listed in Table 4 and illustrated from Atema (1969) in Figures 2, 3, 4, 5, 6, and 7.

Observations were made in reduced light (11 - 88 lux (1 - 8 fc)). Incident light was measured at the surface of the water. Illumination was provided by two white 15-watt incandescent lights controlled by rheostat. Most observations were made at light levels in the range of 16 - 25 lux.

The fish were unaffected by the reduced light levels after an initial acclimation period. At these light levels, individual bullheads were readily distinguished from one another. Behavioral units were voice recorded using a magnetic cassette tape recorder (Dictaphone Model 84). Timing of sessions was made with a 60 minute, 0.2 second division, mechanical stopwatch.

Reproductive and mating behaviors were not recorded. The yellow bullheads' reproduction often involved severe injury and mortality. Temperature and light controls were employed to limit reproductive and mating behaviors. Consequently, these behaviors were not observed during the experiments.

TABLE 4

The Partial Ethogram; List and Description of 50 Behavior Subcategories

I. Aggressive Behavior

1. Mouth Fight (MF): Highest level of aggression seen; test of physical strength; results in injury.

2. Bite (BI): Extremely aggressive act resulting in visible damage to the recipient fish's body or fins.

3. Nip (NP): Relatively high level of aggression; may result in slight injury.

4. Chase (CH): Rapid active pursuit; indicates dominance.

5. Butt (BU): Relatively high level aggressive action; head to body.

6. Mouth Display 4 (M4): Mouth fully open, opercles extended; most aggressive display without physical contact, usually non-mobile.

7. Head Thrust (HH): Aggressive displacemnet of one fish by another using head.

8. Tail Thrust (TH): Displacement of one fish by another using caudal fin or body thrust.

9. Frontal Display (FD): Approach by a fish to another with mouth display, barbels forward and dorsal fin erect.

10. Nudge (ND): Moderately aggressive action; gentle pushing of one fish's body by other's head; some movement of recipient may occur.

11. Tail Block (TB): Body or caudal fin used to block shelter entrance.

12. Circle (CI): Tight circular swimming; dominance not defined.

13. Head Wag (HW): Occurs during displays; usually with lateral display (LD).

TABLE 4 (Continued)

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14. Mouth Display 3 (M3): Mouth open more than M2; greater than half way open; opercles moderately extended.

15. Mouth Display 2 (M2): Mouth open up to half; opercles slightly extended.

16. Mouth Display 1 (M1): Mouth slightly open; opercles not visibly extended.

17. Approach (AP): Slow, swim toward another fish; no displays.

18. Lateral Display (LD): Lowest intensity of mobile aggressive display.

19. Dorsal Fin Erect (DE): Dorsal fin erect or partially erect; denotes dominance state; dominance signal when erect.

II. Feeding Behaviors

20. Head Stand (HS): Pre-ingestion after detection of food objects on or in substrate; rarely as a displacement behavior after encounter.

21. Ingest (IG): Terminal behavior in feeding sequence; may include non-food objects along with food.

22. Spit (SP): Regurgitation of ingested objects; expels objects from mouth.

23. Dig (DG): Mouth scoop substrate sometimes after head stand.

24. Search (SS): Rapid, intense food locating behavior.

25. Cruise (CB): Swim, barbels touching or near substrate; food location.

III. Neutral Behaviors

26. Hover (HO): Hover in water column sometimes near a territorial boundary.

27. Resting Position 4 (R4): Resting on or sometimes burrowed in substrate at least four points of contact.

TABLE 4 (Continued)

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28. Resting Position 3 (R3): Three points of contact with substrate.

29. Turn (TU): Turn.

30. Stress Pump (ST): Rapid opening and closing of mouth and extension of opercles.

31. Explore (EX): Exploratory; investigation of new objects or fish.

32. Cruise (CR): Periodic swimming.

33. Barbel Touch (BA): Recognition behavior between fish, non-aggressive, may also occur after conflict.

34. Scratch (SC): Rubbing body on substrate or object.

35. Collide (CD): Fish strikes object in tank.

36. Yawn (YA): Yawn.

37. Resting Position 2 (R2): Two points of contact with substrate.

38. Resting Position 1 (R1): One point of contact; ready to avoid.

39. Startle (SA): Submissive behavior; short, moderately rapid, swimming away from another fish.

IV. Submissive Behaviors

40. Border Turn (BT): Turn and display on a territorial boundary mostly by subordinate fish.

41. Dorsal Down (DD): Dorsal fin down against body; subordinate behavior, usually.

42. Halt (HA): Stop swimming rapidly by extending pectoral fins; usually occurs when subordinate fish meets display or territory of dominant.

TABLE 4 (Continued)

43.	Reverse (RV): Avoidance behavior; less intense then FL or CH.
44.	Roll (RO): Roll while swimming in contact with other fish, usually subordinate behavior.
45.	Barbel Quiver (BQ): Barbel vibration; submissive behavior.
46.	Quiver (QI): Shivering, vibration of body; usually by subordinate fish.
47.	Resting subordinate (RS): Fish rests on dominant.
48.	Avoid (AV): Continuous avoidance by subordinate fish of a dominant.
49.	Dart (DA): Darting, rapid swimming coming to a stop; escape.
50.	Flee (FL): Very rapid, continuous swimming behavior; seeking shelter, to escape pursuing dominant fish, frantic.

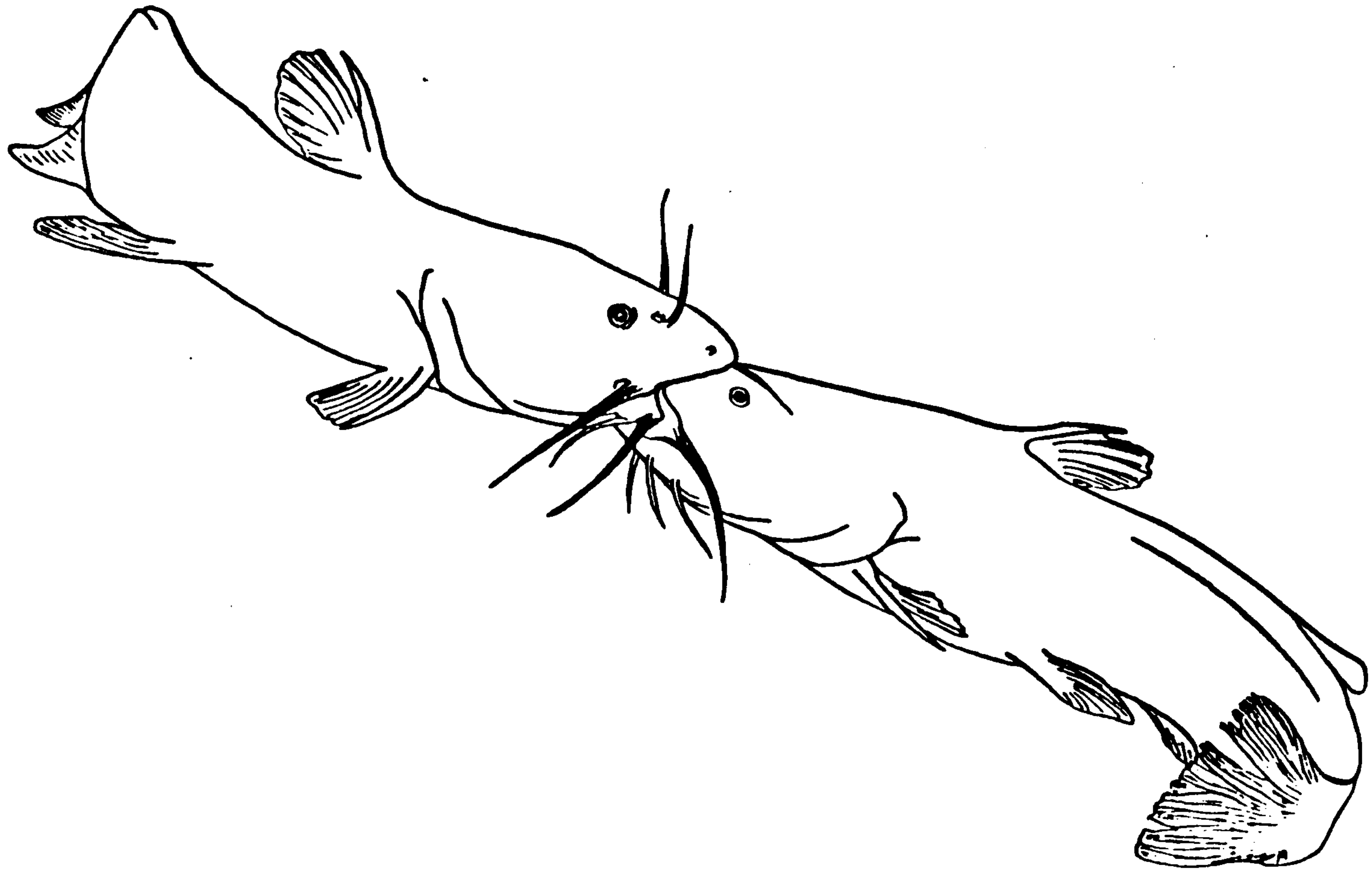

Figure 2. Drawings of Bullhead Behavior. Mouth Fight.

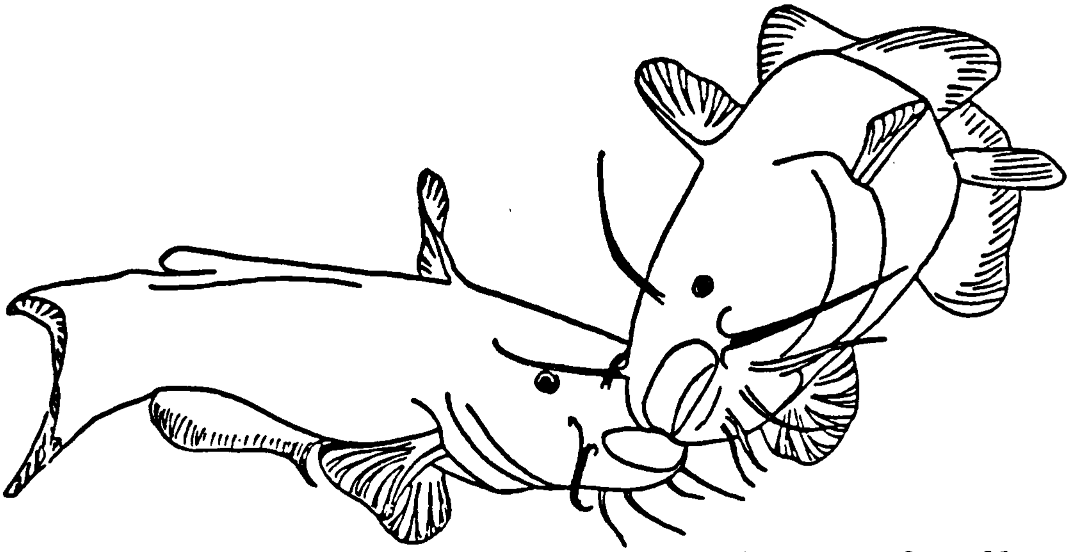

Figure 3: Drawings of Bullhead Behavior. Mouth Display 2, Roll.

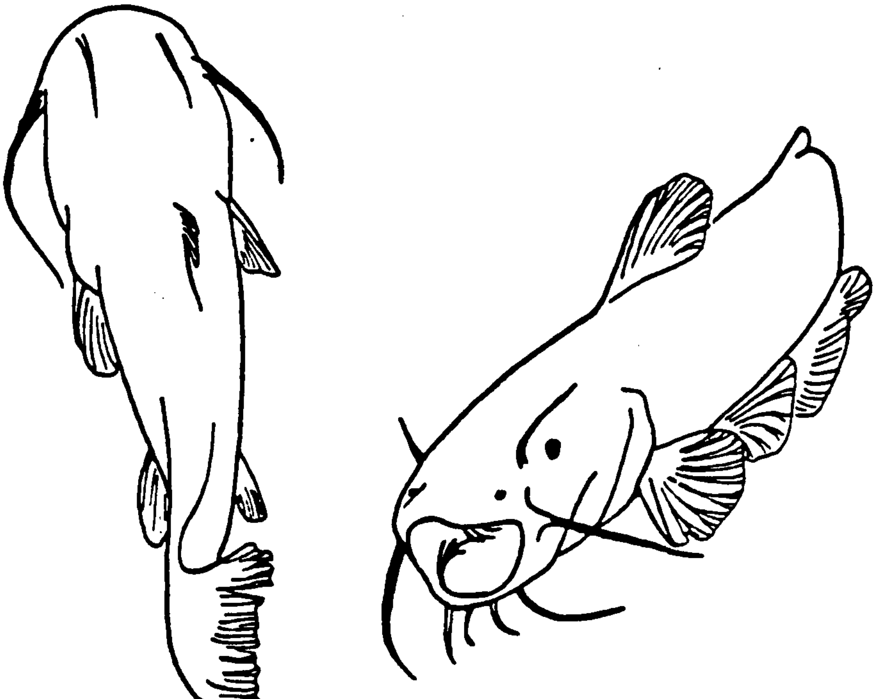

Figure 4: Drawings of Bullhead Behavior. Chase Mouth Display 3, Flee.

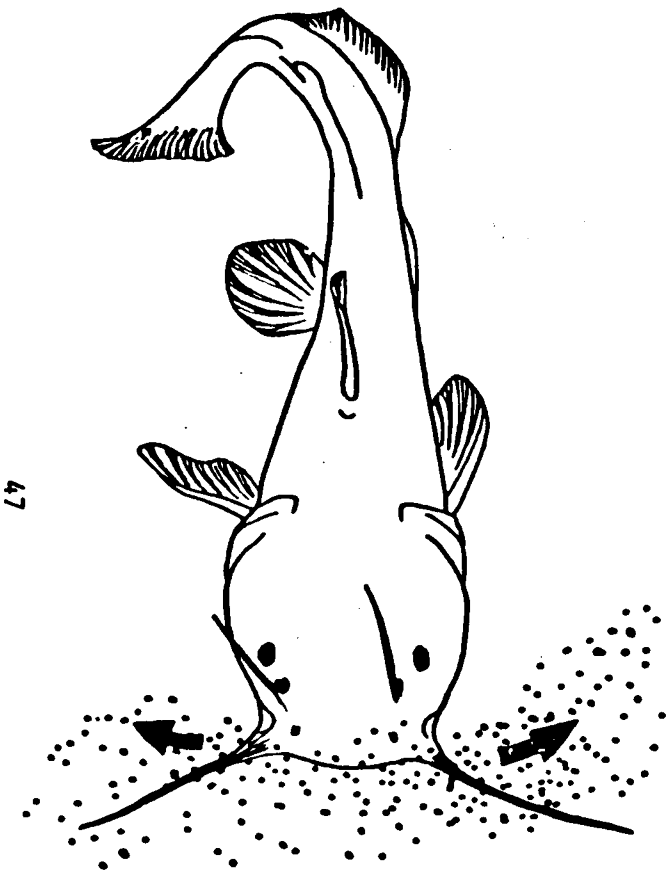

Figure 5. Drawings of Bullhead Behavior. Dig and Head Stand.

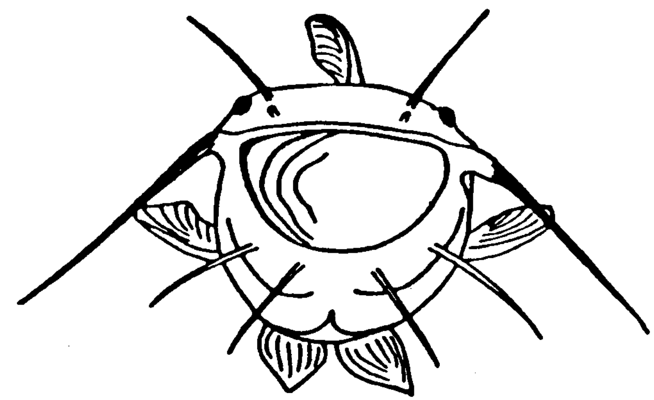

Figure 6: Drawings of Bullhead Behavior. Yawn.

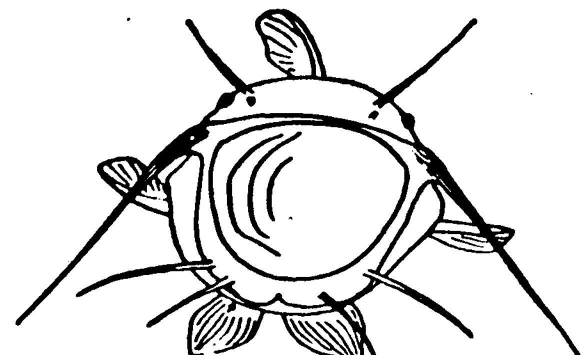

Figure 7. Drawings of Bullhead Behavior. Mouth Display 4.

3. Verification of Behaviors

Field-type observations were made in the pool of the Tennessee Valley Authority Fisheries Laboratory at Norris, Tennessee during February 1975 on three occasions. Yellow bullheads from the Surgoinsville population were introduced in November 1974 to the pool which contained approximately 45,000L of clear water. Observations were not attempted at the Surgoinsville collection site because of the low light penetration, high turbidity and heavy growth of aquatic macrophytes (Table 5).

C. Experimental Design

1. Pesticides

The exposure levels chosen for bullheads in these experiments were estimated through extrapolation from 96-hour LC50 levels in ictalurid species cited in the literature (LC50 = concentration given in miligrams per liter or micrograms per liter which results in 50 percent mortality in a species of over 96 hours of exposure.) The levels chosen (0, 1, 2 and 4 mg l^{-1} (1,000, 2,000 and 4,000 ug l^{-1})) were estimated to be clearly sublethal with respect to the 96-hour LC50 for carbaryl and malathion. (Some of these doses were less than the application factor, 0.1 of the 96-hour LD50). An application factor is that concentration level of chemical generally considered to be non-damaging.

TABLE 5

The Partial Ethogram, Correspondence Between Laboratory and Field Observed Behaviors

Behavior	Laboratory Observed	Field Observed
Approach	+	+
Avoid	+	+
Barbel Touch	+	+
Bite	+	0
Barbel Quiver	+	+
Butt	+	+
Boundary Turn	+	+
Collide	+	+
Chase	+	+
Circle	+	+
Cruise	+	+
Cruise Barbel Feel	+	+
Dart	+	0
Dorsal Down	+	+
Dorsal Erect	+	+
Dig	+	0
Explore	+	+
Frontal Display	+	0
Flee	+	0
Halt	+	+
Head Stand	+	+
Head Thrust	+	+
Hover	+	+
Head Wag	+	0
Ingest	+	+
Lateral Display	+	+
Mouth Display I	+	+
Mouth Display II	+	+
Mouth Display III	+	0
Mouth Display IV	+	0
Mouth Fight	+	+
Nudge	+	+
Nip	+	+
Quiver	+	0
Resting Position I	+	+
Subord. Rests on Domin.	+	+
Resting Position II	+	+
Resting Position III	+	+
Resting Position IV	+	+
Reverse	+	0
Roll	+	0
Startle	+	0
Scratch	+	+
Spit	+	+
Search	+	0
Stress Pump	+	+
Tail Block	+	+
Tail Thrust	+	+
Turn	+	+

+ = Observed; 0 = Not observed

The 96-hour LC50 estimated for this species at this size was probably greater than the extrapolated values: larger fish are able to tolerate higher exposure to toxic chemicals. In addition, the 48-hour LC50 values for these compounds probably would be higher than 96-hour LC50 values, i.e., most compounds are less toxic in 48 hours than in 96 hours of exposure: the sublethal levels of exposure were comparatively even less than the sublethal levels as stated.

The 48-hour exposure was employed to counteract the possible effects of removal of the alpha bullhead on the dominance relationship between the pair. The colonies were established and stable for a relatively long period to minimize the disruptive social effects of manipulation on colonies. It has been reported that removing a dominant fish from a colony sometimes disrupts the hierarchy (Bryant, 1977).

A bracketing of exposures was maintained by the experimental design requirements with respect to both chemicals within the estimated sublethal effects range. The dominant bullhead (alpha fish) was exposed for a period of 48 hours in a continuous flow system (Table 6). After exposure, the fish was washed for approximately one hour in clean water to remove any adsorbed toxicant and returned to the tank from which it came and to its tank mate (the beta fish). The social behaviors (Aggressive, Feeding, Neutral, and Submissive) of these colonies were observed beginning one hour after exposure in a geometric time series ending at 256 hours (Figure 8). The observations were made for a total of 15 minutes of activity. Periods of

TABLE 6

Experiment Number, Exposure and Fish Identification

	Exposure		Fish I.D.
E 11	Untreated	0.0 mg l^{-1}	17 α , 17 β
E 12		0.0	19 α , 19 β
E 29	Carbaryl	1.0 mg l^{-1}	21 α , 21 β
E 32		1.0	22 α , 22 β
E 34		2.0	24 α , 24 β
E 41		2.0	9 α , 9 β
E 38		4.0	23 α , 23 β
E 36		4.0	25 α , 25 β
E 50	Malathion	1.0 mg l^{-1}	3 α , 3 β
E 51		1.0	26 α , 26 β
E 52		2.0	30 α , 30 β
E 53		2.0	31 α , 31 β
E 54		4.0	33 α , 33 β
E 55		4.0	32 α , 32 β

EXPOSURE

Type of Experiment	Experiment Number	
Control (Non-treated)	11	13
Pesticide (treated)		
I. Carbaryl		
Low 1 mg l^{-1}	29	32
Medium 2 mg l^{-1}	34	41
High 4 mg l^{-1}	38	36
I.. Malathion		
Low 1 mg l^{-1}	50	51
Medium 2 mg l^{-1}	52	53
High 4 mg l^{-1}	54	55

OBSERVATIONS

Number	Hour Post Dosing	Behaviors by Category
1	1	F = Feeding........ 6 behaviors
2	2	
3	4	
4	8	N = Neutral........14 behaviors
5	16	
6	32	S = Submissive.... 10 behaviors
7	64	
8	128	A = Aggressive.... 20 behaviors
9	256	
2 fish each experiment α and β		50 behaviors

Figure 8. Experimental Design

inactivity were timed and noted on the tape recording and in the data analysis.

Each chemical was applied to fish a total of six times, i.e., three exposure levels and two fish exposed at each exposure concentration (Figure 8). Untreated fish were replicated once. The data were voice recorded as a behavior code (Table 4, page 41) and subsequently transcribed. Behaviors were timed using a stopwatch to measure the duration of behavior as recorded. The voice recorded data codes provided an approximate time measure of duration of individual behaviors.

2. Experiments

The alpha fish were introduced into the exposure aquarium which received the toxicant from a Mount-Brungs Proportional Diluter (Figure 9). This machine was employed to maintain a predetermined concentration of a chemical in contact with a fish over 48 hours. The diluter is driven hydraulically, therefore, it only needs water in a head tank to operate it. In Figure 9-A, the chemical metering device delivers a known quantity to the initial dilution box in the cells of the diluter. The plastic bucket of the metering device fills with water from the head tank. It is counterweighted to dip a single dose from the constant level reservoir (a funnel connected to a mariotte bottle). The dose is held in the hollow distal arm by capillary attraction and runs into the initial cell of the diluter when the bucket tips from the weight of the water. Only one fish was exposed during a session. Water quality data were measured prior to the

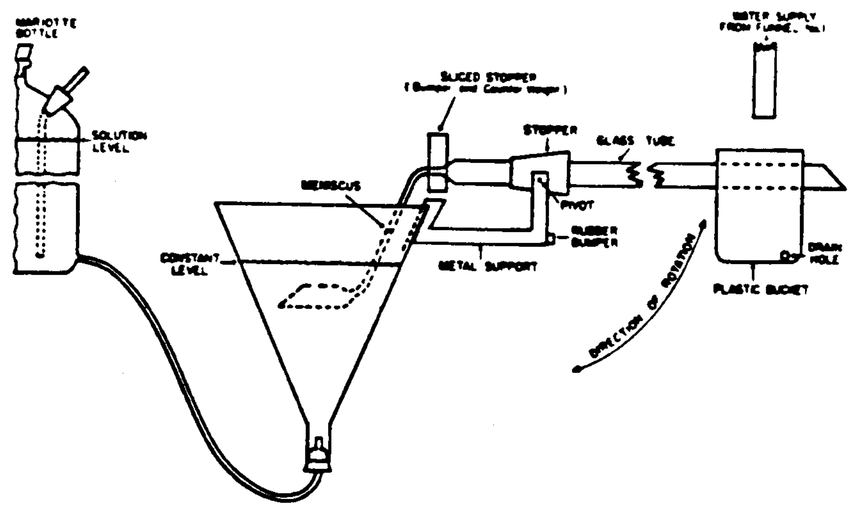

Figure 9-A. Chemical Metering Device, "Dipping Bird".

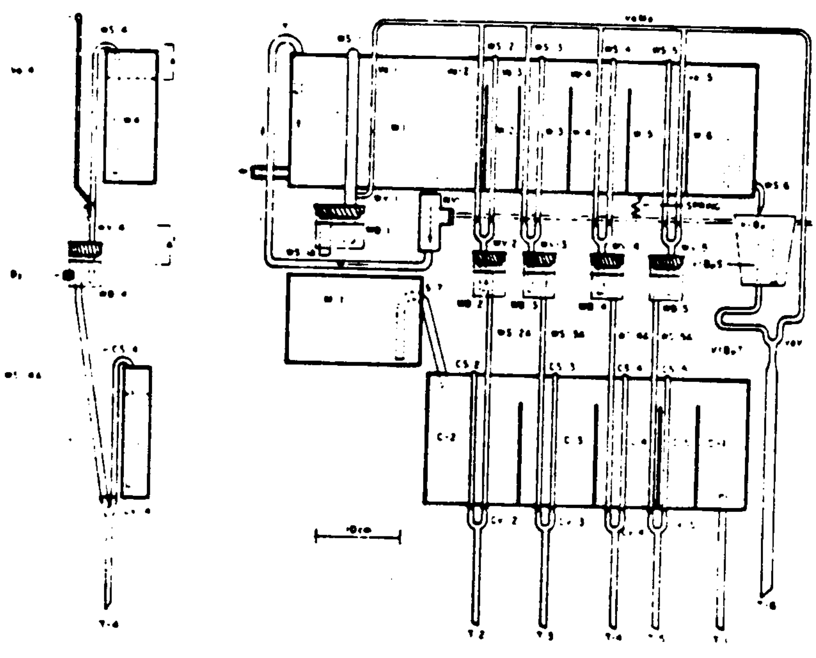

Figure 9-B. Cells of Mount-Brungs Diluter.

Figure 9. Diagram of Mount-Brungs Proportional Diluter

untreated (alcohol) exposure sessions (Table 7). Water quality measures were made prior to carbaryl and malathion exposures Table 8). Some of the water quality determinations were made with a Hach Water Quality Kit. Oxygen measures were determined with a YSI oxygen meter (model 54RC), and pH measurements were made with a Beckman Model 72 pH meter. Toxicant solution flow was initiated two to four hours before introduction of a bullhead. This insured that most adsorptive sites were occupied by the compounds thereby maintaining the calculated exposure level of the compounds. The use of gasliquid chromatography to identify and quantify the compounds and nominal exposure levels was attempted. Carbaryl absorption peaks were tentatively identified in sample waters from the diluter but quantification of concentration was not successful.

The chemicals carbaryl [(1-naphthyl N-methylcarbamate) and malathion [S-(1,2 carbethoxyethyl), 0,0-dimethyldithiophosphate)] were obtained from Dr. Parris Lambden of the University of Tennessee Institute of Agriculture, Knoxville, and were technical standards grade materials. Eighty percent active ingredient carbaryl was solubilized in a 35 percent ethanol to 65 percent distilled water solution. The malathion standard material was a 50 percent active ingredient in ethanol and summer oil (an emulsifier). Solutions of the toxicant were made fresh daily and used the same day because of the relatively short biological half-life of these chemicals and because of their conversion to more toxic by-products under certain conditions.

TABLE 7

Water Quality Values for Untreated (Alcohol) Dosing*

Parameter	Value
D.O.	7.97 mg l^{-1}
pH	6.4
Alkalinity	54 mg l^{-1}
Phenol.	0.0 mg l^{-1}
Hardness as $CaCO_3$/Total	42/60 mg l^{-1}
Cond mhos	110
Acid	0/0 mg l^{-1}
Turbid fmu	< 5
SO_4	3.1 mg l^{-1}
Temp °C	19
CO_2	4.8 mg l^{-1}
Ca	< 0.02 mg l^{-1}
Cl_2	0.0 mg l^{-1}
PO_4	0.0 mg l^{-1}
Meta PO_4	0.0 mg l^{-1}
NO_3	4.4 mg l^{-1}
NO_2	< 0.03 mg l^{-1}
NH_4	0.0 mg l^{-1}
Flow	2.85 l/cy
Vol	

*In M/B Apparatus--Control No Treat.

TABLE 8

Water Quality Values for Pre-Dosing*
In M/B Diluter

Parameter	Pre-Carbaryl Value	Pre-Malathion Value
D.O.	8.0 mg l^{-1}	8.27 mg l^{-1}
pH	6.8	6.4
Alkalinity	78 mg l^{-1}	65 mg l^{-1}
Phenol.	0 mg l^{-1}	81 mg l^{-1}
Hardness as $CaCO_3$/Total	78/85 mg l^{-1}	66/81 mg l^{-1}
Cond mhos	290/210	200
Acid	0/0 mg l^{-1}	< 5 mg l^{-1}
Turbid fmu	< 5	< 2)
SO_4	25 mg l^{-1}	25 mg l^{-1}
Temp °C	25.5	18
CO_2	4.8 mg l^{-1}	0.36 mg l^{-1}
Ca	0.06 mg l^{-}	< 0.05 mg l^{-1}
Cl_2	0 mg l^{-1}	< 0.01 mg l^{-1}
PO_4	0.10 mg l^{-}	0.13 mg l^{-1}
Meta PO_4	0.45 mg l^{-1}	0.52 mg l^{-1}
NO_3	0.5 mg l^{-1}	4.4 mg l^{-1}
NO_2	--	< 0.02 mg l^{-1}
NH_4	0.4 mg	0.0 mg l^{-1}
Flow	2.85 l cy^{-1}	2.85 l cy^{-1}
Vol		
FE	0.05 mg l^{-1}	< 0.05 mg l^{-1}

*In M/B Diluter.

For example, malathion may be converted to its more toxic by-product (to fish), maloxon at some higher pHs. These pHs were not observed during the exposures. Moreover, the fresh solutions and relatively reduced pHs in the flow-through system reduced the likelihood of the formation of oxidation products.

The concentration of toxicant after dilution in the exposure tank was verified with rhodamine B dye. The exposure metering system was checked periodically and found to be very accurate (> 97 percent) in delivery of rhodamine dye at 1,000 ug l^{-1}; 2,000 ug l^{-1}; 4,000 ug l^{-1} and 10,000 ug l^{-1}. The concentration of dye was measured at various times during the two-day tests of accuracy of the proportional diluter. The concentrations of dye were determined with a Bach and Lomb Spectronic 20 colorimeter calibrated for 100 percent conductance (blank) at 550 nanometers.

The calibration of the "dipping bird" toxicant metering device (Figure 9-A) was made by cycling the apparatus 100 times and measuring the delivered volume. The mean volume per event was calculated. The reservoir toxicant solution was continuously stirred with a magnetic mixing apparatus during the exposure periods to prevent settling of emulsions.

The proportional diluter was reconditioned, cleaned and decontaminated with a five percent solution of sodium hypochlorite prior to and between carbaryl and malathion exposure. The diluent water dechlorination system was reconditioned and repaired.

The exposure chamber was a 57L glass with stainless steel frame aquarium which was light shielded and visually isolated from the exposure laboratory. Lighting was maintained on an approximately 12-hour light, 12-hour dark schedule and water temperature was maintained at 18.8 $\pm$2.5°C.

The dilution water was aerated and dechlorinated in a two stage pressurized spraying to remove chlorine. Free chlorine, along with other water quality measurements, were made during the exposure to the toxicants (Tables 9 - 14).

The bullheads were introduced into the exposure aquarium and remained there for a period of 48 consecutive hours. Measurements on respiration were noted as an indicator of general condition of the fish during exposure. There were no indications that a lethal action was impending during any of the exposures.

The diluter water flow rate was adjusted to the weight of the individual bullhead. Following the recommendation of Sprague (1969), all fish were exposed at greater than 2.0L gm^{-1} of fish wet-weight over the course of the exposure. Fish were weighed before the exposure was initiated.

3. Environmental Factors

The cycle for the observation tanks was maintained at 12 hours light and 12 hours dark. The light cycle began at 6:30 a.m. Temperature control was maintained in a range of approximately 5°C between 61° - 66°C.

TABLE 9

Water Quality Values
Carbaryl (1 mg)

Fish 21 α = 310 g
8/18/75 - 8/20/75

Fish 22 α = 270 g
9/8/75 - 9/10/75

Parameter	21 α	22 α
D.O.	9.0	8.8
pH	6.4	6.4
Alkalinity	68	64.
Phenol.	80	78
Hardness as $CaCO_3$/Total	61	62
Cond mhos	160	190
Acid	0	--
Turbid fmu	nd	--
SO_4	--	--
Temp °C	20	18.5
CO_2	6.41	2.1
Ca	0.02	0.01
Cl_2	--	0
PO_4	--	--
Meta	--	--
NO_3	3.8	2.6
NO_2	0.03	0.01
NH_4	0.01	0.02
Flow	392 cy	356 cy
Vol		729L

392 cy^{-1} X 2.85 l cy^{-1} = 1117L
3.60 X l g^{-1} wet weight fish

256 cy^{-1} X 2.85 l cy^{-1} = 729L
2.7 l g^{-1} wet weight fish

TABLE 10

Water Quality Values
Carbaryl (2 mg)

Fish 24 α = 330 g 10/18/75 — Fish 9 α = 240 g 10/2/75

Parameter	24 α	9 α
D.O.	7.45	.8
pH	6.5	6.48
Alkalinity	60	67
Phenol.	0	0
Hardness as $CaCO_3$/Total	60	62
Cond mhos	100	--
Acid	0	0
Turbid fmu	< 3	< 3
SO_4	52	21
Temp °C	19	19.1
CO_2	4.6	4.1
Ca	0.02	0.01
Cl_2	0	0
PO_4	--	--
Meta	--	--
NO_3	0.5	0
NO_2	0.11	0.01
NH_4	0.2	0.02
Flow	451 cy	443
Vol	115	1262

451 X 2.85 = 1285 L
3.89 l g^{-1} wet weight fish in 48 hours

443 X 2.85 = 1262 L
5.25 l g^{-1} wet weight fish in 48 hours

TABLE 11

Water Quality Values
Carbaryl (4 mg)

Fish 25 α = 320g
11/5/75 - 11/7/75

Fish 23 α = 260 g
11/7/75 - 11/9/75

Parameter	25 α	23 α
D.O.	7.45 mg	7.50
pH	6.5	6.4
Alkalinity	63	--
Phenol.	0	--
Hardness as $CaCO_3$/Total	65/80	71/86
Cond	100 uhs	--
Acid	0	--
Turbid	< 5 units	--
SO_4	100 mg	5.6
Temp °C	19	20
CO_2	60 mg	2.3
Ca	< 0.02 mg	< 0.01
Cl_2	0	0
PO_4	< 0.1	1.1
Meta	< 0.1	0.2
NO_3	0.5 mg	2.1
NO_2	0.13	0
NH_4	0.5 mg	0.01
Flow	278	186 cy
Vol	795L	530L

278 X 2.85 = 795 L
3.01 l g^{-1} wet weight fish

186 cy^{-1} X 2.85 = 530 L
3.21 l g^{-1} wet weight fish

TABLE 12

Water Quality Values
Malathion (1 mg)

Fish 3 α = 510 g — 10/28-30/75

26 α = 240 g — 10/21-23/75

Parameter	3 α	26 α
D.O.	9.03	9.05
pH	6.5	6.46
Alkalinity	72	67
Phenol.	0	0
Hardness as $CaCO_3$/Total	68	59
Cond mhos	140	--
Acid	0	--
Turbid fmu	1	--
SO_4	6.5	4.1
Temp °C	17.35	17.3
CO_2	3.5	2.1
Ca	< 0.01	0.01
Cl_2	0	0
PO_4	--	--
Meta	--	--
NO_3	0.6	2.1
NO_2	0.01	--
NH_4	0.02	0.01
Flow	587 cy in	536
Vol	1673/1	1527
FE	0.05	

(3.28 l g^{-1}) 25 II 510g 587 cycles 48 hours 1673 l
(6.36 l g^{-1}g 3 II 240 g 536 cycles 48 hours 1527 l

TABLE 13

Water Quality Values
Malathion (2 mg)

Fish 30 α = 320 g
11/5/75 - 11/7/75

Fish 31 α = 260g
11/7/75 - 11/9/75

Parameter	30 α	31 α
D.O.	8.41	8.5
pH	6.4	6.5
Alkalinity	72	62
Phenol.	0	0
Hardness as $CaCO_3$/Total	67	--
Cond mhos	--	
Acid	--	--
Turbid fmu	< 5	--
SO_4	4.0	2.6
Temp °C	17.5	17.6
CO_2	2.2	4.5
Ca	0.01	< 0.02
Cl_2	0	0
PO_4	--	--
Meta	--	--
NO_3	2.8	5.2
NO_2	< 0.01	< 0.1
NH_4	< 0.02	0.01
Flow	352	278
Vol	1003L	792L

Flow 352 cy X 2.85 l cy^{-1} = 1003 L   278 cycles = 792L

TABLE 14

Water Quality Values
Malathion (4 mg).

Fish 32 α = 400 g 11/12/75 - 11/14/75 Fish 35 α = 200 g 11/14/75 - 11/16/75

Parameter	32 α	33 α
D.O.	8.27	8.42
pH	6.5	6.5
Alkalinity	78	62
Phenol.	0	0
Hardness as $CaCO_3$/Total	62/78	51/63
Cond mhos	--	--
Acid	--	--
Turbid fmu	--	--
SO_4	2.1	3.9
Temp °C	18.0	18
CO_2	11.1	7.1
Ca	< 0.01	0.0
Cl_2	0.0	0.0
PO_4	--	--
Meta	--	--
NO_3	2.9	2.60
NO_2	0.03	0.0
NH_4	0.01	0.0
Flow		261
Vol		
FE	0.05	

465 cy X 2.85 l cy^{-1} = 1325 L in 48 hours   261 cy X 2.85 = 743L

The light levels in the basement laboratory were low, as previously stated. Ambient light levels were dependent upon the location of the particular tank. The light levels were not generally intense enough to inhibit activity of the bullheads. When light intensities were occasionally higher, the fish became less active and sought shelter.

Tank and pool water loss were made up by activated charcoal-sand-gravel filtered dechlorinated municipal tap water (Table 3). Water quality measures were made on a regular basis. Activated charcoal for filters was autoclaved at 44 - 58 kg cm^2 steam and 120°C and partially replaced regularly. This temperature is high enough to volatilize any carbaryl and 1-naphthol, its principal oxidation product, and malathion and maloxon, its principal oxidation product (Merck, 1968).

The laboratory was accessible only to the investigator. The observation laboratory was isolated from disturbance, noise and human traffic. The exposure laboratory was less isolated from human traffic and disturbance. Temperature and light controls were maintained in both laboratories.

D. Data Analysis

1. Frequency and Intensity

The data, consisting of behavior frequency, sequencing, and duration as well as territorial observations, were transcribed from the voice recorded cassette tapes to data sheets. The durations of the various behaviors were timed with a stopwatch to the nearest whole second. Behaviors less than one second were recorded as one second in duration. The transcribed data were keypunched and printed from the computer. Two sets of cards, original transcribed data and computer printouts and tapes, were kept. The data were completely verified for accuracy and internal coding consistency by comparison with original data sheets and with the computer by means of an internal consistency examination program. The data were also compared to the tape recordings.

2. Data - Matrix Transformation

The frequency and duration of the 50 individual behaviors for the alpha and the beta fish for each of nine observations in the 14 experiments were transformed-converted to a transition matrix. The behavior durations in seconds were transformed: they were multiplied by a weighting factor of 10. This weighting factor was employed as a necessity of calculation and as a result, some of the rapid behaviors (MF) and rare behaviors (BI) were not lost in program numerical rounding techniques. Behavior subcategories were arranged into categories; aggressive, feeding, neutral, and submissive. Each behavior subcategory was assigned a weighting factor and the result was the behavior index (Table 15). This behavior index was formulated from observations of untreated bullheads in dyadic colonies and from the work of Myrberg (1980, 1972a), Simpson (1969), and Nelson (1964). The subcategory matrices resulted from observation and were influenced by the work of Myrberg (1972b). These transition

TABLE 15

Codes and Ranking Factors for
Subcategories of Behavior (Behavior Scale)

Code Letter	Behavior Category	Behavior	Rank
MF	Aggressive	Mouth Fight	+ 48
BI	Aggressive	Bite	+ 47
NP	Aggressive	Nip	+ 45
CH	Aggressive	Chase	+ 43
BU	Aggressive	Butt	+ 40
HH	Aggressive	Head Thrust	+ 35
TH	Aggressive	Tail Thrust	+ 34
FD	Aggressive	Frontal Display	+ 32
ND	Aggressive	Nudge	+ 30
M4	Aggressive	Mouth Fully Open	+ 29
TB	Aggressive	Tail Block	+ 28
M3	Aggressive	Mouth 1/2 - 3/4 Open	+ 26
HW	Aggressive	Head Wag	+ 24
CI	Aggressive	Circle	+ 22
DE	Aggressive	Dorsal Erect	+ 21
M2	Aggressive	Mouth 1/4 Open	+ 20
LD	Aggressive	Lateral Display	+ 19
M1	Aggressive	Mouth Slightly Open	+ 18
AP	Aggressive	Approach	+ 17
IG	Feeding	Ingest	+ 15
SP	Feeding	Spit, Regurgitate Ingested Object	+ 14
HS	Feeding	Head Stand	+ 13
DG	Feeding	Mouth Scoop Substrate	+ 12
SS	Feeding	Intense Search	+ 11
CB	Feeding	Swim w/Barbel Feel	+ 10
R4	Neutral	4 Pt. Contact Burrow	+ 8
HO	Neutral	Hover	+ 5
R3	Neutral	3 Pt. Contact	+ 4
TU	Neutral	Turn	+ 3
SC	Neutral	Rub on Substrate	+ 2
EX	Neutral	Curious-Exploratory	+ 1
CR	Neutral	Swim	0
BA	Neutral	Barbel Touch	- 1
CD	Neutral	Collide	- 2
ST	Neutral	Stress Pump	- 3
YA	Neutral	Yawn	- 4
BT	Submissive	Boundary Turn	- 5
R2	Submissive	2 Pt. Contact	- 6
SA	Submissive	Startle	- 8
DD	Submissive	Dorsal Down	- 10
HA	Submissive	Stop Quickly	- 12
R1	Submissive	1 Pt. Contact	- 15
RO	Submissive	Roll	- 22
BQ	Submissive	Vibration of Barbels	- 25
RV	Submissive	Reverse	- 28
QI	Submissive	Vibration of Body	- 30
RS	Submissive	Subm. Rests on Dom.	- 40
AV	Submissive	Avoid	- 41
DA	Submissive	Darting Escape	- 42

matrices displayed the frequency percentages, probabilities and durations of each behavior for each alpha fish, observation and experiment. The same statistics are shown separately for each beta fish. Cross tabulation values (weighted behavior indices) were calculated for individual fish for each experiment and for pooled replicates for each alpha and beta fish. The same cross tabulations were calculated for subcategories (RF1, Appendix C). Transition matrix values were calculated for categories of behavior by untreated and treated, by untreated, carbaryl and malathion and by exposure concentration for each chemical (Transition Matrix for Groups, Appendix D and Table 16).

The standard deviations were calculated by hour (observation) by experiment number and experiment grouping for each alpha and each beta fish (RF2-A, Appendix E and Table 16).

Mean durations in all behaviors and changes or transitions during each observation period and totals for each experiment by experiment were calculated (RF1-A, Appendix F).

3. Statistical Analysis - ANOVAS and Multiple Classification Analyses

The analyses of variance (ANOVAS) were calculated to determine the effect of: (1) behavior (aggression) index by hour observation versus experiment number (RF2-B Appendix G); (2) behavior index (aggression) by hour (observation) versus: experiment (grouping) pair, untreated or treated, concentration, and replicate, (RF2-C, Appendix H) and (3) behavior index by hour (observation) versus

TABLE 16

Partition of Experimental Design

For the partitioning of the experimental design, the following terms were used as factors:

HR = 1 to 9; observation periods; 1,2,4, ... 256 hours.

EXPNO = 1 to 14; each individual experiment number

EXPN = 0 to 6; experimental group or pair

0 = untreated; 1 = carbaryl* 1 mg l^{-1}; 2 = carbaryl 2 mg l^{-1}
3 = carbaryl 3 mg l^{-1}; 4 = malathion 1 mg l^{-1}; 5 = malathion
2 mg l^{-1}; 6 = malathion 4 mg l^{-1}

EFACT = 0, 1: 0 = untreated; 1 = treated

ETREAT + 0,1,2: 0 = untreated; 1 = carbaryl; 2 = malathion

ECONC = 0,1,2,3, = experimental exposure concentration of toxicant

0 = untreated; 1 = 1 mg l^{-1}; 2 = 2 mg l^{-1}; 3 = 4 mg l^{-1}

EREPL = 1,2 = experimental replicate 1 or 2 for each replicate pair

Experiment #	Exposure	EXPNO	EXPN	ETREAT	ECONC	EREPL	EFACT
11, 13	untreated	1,2	0,0	0	0	1,2	0
29, 32	carbaryl 1 mg l^{-1}	3,4	1,1	1	1	1,2	1
34, 41	carbaryl 2 mg l^{-1}	5,6	2,2	1	2	1,2	1
36, 38	carbaryl 4 mg l^{-1}	7,8	3,3	1	3	1,2	1
50, 51	malathion 1 mg l^{-1}	9,10	4,4	2	1	1,2	1
52, 53	malathion 2 mg l^{-1}	11,12	5,5	2	2	1,2	1
54, 55	malathion 4 mg l^{-1}	13,14	6,6	2	3	1,2	1

*Sevin = carbaryl

*1 mg l^{-1} = 1,000 ug l^{-1}

experiment (grouping) pair and replication (RF2-D, Appendix J). In the ANOVAS, alpha and beta fish were treated separately. The ANOVAS were calculated using the Statistical Package for Social Sciences (SPSS) (Nie et al., 1975).

The ANOVAS were calculated for alphas (α) and betas (β) and the behavior (aggression) index (+ 50 to - 50) for either fish was weighted by sec/4.95 (Table 11, page 62). This was the number of seconds of a given behavior divided by the average time per case over all of the data (this number was fairly uniform throughout). This division made no difference in the weighting process since it is a sum of the index and time. The division made the sum of all weights equal to the original number of cases. The SPSS ANOVAS use the sum of the weights for degrees of freedom. Thus, this division brings the number into line with reality.

III. RESULTS

A. Fish Behavior

1. Environmental Conditions

The maintenance of the facilities for holding and observation of exposed and unexposed fish was accomplished with some initial difficulty but later proved to be satisfactory for bullhead culture.

The behaviors were recorded over approximately 11 months from January to November 1975. The behaviors were categorized from observations and from modifications of the work of previous workers in ethological analysis. The results comprised a partial ethogram of the social behaviors of the yellow bullhead. Reproductive-mating behaviors were omitted. The initiation of reproductive activity in bullheads was reported to result from an increasing photoperiod in combination with increasing temperature (Breder and Rosen, 1966). During the bullhead culture establishment, the ambient temperature rose above 22°C and photoperiod was 14 - 15 hours daylight. Upon several occasions fish were found dead on the floor beside pools and in tanks. Other fish showed signs of fighting: scrape marks, broken skin, missing patches of skin and dorsal spines and fins and missing dorsal part of the caudal fin. Approximately 20 percent of the population died as an indirect (subsequent infections) or direct result of combat. The initiation of temperature and light controls inhibited reproductive fighting behavior and no further deaths occurred.

The wading pool liners contained a plasticizer, ethyl hexylphthalate, and an antioxidant, tertiary butylphenol, in significant quantities. These chemicals were mostly removed by washing with detergent and rinsing with an oxidant (hypochlorite) solution and a solvent, acetone, and several water rinses. These compounds are commonly used in packaging for human food. Since their effects were unknown, the suspected sensitivity of this species' behavior to low level contaminants was reason for preventive measures.

The effects of light intensity on the bullheads were noticeable because these animals are crepuscular. In the colony they were most active in light levels below 22 lux (2 fc). At incident light levels (measured at the water surface) greater than 30 - 33 lux (2.8 - 3 foot candles), the bullheads sought and mostly remained in shelters. When a bullhead emerged from the shelter under these light conditions, it swam very rapidly (darted) to another shelter. Upon acclimation the bullheads were generally active in the light levels used for observation. At these light levels, the fish were easily, individually distinguishable.

After treating the initial problems of fin rot and whirling disease (caused by a sporozoan parasite), the fish colony remained healthy throughout the experiments.

Three yellow bullheads which died soon after capture were analyzed for heavy metals (in flesh) by the Tennessee Valley Authority Water Quality Branch. The flesh contained 390, 870 and 550 ug gm^{-1} (parts per billion) of mercury. Other heavy metals were not reported. There was no evidence of mercury intoxication in the colony. A subsequent examination of the literature did not indicate potentiation or antagonism between mercury and carbaryl or malathion.

The results of water quality examination in the laboratory and at the collection site, mile 118.6 of the Holston River, Surgoinsville, Tennessee, are listed in Table 3 and Appendix A, respectively. The statistics are similar for most individual water quality parameters measured in both locations. There was a difference in pH between the two locations which may have accounted for the initial disease incidence in the laboratory bullhead colonies.

2. Normal Behavior

The principal assumption of these studies was that the dominance of one fish over another was quantifiable. These arguments were based upon the social dominance theory in ethology as described by a number of authors (Clutton-Brock _et al_., 1976; Hinde, 1970). Notably, the methods used to quantify this assumption were based on work of Myrberg (1972a,b) and Nelson (1964b). However, central to these investigations is the concept of social dominance which Clutton-Brock _et al_. (1976) defined generally, that specific individuals in social groups have regular priority of access to resources in competitive situations. The apparent absence of dominance in competition for food access in these fish has also been reported in some herbivorous animals (Geist, 1974). Bernstein and Gordon (1980) describe some of the conditions which also seem to be important in bullheads. They offer the alternatives that previous encounters (learned), spatial location and social context may be important in defining social dominance in primates. In the bullheads, the territorial component, as well as previous encounters, appear to be important in defining the dominance of untreated alpha fish, especially upon reintroduction to a colony. The social context hypotheses were not examined in these studies.

Observation of bullhead behavior made in the aquatic community with approximately 25 other species of fish, aquatic invertebrates and vertebrates in the pool at the Tennessee Valley Authority Fisheries Laboratory at Norris, Tennessee were conducted in reduced daylight (late in the day) on two occasions and under cloudy conditions once. The pool offered a good opportunity to observe the fish in clear water. Several bullheads occupied a shelter area at the west end of the pool and others were found in pairs in other shelters. The observations of behaviors were confirmatory of many of the behaviors seen in laboratory culture (Table 5, page 49). Relatively high light intensity in the pool was inhibitory on the general activity of the bullheads. The pool also contained channel catfish, but the yellow bullhead was the only bullhead species in the pool. Channel catfish and yellow bullheads were easily distinguished underwater.

The holding of territory and subsequent defense of territory by the dominant bullhead was observed in each experiment 1 - 14 prior to exposure. Seventeen colonies were screened for evidence of clear dominance relationships among the pairs; in two of the three additional colonies, one of the pair of bullheads died.

The 50 behaviors were observed in total in untreated fish and prior to treatment and after treatment (Table 4, page 41). These behaviors comprised the partial ethogram for the yellow bullhead. The ethogram was not found to be as extensive as reported by Todd (1968). Some individual behaviors were not observed and, in general, the high level of aggressive behaviors reported by Todd (1968) was not confirmed. The sources of experimental animals were different; Todd's animals came from a lake in Michigan.

Some general observations on the partial ethogram (behavior subcategories) listed in Table 4, page 41, were made and they follow.

There was no preference or dominance when the animals were feeding, i.e., the alpha fish did not eat first; it was "first to find; first to feed." This applies only to these conditions.

Generally, the dominant fish was in the highest numbered resting position when both fish were in resting positions.

Dominant fish appeared to defend a preferred shelter and to occupy a preferred location in that shelter. This position was generally in the back of a shelter whether or not it was the preferred shelter.

Generally, when one fish rested on top of another, the bottom fish was the dominant.

Submissive fish were generally more active than dominant fish. This was supported by the differences seen in the percent of time spent in two inactive neutral behaviors summed (Resting position 3 and 4; R3 and R4) in untreated alpha versus beta fish $\alpha\Sigma$ R3,4 = 42.3 percent; $\beta\Sigma$ R3,4 = 35.0 percent. The corresponding percent of time spent in an active neutral behavior (cruise, CR) for untreated alpha fish was 41.2 percent and for beta was 47.0 percent. This was an indication that the beta fish were more active in neutral behaviors.

It was observed that the higher resting positions indicate dominance. These positions, while indicating a condition of dominance, were classified in the neutral behaviors category in Table 4, page 41. This was not inconsistent since the two observations, although related, were not mutually exclusive.

External stimuli such as loud noises accompanied by low frequency vibrations were observed to stimulate beta fish to leave their shelters and join alpha fish in their shelters. The significance of these behaviors was unknown.

The bullheads were observed to be extremely quiet at times, especially during relatively long periods of the dark cycle. When the fish were observed very briefly at times six to eight hours after the dark cycle began (Figure 10), they appeared to be sleeping. After the observation lights were turned up, activity began. In very low light levels after prolonged darkness, the fish continued to "sleep".

The effects of the light-dark cycle (Figure 10) on fish behavior were examined in the untreated group. The results of the "t" test of the hypothesis, that observations made during the light cycle

Light Cycle During Observations

6:30 A.M. -- 6:30 P.M.

Date Out	Experiment	No.	Observation Number/Hour After Exposures									
			0	1	2	3	4	5	6	7	8	9
7/16	Untreated	11	12:00	1:00	2:00	4:00	8:00P	4:00A	8:00P	4:00A	8:00P	4:00A
7/30		13	8:00	9:00A	10:00A	12:00	4:00P	12:00A	4:00A	12:00A	4:00P	12:00A
8/20	Carbaryl (1 mg)	29	12:00	1:30	2:30	4:30	8:30P	4:30P	8:30P	4:30A	8:30P	4:30A
9/10	Low (1 mg)	32	8:30	9:30A	10:30A	12:30P	4:30P	12:30A	4:30P	12:30A	4:30P	12:30A
10/2	Carbaryl (2 mg)	34	8:00	9:00A	10:00A	12:00P	4:00P	12:00A	4:00P	12:00A	4:00P	12:00A
10/8	Medium (2 mg)	41	1:00	2:00P	3:00P	5:00P	9:00P	5:00A	9:00P	5:00A	9:00P	5:00A
8/28	Carbaryl (4 mg)	36	9:00	10:00A	11:00A	1:00P	5:00P	1:00A	5:00P	1:00A	5:00P	1:00A
9/3	High (4 mg)	38	12:30	1:30P	2:30P	4:30P	8:30P	4:30A	8:30P	4:30A	8:30P	4:30A
10/23	Malathion (1 mg)	50	8:30	9:30	10:30	12:30	4:30P	12:30A	4:30P	12:30A	4:30P	12:30A
10/30	Low (1 mg)	51	11:00	12:00N	1:00P	3:00P	7:00P	3:00A	7:00P	3:00A	7:00P	3:00A
11/5	Malathion (2 mg)	52	11:30	12:30P	1:30P	3:30P	7:30P	3:30A	7:30P	3:30A	7:30P	3:30A
11/7	Medium (2 mg)	53	8:45	8:45A	10:45A	12:45A	4:45P	12:45A	4:45P	12:45A	4:45P	12:45A
11/12	Malathion (4 mg)	54	12:30	12:30P	1:30P	3:30P	7:30A	3:30A	7:30P	3:30A	7:30P	3:30A
11/14	High (4 mg)	55	8:45	9:45A	10:45A	12:45P	4:45P	12:45A	4:45P	12:45A	4:45P	12:45A

Figure 10. Summary of Light Regime During Each Observation

cycle were the same as those made in the dark cycle, were significant at the 0.01 level. Therefore, the null hypothesis that there was no significant difference between observations made during the light cycle from those made during the dark cycle was accepted.

The effects of removal of the untreated alpha fish were tested for significant effects between alpha and beta fish. The hypothesis that the behavior index mean values for alpha fish were equal to those of the beta fish were rejected as a result of the findings of a series of "t" tests over the nine observations after "exposure for 48 hours of the untreated fish in the dosing apparatus. The null hypothesis is:

$$H_0: \mu \quad \alpha \quad 11, 13 = \mu \quad \beta \quad 11, 13$$

for HR one through nine. This hypothesis was rejected except for the eight-hour observation, in which case the values were not significantly different and the hypothesis was accepted (Table 17). When the behavior index values were tested for significance of difference of values between the alpha and beta fish for the observation periods, only one was found to be significant. All others were significant at the .01 or lower level. However, at the 256-hour observation, the beta fish behavior index value was significantly different (at 0.1 level) (greater than) from the alpha fish. In each case the higher positive value of behavior indices indicated that the alpha - beta dominance relationship was not disrupted by the removal of the

TABLE 17

"t" Values for Significant Differences Between α and β Behavior Index Scores

Obs. Hrs.	1	2	4	8	16	32	64	128	256
Value of t	3.6869	3.728	4.39	- .322	7.43	2.80	4.749	2.666	- 1.739
Level of sig.	.001	.001	.001	n.s.	.001	.01	.001	.01	.1

Infinite Degrees of Freedom

alpha fish from the colony for up to 48 hours. The dominance relationships in the untreated fish were evident upon return of the alpha fish to the tanks.

3. Ranking the Behavior Subcategories

The categories and subcategories of behavior which comprise the yellow bullhead partial ethogram were derived from observation and represented an approximation of intensity associated with each of the 50 subcategories (Table 15, page 68). The categories: aggressive, feeding, neutral and submissive were the four states (excluding reproductive behaviors) which were evident during observations. Each of the four categories or stages of behavior in the partial ethogram were observed to contain several subcategories. These were classified according to intensity and a scale was derived. The scale or index was derived from observation of the intensities and sequences in the bullheads' social interactions. These partial ethograms were also the result of distinctiveness for this species and did not necessarily represent a fixed action patterns in the sense of Hinde (1970). The behaviors were discrete and highly consistent among the yellow bullheads in these studies. The data recorded over a period of 11 months demonstrated a diversity of the subcategories of social behaviors throughout all treatments and exposures. Behaviors were observed consistently throughout the experiments. Intensity of some aggressive and submissive categories was altered, and interactive frequencies were affected by the exposures. These results have been reported as effects on perceptive behavior, i.e., those actions which effect higher integrative brain centers. Although reflexive behaviors were quantified (respiration, rheotaxis, etc., other physiological changes), they were not generally as pronounced as the perceptive behavior changes.

B. Results of Data Analysis

1. Behavior Index

The examinations of behavior were based on a test of the mean differences in the behavior index between the untreated (experiments 11 and 13) alpha and beta fish. The value of t was 7.445 with infinite degrees of freedom. The "t" test value is significant at the 0.05 level.

$$t = \frac{(3.096 - 0.617)}{\sqrt{(12..942)^2/3548 + (15.029)^2/3548}} = 7.445$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{(S_1)^2}{n_1} + \frac{(S_2)^2}{n_2}}}$$

This finding supports the alternate hypothesis that composite behavior index values for the alpha and beta fish are not equal in the untreated groups.

$$H_a: \mu\ \alpha\ 11,13 \neq \mu\ \beta\ 11,13.$$

These findings confirm the key assumption that differences in the ethograms of dominant and non-dominant bullheads in two member colonies were quantitatively discernable.

2. The Analyses of Variance (I)

In this section, the general objective is to examine how the effects of time-since-exposure (as designated by HR one through nine) were discernable by experiment number EXPNO 1 - 14).

The analyses of variance (ANOVAS) and the Multiple Classification Analyses (MCA's) were calculated using a Statistical Package for the Social Sciences programs (Nie et al., 1975).

The first set of ANOVAS of the behavior index* (see RF-2B, pages 3 and 6, Appendix G) examined the source of variance from hours (HR) or experiment number (EXPNO).

The null hypothesis is stated as: There was no significant effect between the behavior index and hours (HR) at which it was measured or experiment number (EXPNO). These hypotheses were tested for all alpha and all beta fish.

RF 2 B(1)

$$H_o^{I\,\alpha} : \quad \mu \text{ HR } 1 = \mu \text{ HR } 2 \ldots \mu \text{ HR } 9.$$

$$H_o^{I\,\beta} : \quad \mu \text{ HR } 1 = \mu \text{ HR } 2 \ldots \mu \text{ HR } 9.$$

RF 2 B(2)

$$H_o^{II\,\alpha} : \quad \mu \text{ EXPNO } 1 = \mu \text{ EXPNO } 2 \ldots \mu \text{ EXPNO } 14.$$

$$H_o^{II\,\beta} : \quad \mu \text{ EXPNO } 1 = \mu \text{ EXPNO } 2 \ldots \mu \text{ EXPNO } 14.$$

The main effects of hours (HR) and experiment (EXPNO) number were significant at the .001 level in an F test. Observation period hours (HR) was significant at the 0.001 level in an F test. The experiment

*labelled "Aggression Scale" in the Appendices numbers (EXPNO) were significant at the .001 level in an F. test. The interaction of time of hours (HR) and exposure (EXPNO) were significant at the .001 level in an F test. All alpha and all beta fish were tested (RF-2B, pages 3 and 6, Appendix G).

The two null hypotheses that there were no differences in times, observations, (HR) or experiment numbers (EXPNO) were rejected.

3. Multiple Classification Analysis for EXPNO

The Multiple Classification Analysis of the behavior index (RF 2B, page 4, Appendix G) by variable (HR) and category (HR one through nine) indicated that the one-hour, two-hour and eight-hour observations were less than the grand mean value in the alpha fish. The remaining observations (HR 5, 6, 7, 8, 9) demonstrate a trend of increasing mean behavior index values with increasing time (from the end of the exposure). The beta fish show initial positive values between time and increased behavior index values through the eight-hour observation. In the geometric time series, the eight-hour through the 256-hour observations, the mean behavior indices were less than the grand mean. This indicated an initial increase in mean values of beta fish up to eight-hours after exposed alpha fish were returned to the tanks. These results are in agreement with behavior summary observations (Tables 18 through 23) except the behavior summary observations indicate that some status changes occur up to approximately 16 hours.

The behavior index values for untreated beta animals EXPNO 1, 2 in the Multiple Classification Analysis were low (- 1.23 and - 3.28)

TABLE 18

Behavior Summary for Malathion Experiments (1 mg)

HOUR	50 α	50 β	51 α	51 β
1	CR; HS Into AV; Alt. Shelt.; RO; CR; RV; TU; AV; No Feed Pathol.;	CR; R3; R4; M3; R3 In Pref. Shelt.; Dom.? FD; M3; Resp. Slow; DE; No Feed Pathol.	Rap. Resp.; Not In Shelt.; R2; AV;FL; CR; RV; No Feed Pathol.	In Pref. Shelt.; R3; Dom.; HH; TH; BU M2

TABLE 19

TABLE 20

Behavior Summary for Malathion Experiments (4 mg)

TABLE 21

[illegible]

TABLE 22

Behavior Summary for Carbaryl Experiments (2 mg)

HOUR	36 α	36 β	41 α	41 β
1	CD; DE; TH; AV; RV Expelled Shelt.; AP; AV;	Pref. Shelt.; LD; M3; Dom.? Territ. After 10 Min.;	CR To Shelt.; R1; Rap. Resp.; Feed Pathol.;	AP; BT; HO Occupy α 's Shelt.; CR

TABLE 23

Behavior Summary for Carbaryl Experiments (4 mg)

HOUR	36 α	36 β	38 α	38 β
1	α In Distress; Resp. Rap. Unable To Defend ; Uncoord.; Feed-Block? And 2 (2X) Barbel - No	AP; Feed OK; Dom.; Moves α Around In Pref. Shelt.; FD; M3	CD; Uncoord.; Over swims; V. Rap. Resp.; AV; Feed; Block 2	CR; SS; IG; Feed-OK; R3; Dom.; Occupy Pref. Shelt.; ND

compared to the grand mean of 2.93. These same values for the untreated alpha fish were high (.39 and 1.49) compared to the grand mean 2.13. These values indicate the dominance of the alpha fish in the unexposed groups.

4. Analyses of Variance (II)

The second set of ANOVAS of the behavior index (RF2C, Appendix H) examined the sources of variation from (1) hours (HR) and experiment group or pair (EXPN); (2) from hours and experimental treatment (ETREAT); (3) from hours (HR) and experimental concentration (ECONC); (4) from hours (HR) and factors, untreated or treated (EFACT); and from (5) hours and replicate (EREPL).

The five null hypotheses were stated as: There was no relationship between the behavior index within hours (HR) and (1) experiment group or pair (EXPN); (2) experimental treatment (ETREAT); (3) exposure concentration (ECONC); (4) factor (EFACT); and (5) replicate (EREPL).

2 C(2) $H_o^{III\ \alpha}$: $\mu\ \text{EXPN}_o = \mu\ \text{EXPN}_1 = \ldots\ \mu\ \text{EXPN}^6$.

$H_o^{III\ \beta}$: $\mu\ \text{EXPN}_o = \mu\ \text{EXPN}_1 = \ldots\ \mu\ \text{EXPN}^6$.

2 C(3) $H_o^{IV\ \alpha}$: $\mu\ \text{ETREAT}_o = \mu\ \text{ETREAT}_1 = \mu\ \text{ETREAT}_2$.

$H_o^{IV\ \beta}$: $\mu\ \text{ETREAT}_o = \mu\ \text{ETREAT}_1 = \mu\ \text{ETREAT}_2$.

2 C(4) $H_o^{V\ \alpha}$: $\mu\ \text{ECONC}_o = \mu\ \text{ECONC}_1 = \mu\ \text{ECONC}_3$.

$H_o^{V\ \beta}$: $\mu\ \text{ECONC}_o = \mu\ \text{ECONC}_1 = \mu\ \text{ECONC}_3$.

2 C(5) $H_o^{VI\ \alpha}$: $\mu\ \text{EFACT}_o = \mu\ \text{EFACT}_1$

$H_o^{VI\ \beta}$: $\mu\ \text{EFACT}_o = \mu\ \text{EFACT}_1$

2 C(6) $H_o^{VII}\ \alpha$: μ EREPL $_1$ = μ EREPL $_2$

$H_o^{VII}\ \beta$: μ EREPL $_1$ = μ EREPL $_2$

The second set of ANOVAS (RF-2C, Appendix H pages 3, 5, 7, 9, 11, 14, 16, 18 20, 22) identified above in the text as RF 2C (1), (2), (3), (4), (5), and (6) demonstrated significance at the 0.001 level in all main effects and all individual effects and all interactions in F tests.

The null hypotheses $H_o^{III}\ \alpha\ ,\ \beta$; $H_o^{IV}\ \alpha\ ,\ \beta$; $H_o^{V}\ \alpha\ ,\ \beta$; $H_o^{VI}\ \alpha\ ,\ \beta$; and $H_o^{VII}\ \alpha\ ,\ \beta$ were rejected.

(1) Multiple Classification Analysis for HR

The Multiple Classification Analysis of the mean behavior index values for alpha fish were less than grand mean at 1, 2, 8, and 16 hours (HR) (RF-2C, page 4, Appendix H).

(2) Multiple Classification Analysis for EXPN

The examination of the behavior index values of alpha fish for experiment pairs, EXPN, (RF 2-C, page 4 - Appendix H) indicated that behavior index values for carbaryl EXPN 1 and 3, (1 mg l^{-1} and 4 mg l^{-1}) were greater than the grand mean while EXPN 2 (2 mg l^{-1}) was slightly less than the grand mean. The behavior index values for malathion EXPN 5 and 6, (2 mg l^{-1} and 4 mg l^{-1}) decreased significantly while EXPN 4 (1 mg l^{-1}) was slightly less than the untreated group, EXPN 0. In all of the beta fish, the mean behavior index values increased over the one, two, four and eight hour observations HR 1, 2, 3, 4 (RF-2C, page 17, Appendix H). In the remaining observations, at 16, 32, 64, 128, 256 hours, the mean behavior index values were negative for beta fish (page 17, Appendix H). The examination of the EXPN behavior index values for the groups of beta fish (page 15, Appendix H) showed a trend of initially reduced value for the untreated group and carbaryl, EXPN 0, 1 and 2, to a slightly positive value for EXPN 3 to higher positive values for malathion, EXPN 4, 5, 6. The overall trend EXPN 0 through 6, is from a relatively low behavior index value (- 2.27) to a positive value (+ 2.68) with a grand mean of + 2.93 (Figure 11). The values in this figure were derived by summing the MCA mean and the grand mean for α and β and multiplying by 4.95.

As alpha fish group recovered from sublethal intoxication, the behavior index values became higher than the group grand mean and the beta fish group index values became lower than the group grand mean values. However, these trends were derived separately, i.e., grand mean for all alphas was separate from the betas. These values were supported by the summaries of behaviors given in Tables 18 through 23, pages 85 - 90. The time (observation hour) of the change the mean behavior index values from alpha and independently from beta fish were in close agreement (at 16 hours) between the behavior summaries (Tables 18 through 23, pages 85 - 90) and the Multiple Classification Analysis for experimental pair, EXPN.

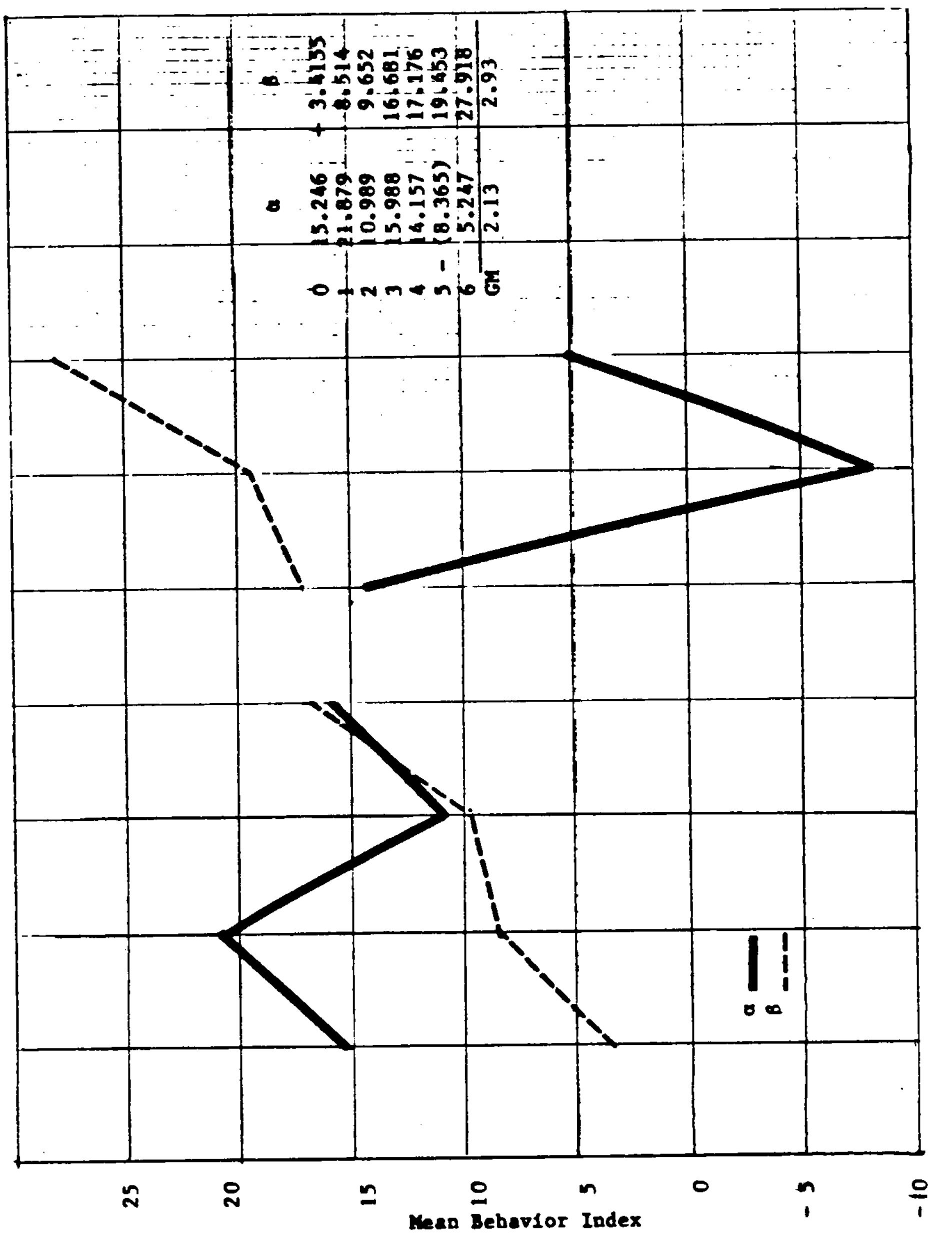

Figure 11. Behavior Index Mean Values for EXPN from MCA's

(3) Multiple Classification Analysis for ETREAT

Upon examination of the Multiple Classification Analysis, the mean behavior index values of alpha fish for experimental treatments ETREAT (RF-2C, page 6, Appendix H) by hours (HR) were less than the grand mean for the 1, 2, 8, 16 and 256-hour observations. Other observations were greater than the grand mean with respect to the time of observation, 4, 32, 64, 128-hour observations. The same trends were shown as in previous examples, ((2) EXPN): the effects of both of the toxicants and the untreated fish data on behavior index values of the alpha fish.

Upon examination of the Multiple Classification Analysis, the behavior index values for experimental treatment (ETREAT 0, 1, 2) for the alpha fish were greater than the grand mean value for the untreated group (+ 0.97) and carbaryl (+ 1.27) and significantly less than the grand mean for the malathion group (- 1.42).

The beta fish statistics (RF-2C, page 17, Appendix H) indicated initial increased behavior index values up to the 16-hour observation after which they were less than the grand mean with respect to time (HR). The examination of the variable, experimental treatment (ETREAT) and its categories 0, 1, 2, which represent untreated, carbaryl* and malathion, indicated that the carbaryl group exhibited a reduction (0.67) in behavior index values and malathion exhibited a significant increase of these values (+ 1.43) while the untreated

*Carbaryl = Sevin.

value was also significantly increased (+ 2.27) over the grand mean of 2.93 (Figure 12).

(4) Multiple Classification Analysis for ECONC

The mean behavior index values for the experimental concentrations, ECONC 0, 1, 2, and 3 were pooled for carbaryl and malathion groups at 1, 2, and 4 mg l^{-1} and were pooled for the untreated group for alpha fish. These values showed considerable disparity, as would be expected (Figure 13).

The behavior index value for ECONC 1, (+ 1.53) was greater than the untreated value (+ 0.97); and value for ECONC 2 was considerably less than the untreated value (- 1.86) and the ECONC 3 was not significantly different (0.01) than the grand mean for the alpha fish (RF-2C, page 8, Appendix H).

The Multiple Classification Analysis of the ECONC 0, 1, 2, 3 for the beta fish showed negative behavior index values for the untreated (- 2.27) and a negative value for the ECONC 1 (- 0.39), a slightly negative value for ECONC 2 (- 0.07) and a positive index value for ECONC 3 (+ 1.55). These index values show a trend toward positive behavior index values for higher concentrations regardless of "toxicant" group (RF-2C, page 19, Appendix H; Figure 13). The values in this figure were calculated by summing the MCA means and the grand means for α and β and multiplying by 4.95. This result supported the general trend seen with the general inhibition of

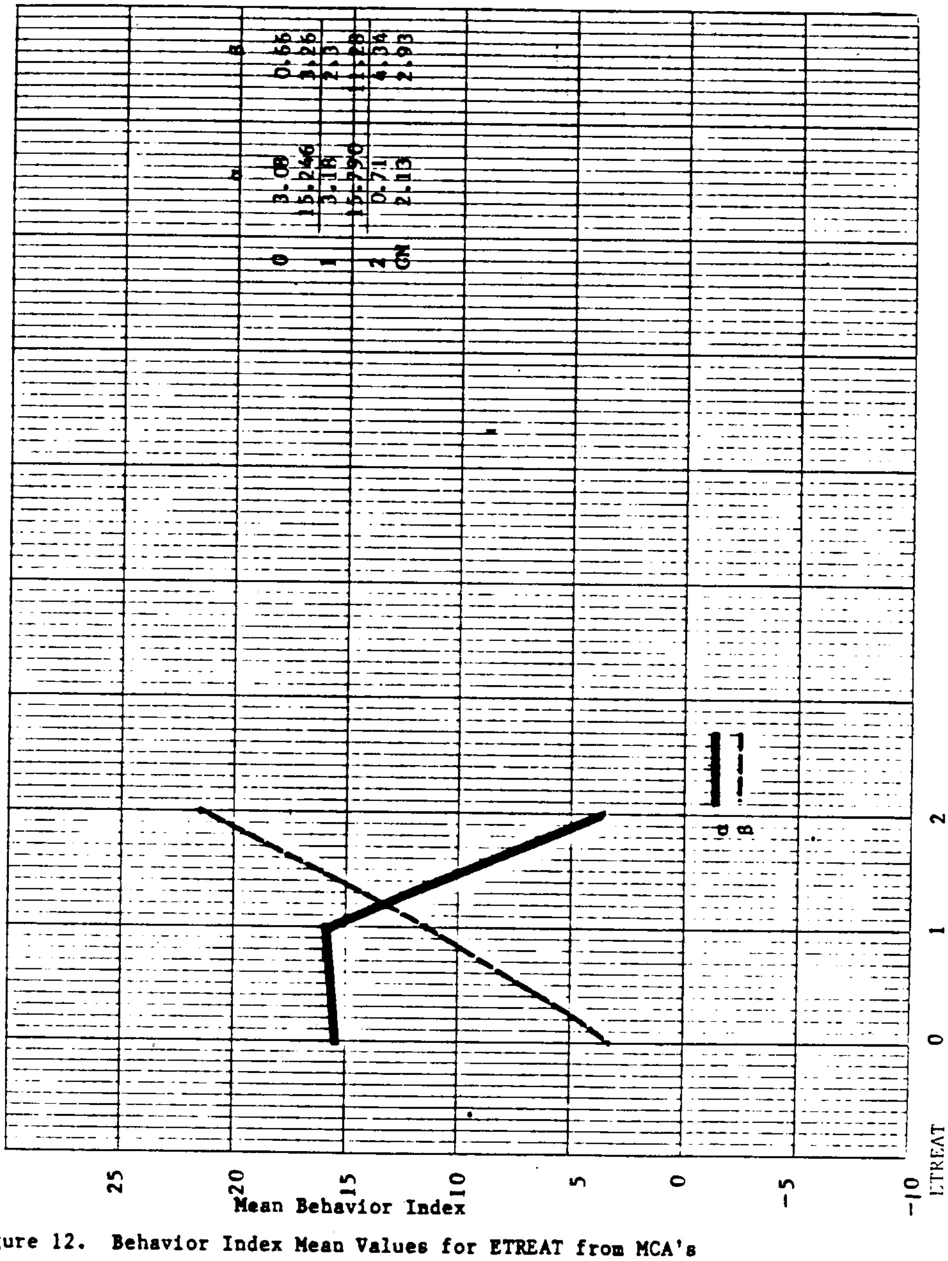

Figure 12. Behavior Index Mean Values for ETREAT from MCA's

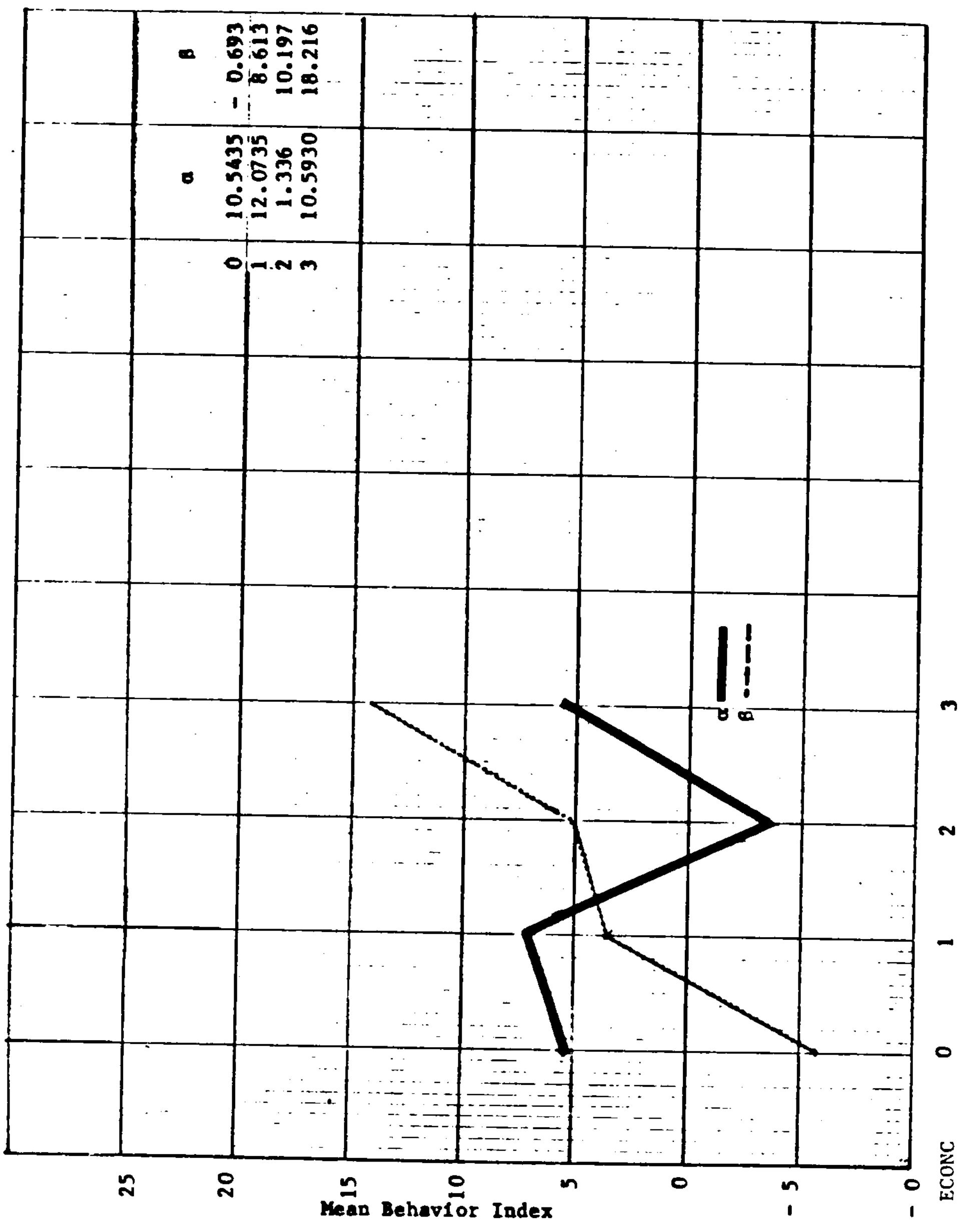

Figure 13. Behavior Index Mean Values for ECONC from MCA's

aggressive index values in the treated fish observed as an increase in the values in the untreated fish without respect to toxicant.

(5) Multiple Classification Analysis for EFACT

The mean behavior indices of alpha fish for factor (exposed and unexposed) EFACT 0 and 1, indicated a difference in these values from the grand mean as expected (RF-2C, page 10, Appendix H). The Multiple Classification Analysis behavior index values for EFACT 0 and 1 indicate a difference between beta fish "untreated" (- 2.27) and "treated" (+ .37) from the grand mean (+ 2.93) (page 21, Appendix H; Figure 14). The values in this figure were calculated by summing the MCA means and the grand means for α and β and multiplying by 4.95.

(6) Multiple Classification Analysis for EREPL

The means of the behavior indices of alpha fish for replicates EREPL 1 and 2 show significant differences from the grand mean (+ 2.13) (RF-2C, page 12, Appendix H).

The means of the behavior indices of beta fish for replicates EREPL 1 and 2 indicated some differences from the grand mean (+ 2.93) (page 20, Appendix H). These differences indicate variation of an unknown origin in the data set (Figure 14).

5. Analyses of Variance (III)

The third set of ANOVAS (RF-2D, Appendix J) of the behavior index examined the sources of variation under main effects; one-way

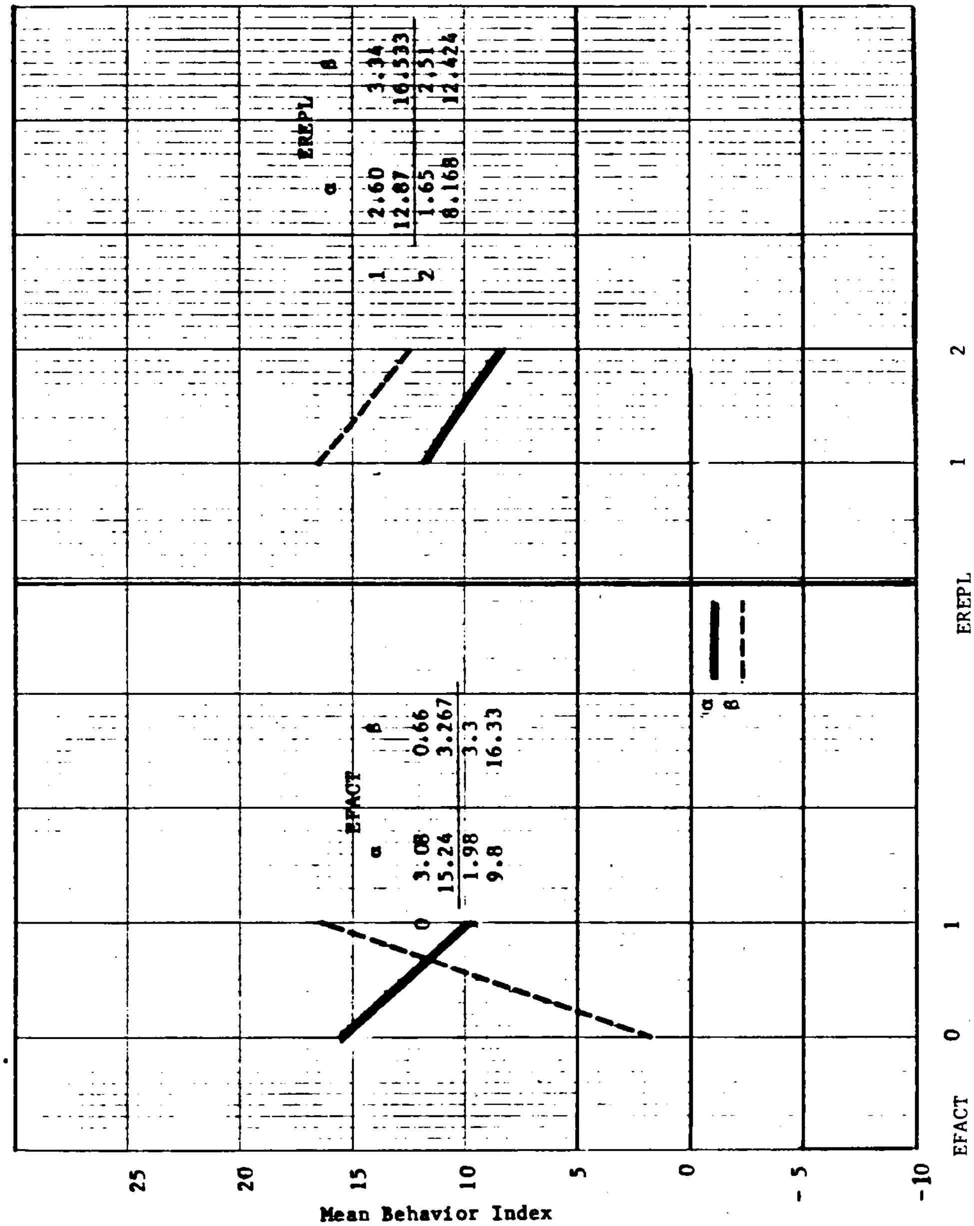

Figure 14. Behavior Index Mean Values for EFACT and EREPL from MCA's

interactions HR, EXPN, EREPL; from two-way interactions HR and EXPN, HR and EREPL, EXPN and EREPL and from three-way interactions HR, EXPN and EREPL.

The null hypothesis was stated as: there was no significant difference between the behavior index and (1) hours (HR), (2) experimental pair (EXPN), and (3) replications (EREPL); (4) hours (HR) and experiment pair (EXPN); (5) hours (HR) and replicate (EREPL); (6) experimental pair (EXPN) and replicate (EREPL); and finally (7) hours (HR), experimental pair (EXPN) and replicate (EREPL). The ANOVAS were calculated for alpha and beta fish separately.

The equations for the null hypothesis stated above are not listed in this case.

The third set of ANOVAS identified above as (1), (2), (3), (4), (5), (6) and (7) (pages 3 and 6 RF-2D, Appendix J) were significant at the 0.001 level in F tests for all variables and the effects of all interactions. The seven null hypotheses were rejected for all cases.

The Multiple Classification Analyses for this set of ANOVAS demonstrate very minor differences in values from ones calculated in the preceeding sections (of ANOVAS 2C) and labelled (1) MCA for HR (2) MCA for EXPN and (6) MCA for EREPL.

IV. DISCUSSION

A. Summary of Results

1. General Observations and Summary

The exposure of yellow bullheads to low levels of the pesticides carbaryl and malathion resulted in significant alterations of their social interactions in both frequency and intensity. This discussion of the implications of these results generally follows in the order in which it was reported in previous sections. The initial part involves some of the minor points of discussion.

The potential problems with low level contaminants in the holding system and dosing tank system were adequately addressed. As a result of that, the behavior alterations were for the most part the effects of exposing the bullheads to sublethal concentrations of carbaryl and malathion. Reasonable precautions against contaminants were taken as described elsewhere.

Only one of each of the pairs of bullheads was exposed to the pesticide. The rationale for this design was as follows: at sublethal dose levels employed in these investigations, the differences of behavior intensity in a comparatively pesticide tolerant species (according to the literature) might not have demonstrated enough amplification if both animals were exposed. Therefore, it was theorized that differences would be much more distinct in quantifying exposed versus unexposed animals. The exposure of the alpha fish (dominant) was done because some behavioral effects would not show up so readily in a beta fish (subordinate). Its aggression scale was suppressed in a social hierarchy. These assumptions proved to be good ones (and the bullheads complied).

The effects of observation light intensity on bullhead behavior appeared to be minimal, although a positive control for this variable was not attempted. It was beyond the scope of the investigation.

Ethology as an approach to the quantification of behavior altered by sublethal levels of pesticides provided considerable insight into the behavior of the yellow bullhead. Initially, consideration was given to using operant techniques to study toxic effects on behavior. However, it was unclear what advantage was conferred upon an organism by "learning to avoid a shock" after perceiving a light flash or some other appropriate stimulus or conditioned avoidance, e.g., Warner et al., (1966). The organisms' ability to learn some avoidance or reward scheme imposed by the investigator (and often designed for his convenience) seemed to violate a basic ecological and evolutionary premise. This premise is that a learning or avoidance behavior should contain some ecologic or selective content (advantage) for an organism the same as would be expected for a meristic character. Since it is possible that these so called behaviors have no selective value for an organism, the behaviors may be "artifact." When an animal is trained to perform some task or avoid some punishment, the inability of the animal to perform the task or extinction of the training could well be the extinction of an "artifact." However, there may be cases in which selective or adaptive advantage may be conferred by a behavior resulting from conditioned training--at least one can imagine such cases.

The degree of correspondence between the "field" observed behaviors and behaviors observed in the laboratory, 0.74, was adequate to support the assumption that behaviors observed in the laboratory were representative of this species in the environment.

The 50 behaviors (subcategories) and categories which comprise the partial ethogram used in these studies were the product of many observations. The numbers and the many subtle gradations within a subcategory as described by Todd (1968) were not observed. The high level and high frequency of aggressive behaviors reported by Todd were not confirmed in this colony. However, the behavior reporting methods were somewhat different and the sources of populations of yellow bullheads for the two studies were different.

The function of these studies was to examine the effects of low level chemicals on the behaviors that comprise an ethogram. However, early in the examination of behavior of the fish in this culture it became evident that reproduction in the fish was accompanied by considerable violence and several fatalities occurred. A more detailed study which included reproductive behavior would have yielded a complete ethogram. However, the additional information from reproductive behavior was not without risk. The death of a fish represented a great loss of potential data and accumulated data.

Relatively few fish were used. The data herein represents the output of 28 fish. However, the amount of data produced from fish of a pair or per experiment pair was substantial. The partial ethogram was constructed and subcategories, frequencies, etc. were quantified without the difficulties and risks associated with reproduction or reproductive behaviors.

The categories (aggressive, feeding, neutral, submissive) were chosen as a matter of convenience and were in part based upon the work of Myrberg (1972a). The analytical treatment of the categories and subcategories, i.e., arranging them into a series of 50 by 50 matrices and calculating the transition frequencies and probabilities between the subcategories and subsequently between categories for each experiment, was in itself a partial confirmation of the selection and ordination of the categories and the subcategories which comprise the categories (Appendix C, RF-1); that is, the indices derived, confirmed the hierarchial relationships. The observations in Tables 18 through 23 (pages 85 - 90) and Tables 24 and 25 confirmed that there were quantifiable differences in the behaviors of the alpha and beta fish in each experiment which were attributable to treatment, to social status and to the interaction (Figure 15). Figure 15 is a graph of Tables 24 and 25.

The use of a factor of 10X in the assembling of time-in-behavior cross tabulations was found to be efficient in generating matrix cell values. The selection of the + 50 to - 50 scale to provide a measure of the intensity of subcategories (individual behaviors) was generally

TABLE 24

Alpha Composite Behavior Index Mean Values by Experiment Number

	EXPN 0	EXPN 1	EXPN 2	EXPN 3
A	25.844 (8.610)	24.051 (8.935)	24.731 (8.181)	24.561 (8.114)
F	10.791 (1.368)	11.551 (1.896)	11.457 (1.793)	11.715 (1.914)
N	0.956 (4.805)	3.222 (3.866)	.694 (4.913)	2.163 (4.833)
S	-29.150 (8.237)	-28.584 (8.876)	-32.061 (8.832)	-29.654 (8.636)

	EXPN 0	EXPN 4	EXPN 5	EXPN 6
A		25.904 (8.529)	24.055 (8.262)	27.867 (8.203)
F		11.121 (1.531)	11.286 (1.602)	10.827 (1.483)
N		1.232 (3.523)	-2.374 (6.791)	.362 (5.887)
S		-30.329 (8.900)	-32.811 (9.090)	-31.924 (8.778)

A = Aggressive

F = Feeding

N = Neutral ( ) = Standard Deviation

S = Submissive

TABLE 25

Beta Composite Behavior Index Mean Values by Experiment Number

	EXPN 0	EXPN 1	EXPN 2	EXPN 3
A	25.514 (8.114)	22.718 (7.410)	25.447 (8.453)	27.323 (8.650)
F	10.734 (1.348)	10.707 (1.229)	11.129 (1.500)	11.007 (1.618)
N	.412 (4.893)	- .198 (4.867)	.637 (3.991)	.833 (4.279)
S	-34.055 (10.085)	-33.961 (11.229)	-33.322 (9.762)	-33.145 (8.889)

	EXPN 4	EXPN 5	EXPN 6
A	27.244 (8.787)	26.659 (8.623)	28.165 (7.695)
F	11.393 (1.566)	10.825 (1.400)	10.486 (1.242)
N	2.597 (3.995)	.849 (3.735)	1.667 (3.923)
S	-31.562 (9.194)	-30.820 (8.611)	28.697 (8.409)

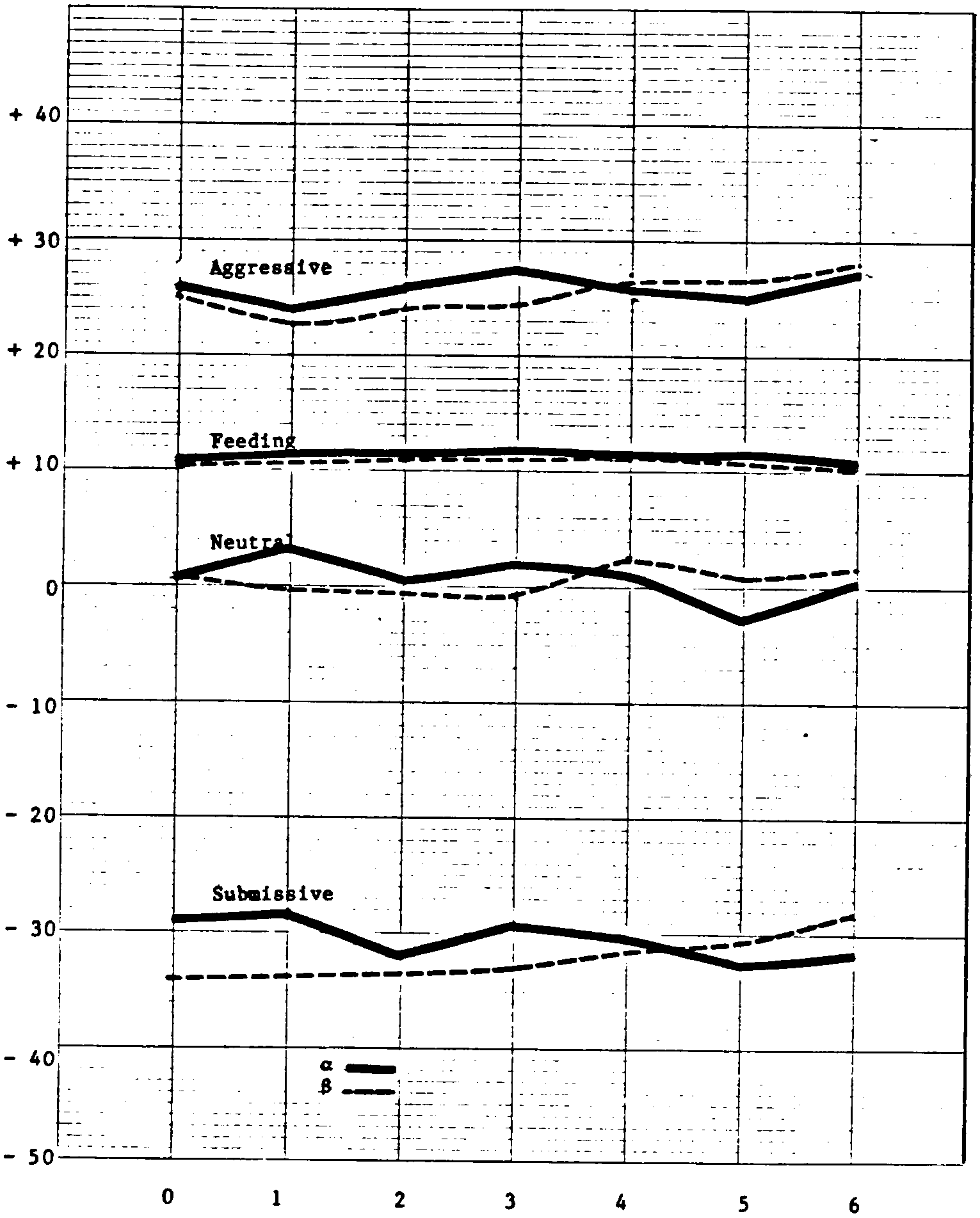

Figure 15. Summaries of Behavior Index Mean Values for Each Experiment; Numerical Values and Standard Deviation in Tables 24 and 25

satisfactory. The scale was particularly useful but may have limited the accuracy of the measures of behavior. In the consideration of this problem, the importance of time spent observing the bullheads was found to be crucial to the understanding of social interactions and to the design of the experiments. The behavior index proved to be relatively accurate and sensitive to subtle differences in behavior and also sensitive to local statistical variations in the Multiple Classification Analysis (R squared and multiple R values in Appendices G, H, and J.)

2. Feeding Behavior Pathology

One of the major findings of these studies was one which has interesting and perhaps far reaching implications. The bullheads were dosed as described in previous sections. During the 16-hour observation period of the first exposure to carbaryl, 1.0 mg l^{-1}, the alpha fish showed a significant departure from the typical feeding behavior (described below).

The fish were fed on a regular schedule and this feeding by coincidence occurred in the 16-hour session of the 1 mg l^{-1}, exposure to carbaryl to bullhead number 29 alpha.

Initially, this fish (and others subsequently) appeared to be unable to draw the food item, a small piece of fresh hog liver, into its mouth (approximately 0.5 - 1.0 cm diameter). This feeding behavior pathology was observed in all fish exposed at 1 mg l^{-1}, 2 mg l^{-1} and 4 mg l^{-1} of carbaryl. The degree of this inhibition, (see Tables 21 through 23, pages 88 - 90) appeared to be a time-dependent phenomenon and to vary somewhat in its intensity.

The pathology consisted of an inhibition of feeding in the exposed fish. The affected animal could sense the presence of the food but could not complete the feeding behaviors (IG). The animals demonstrated the typical response of bullheads to food tastes as described by Bardach et al. (1967) and Atema (1969). The typical appetitive response to food stimuli was observed in the exposed fish.

The normal feeding responses were seen in the (unexposed) beta fish. Upon detection of food stimulus in the water, the bullheads immediately began a search pattern. According to Bardach et al. (1967), the amino acid, cysteine, is the stimulant for gradient search reaction to food. It is mediated through gustation; these authors and Atema (1969) were unable to establish the role for olfaction in the search for and location of food.

In this investigation, the taste-stimulated bullheads (with exudate from the liver) immediately became active (swam toward food) if they were in resting position (RP) or followed a trail of diluted exudate if they were swimming (CR, CB). All of the fish were very accurate in locating food items. Upon location, the typical behavior in these fish was to head stand (HS) from swimming (CB) and scoop or dig (DG) a mouth full of the substrate containing the food and swallow it (ingest, IG). The presence of another fish seemed to encourage this scooping (DG) behavior, otherwise the fish would pick the food up without swallowing the substrate. The fish would swim away, stop

(HA) and regurgitate (SP) the non-food items. The ingestion (IG) behaviors were completed very rapidly, in less than 1.5 seconds.

Most of the bullheads which demonstrated the feeding behavior pathology (Figure 16) were initially capable of sensing the presence of food but were unable to draw the food item into the mouth. However, not all bullheads affected with the feeding pathology seemed to be equally, initially sensitive to the exudates and or pieces of food. The feeding pathology was tested during each observation after its discovery. The lack of response to sensory stimulation in some fish may have demonstrated a sensory inhibiting effect of the carbaryl.

The sensory inhibitions, blocks one and two (Figure 16), appeared to be operating at the higher exposure levels and lower elapsed times, one, two, four and eight hours after removal from the 48 hours of exposure (Tables 21 through 23, pages 88 - 90; Tables 24 through 25, pages 106 - 107; and Figure 15, page 108). The fish exposed to malathion exhibited no feeding pathology although its reported toxic modus is similar.

The chemical appeared to undergo a degradation in time in the fish. For example, they were observed to "gape" and as the time from exposure elapsed, the bullheads were able to draw the food into their mouths and spit it out; the drawing-in and subsequent spitting-out of food was observed to occur several times in succession or until the other fish ingested the food. Second, the fish were observed to ingest (chew?) and swallow the food item and then

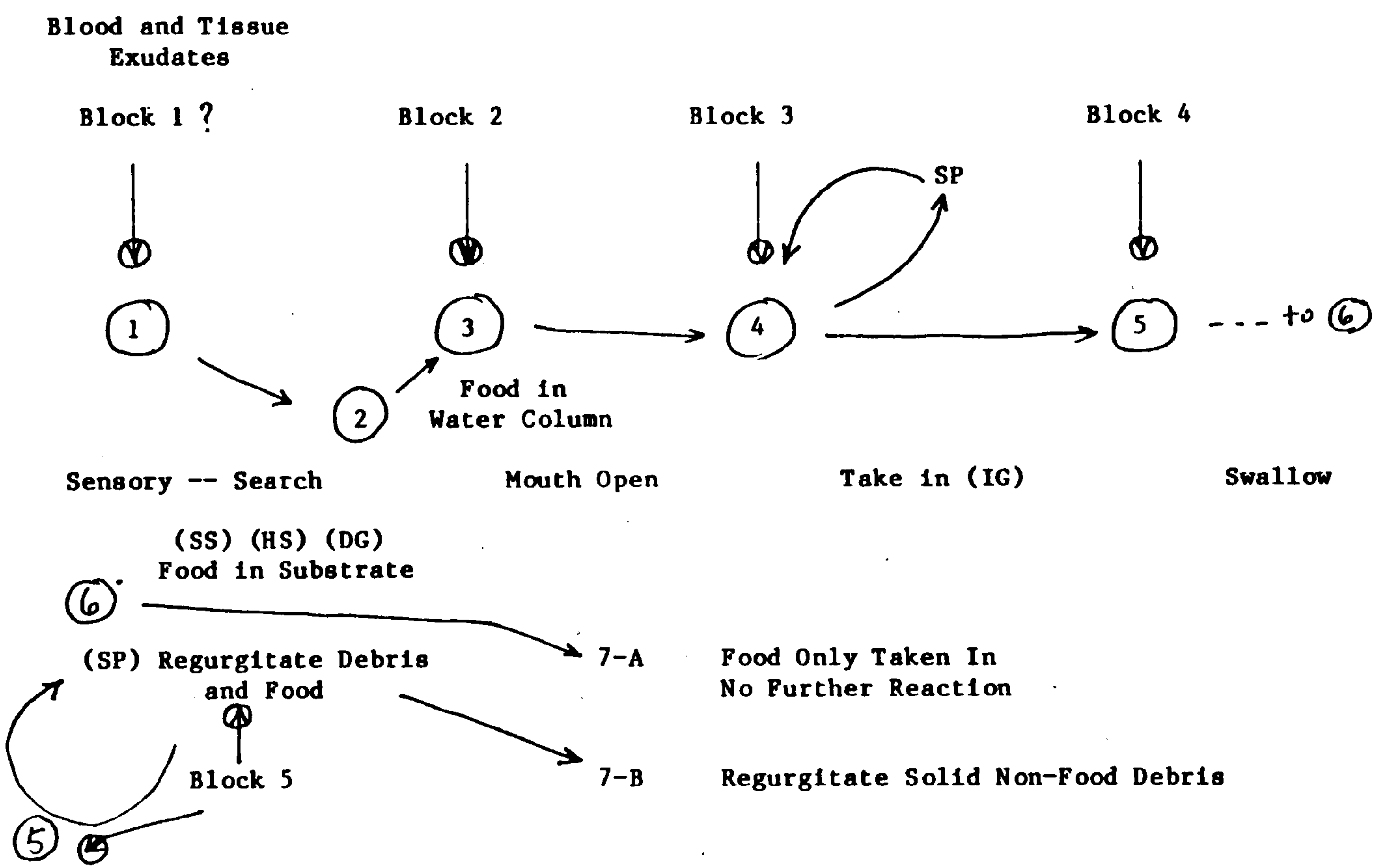

Figure 16. Diagram of the Feeding Pathology in Carbaryl Exposed Yellow Bullheads, <u>Ictalurus natalis</u>

regurgitate it (this segment of the total behavior may have occurred several times also). And third, the fish were observed to ingest the food and regurgitate it, and reingest and regurgitate several times before ingesting and retaining it. Gradually, the typical feeding behavior returned.

The feeding behavior had seven components: (1) sensory; (2) search; (3) mouth open, gape; (4) ingest (chew?); (5) spit; (6) swallow and (7) regurgitate. It was apparent that each component must reach a threshold in sequence before the next component could occur. These were included in Figure 16 "blocks" (one through five) as components of the feeding behavior sequence. These blocks were observed to disappear sequentially in reverse order as the time from exposure elapsed, and the typical feeding behavior with all seven components was reestablished (Figure 16, page 112). From the work of Atema (1969), it was considered likely that the neuropharmacologic activity for the carbaryl feeding response activity was centered in the medulla. Atema also reported that the sensory inputs from olfaction were unnecessary and apparently uninvolved in the location and ingestion of food. Those behaviors in Atema's work were dependent upon gustation. In these cases in which sensory ability appeared to be impaired, the fish may have been in a state of statiety, particularly when observations (feedings) were close together in time. It was previously suggested that carbaryl might inhibit sensory function and that idea was also suggested by the work of Hansen (1969).

Hansen (1969) reported that untrained sheepshead minnows were unable to avoid carbaryl at 0.1; 1.0 and 10.0 mg l^{-1} and malathion at 0.01, 0.1 and 1.0 mg l^{-1}. However, in mosquitofish avoidance of carbaryl and malathion was observed but not pronounced (Hansen et al., 1972).

3. The Test of the Principal Assumptions

The key assumption was that these colonies demonstrate quantifiable differences in the behavior indexes of the untreated alpha and beta fish. These differences are demonstrated in a "t" test for significant differences in behavior index means. The value of "t" was 7.445 with infinite degrees of freedom at the 0.001 level. Without a demonstration of significant difference, the assumptions on which the experiments were based would have been invalid.

4. The ANOVAS and Multiple Classification Analyses; Conclusions

The Analyses of Variance provide the general overview of the significance of the several sources of variation in the experiments. Interactive effects between main treatments in these ANOVAS were not observed. (The ANOVAS are discussed in the order in which they appear in the Results, Chapter III.)

The examination of the ANOVAS, RF2-B, Appendix G, of the behavior index* showed that times (HR) and experiment number (EXPNO) were

*Labelled Aggression Scale in the Appendices.

significant sources of variation in bullhead behavior (Appendix G). Therefore, the null hypothesis that there were no significant differences in either (observation) hours (HR), or experiment numbers (EXPNO) and behavior index was rejected. This provided evidence that time elapsed since exposure was a significant source of variation and that the experiment numbers were also a significant source of variation. These findings are significant and different for all of the alpha fish and all of the beta fish.

The Multiple Classification Analysis of these means (Appendix G) by variable (HR) and category (one through nine) within the variable demonstrate with respect to elapsed time that the behavior index mean values increase after an early inhibition for the pooled data for both pesticide treated and untreated alpha fish. This early inhibition may have reflected some actions of the chemicals on behavior intensity despite the effects of the pooling of data from untreated fish with treated fish. It is improbable that the effects of removal from the colony could have assured such effects. These effects were not demonstrated in a series of "t" tests (Table 17, page 80) which examined the hypothesis that the alpha fish behavior index scores were equal to beta behavior index scores for untreated fish. The null hypothesis were rejected in eight of nine cases (See Table 17, page 80). The mean values in the beta fish provide some indications of the pesticide effects on behavioral index in the alpha fish. The alpha and beta fish demonstrated opposite trends in values of the behavior index in the untreated fish; that is, when alpha values were positive, beta values were less than the grand mean or negative. This relationship held up for the treated animals as well (Appendix G, pages 4 and 7) but was not as clearly defined in some instances. Initially, the beta fish behavior index increased to a high value between eight and sixteen hours post exposure, after which time it fell drastically. This was a rather well-defined effect of these two chemicals in the time series. It may have indicated the initiation of some time dependent detoxification mechanism in the alpha fish which changed its behavior since both chemicals are similar in their modes of toxic action. (They are both cholinesterase inhibitors.)

In the controls, the behavior index mean values remained stable throughout the observations in both alpha and beta fish.

The Multiple Classification Analysis of experiment number (EXPNO) behavior index values again revealed more of a trend in beta fish than in the alphas. Generally, the index values showed the trend that the beta (untreated) fish in the carbaryl and untreated groups, remained submissive while in the malathion group they generally became more aggressive.

The MCA values and their interpretations are generally substantiated in the summary observations, Tables 18 through 23, pages 85 - 90, Tables 24 through 25, pages 106 - 107, and Figure 15, page 108. In any event, the biological-metabolic time decay of these two compounds appeared to be quite similar. This finding was somewhat surprising since malathion was reported to have a longer biological half life.

The examination of the ANOVAS, RF2C-Appendix H, of the behavior index showed that hour (HR) and experimental pair (EXPN), hour (HR) and experimental treatment (ETREAT); hour (HR) and exposure concentration (ECONC), hour (HR) and factor (EFACT), and hour and replicate (EREPL) were significant sources of variation in bullhead social behavior. Therefore, the null hypothesis that there were no significant differences in HR and EXPN; HR and ETREAT: HR and ECONC, HR and EFACT and HR and EREPL was rejected.

The Multiple Classification Analysis of the mean behavior index values, RF-2C, Appendix H, for hour (HR) in alpha fish indicated a pattern similar to that seen in the previous MCA, i.e., the index values were enhanced through approximately 16 hours. This indicated a potentiating effect of the sublethal short-term exposure of both chemicals on the behavior index through 16 hours, since these values were greater than the grand mean. The beta fish showed a trend opposite to the alpha, i.e., initial values greater than the grand mean approached the grand mean at 16 hours and became less than the grand mean after 16 hours. The Multiple Classification Analysis index values for carbaryl in the alpha fish increased with respect to the grand mean. This was an indication that carbaryl did not interfere with the social dominance of alpha fish in two of three experiments. The 2 mg l^{-1} exposure level of carbaryl index value was slightly lower than the grand mean. This result was partly explained by wide disparity in the values from the individual experiments. The beta fish indices were again opposite to the alpha fish values for carbaryl.

In the Multiple Classification Analysis, the behavior index values were suppressed in alpha fish for the higher concentrations of malathion exposure. These values at 2 and 4 mg l^{-1} of malathion were lower than the grand mean. At the 1 mg l^{-1} level, the value was higher than the grand mean. The values showed the effects of concentration.

These results may have indicated that, after exposure, the alpha fish were no longer dominant (Figure 15, page 108). Upon further examination, these values and the analysis from the matrices in RF-1, Appendix C (pages 148, 149, 157 and 158) which define these values more clearly, it was concluded that the alpha fish were unable to maintain dominance after exposure to malathion. This finding is further substantiated by "t" tests which showed significant differences at the 0.05 level between the matrix behavior index mean values of alphas and betas at all exposure levels. The beta fish mean values were higher in all cases. These findings were substantiated by the behavior summary observations in Tables 18 through 20, pages 85 through 87 and Figure 15, page 108.

Overall, the general finding that social behavior provided much greater sensitivity to alteration than physiological measures was unexpected. Although toxicity symptoms appeared to be present in exposed fish, the unexposed fish also randomly showed some of the same symptoms, e.g., rapid respiration and hypersensitivity. In particular, it was difficult to discern the toxic symptoms associated with cholinesterase inhibition in the fish dosed at the 1 and 2 mg l^{-1} of both carbaryl and malathion. Observations made after approximately 24 hours in the exposure tank and the 0, 1, 2, 4-hour observations did not reveal the significant conventional toxic symptoms in the fish other than elevated respiratory rates. This result was not surprising because the fish were exposed at a low concentration of compounds which are reported to be physiologically labile. However, upon examination of the Multiple Classification Analyses and the behavior observation summaries, it was apparent that the exposed bullheads were exhibiting significant changes in social behavior. These changes were seen even more clearly in some instances in the means for the behavior index in the beta (unexposed) bullheads. Their behaviors in effect became a kind-of-mirror to the exposed fish in which, by analogy, the images were clearly reversed and damped. They showed less variation in the trends of means of the Multiple Classification Analyses than the same trends for treated fish. The exposed fish were more variable in the eyes of the observer than in the senses of a conspecific tank mate.

Another possibility presented was: since the fish behavior index values used for some of the conclusions were composites, the index value could reach a relatively high or low mean value from the contribution of "high" frequencies of non-aggressive but positive valued (Table 10, page 61) categories, i.e., neutral and feeding categories. The explanation of this possibility was treated and explained satisfactorily in the way in which the Multiple Classification Analysis was stated. The mean values for the behavior index were relative to the grand means for the alpha fish and the beta fish. The values were expressed as deviations from the grand means, and incidentally, represent the individual means with adjustments made for the other factor or factors which were tested in the ANOVAS.

The ANOVAS only indicated that the differences between treated and untreated were significant; the Multiple Classification Analyses designated more specific sources of the significance.

B. Related Studies

Studies related to this one have been reported by Henry and Atchison (1979a, 1979b) in which bluegills were exposed to several concentrations of the heavy metals cadmium and zinc, in combination. The frequencies of nine behaviors were recorded. The two studies reported physiological responses as behaviors and others which were actually social behaviors. The behavior assay was apparently sensitive.

In the most extensive studies, already reported in this thesis, Atema (1969) and Todd (1968) characterized the ethogram of the yellow bullhead. Todd was principally concerned with characterizing the ethogram and the sensory mode through which the animals communicated changes in social status. Atema's study was concerned with the role of olfaction and gustation on the community social structure. His work indicated, among other findings, a significant role of the olfactory bulb in regulating intensity of aggressive behavior. In these studies, a similar phenomenon was noted and was reported briefly in Tables 21 (page 88) and 23 (page 90). The carbaryl exposed fish exhibited what appeared to be an aggressive overcompensation after toxicant behavior effect had abated in the later observations, 128 and 256 hours after exposure. While this observation was tentative in carbaryl exposed fish, the fish exposed to malathion did not show the increased intensity of aggressive behaviors. The increased intensity of aggression may have been the result of the secondary effects in addition to cholinesterase inhibition of the carbaryl. It is a carbamate and the properties of this class have been known to alter "emotional" states. From the feeding pathology of compounds, it was speculated that this compound's activity was in the medulla.

Sparks _et al_. (1972) reported on the use of shelters to alter stress in bluegills exposed to lethal concentrations of zinc. The dominant fish survived the exposure longer than non-dominant. The use of shelters prolonged survival in dominants. Sparks' study illustrates the role of a territorial modifier on survivability to toxics. Generally, the use of ethological methodology to assess toxicity has been forthcoming. The principal, apparent disadvantage of this methodology was that it was time consuming. The principal advantages were its sensitivity and apparent accuracy as a detection methodology. Again, these studies indicated the rich area of investigation open in the ethological analysis field.

C. Applications of Findings

These results have some interesting implications which have been mentioned previously. The list following was not set down in order of priority.

I. The use of chemicals to "dissect" behavior sequences.

II. The use of ethological techniques as a sensitive means of assaying the damage to communities and estimating risks of contaminants.

III. The use of non-dominant members of a social group (hierarchy) to model the course of alteration in treated dominants.

IV. Expand these techniques to model and quantify the ethograms of two interacting species using chemicals as a selective behavioral suppressant.

V. Examine the effects of behavior alteration by chemicals on the mechanisms associated with population regulation in a single species.

VI. Examine the alterations in selective regimes imposed by ecotoxicological mechanisms.

VII. Examine the role of sublethal levels of chemicals in extinctions.

D. Sources of Error

The error in these studies originated with the following sources:

(1) Time dichotomy, i.e., the time spent in a particular behavior, was subject to observational error. Many behavioral events in yellow bullheads occur very rapidly. The measurement of these events was a likely source of error.

(2) Other contaminants in the system were not likely, but the levels of mercury in fish in the early phases of the study was cause for concern.

(3) The behavior scale was also a likely source of error. The scale was based upon experience and an intimate knowledge of the behavior of the yellow bullhead. It was subjective.

In an overview, the experimental conditions were far from perfect, but physical variables were well controlled with some minor exceptions. The amount of variance in some of the data was, frankly, unexplained. The errors and omissions in this study were solely my own.

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APPENDIXES

APPENDIX A

WATER QUALITY DATA FROM HOLSTON RIVER MILE 118.4. AT SURGOINSVILLE, TENNESSEE. NOVEMBER AND DECEMBER 1974

TENNESSEE VALLEY AUTHORITY

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	00010 WATER TEMP CENT	00070 TURB JKSN JTU	00080 COLOR PT-CO UNITS	00081 AP COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00335 COD LOWLEVEL MG/L
740128	1450	1	50	24	12.2	18	15	30	260	9.2	15
740410	1000	1	50		12.2	34	15	35	240	9.3	5
740508	1455	1	50		17.8	10	5	20	260	9.5	6
740508	1530	1	50		17.2	12	5	20	250	9.5	6
740512	1240	1	50		19.1	7	10	20	220	9.5	6
740512	1300	1	50		19.1	5	10	20	210	9.7	[illegible]
740710	1355	1	50		21.1	10	10	20	220	9.6	5
740710	1415	1	50		21.1	10	10	20	250	9.7	5
740807	1415	1	50		22.2	13	10	30	250	9.3	[illegible]
740807	1440	1	50		22.2	13	10	30	250	9.3	10
740911	1620	1	50		23.5	9	15	20	330	10.5	[illegible]
740911	1621	1	50		22.9	8	15	20	320	10.4	5
740916	0720	1	50		19.0	5	10	20			5
740917	0725	1	50		23.0	11	20	30			13
740918	1335					7	15	25			12
740919	1310	1	50		22.0	7	10	20			[illegible]
740920	1345				21.0	4	5	10			5
740921	1510				20.0	6	10	20			7
740922	1615				23.0	7	15	30			12
740923	1340				20.0	6	15	20			[illegible]
740924	1340				18.0	10	10	25			5
740925	1335	1	50		19.5	4	10	20			[illegible]
740926	1345				20.0	3	5	10			7
740927	1320	1	50		22.0	4	20	25			12
740928	1635	1	50		23.0	4	20	25			15
740929	1320	1	50		22.0	2	5	10			[illegible]
740930	1345	1	50		21.0	2	20	30			22
741001	1340	1	50		20.0	3	10	20			18
741002	1340	1	50		19.0	8	15	25			17
741003	1340	1	50		18.0	6	10	15			11
741004	1235	1	50		18.0	5	10	15			[illegible]
741005	1545	1	50		20.0	7	10	20			8
741006	1815	1	50		22.0	3	30	35			10
741007	1330	1	50		20.0	2	10	20			9
741008	1330	1	50		19.0	5	10	25			13
741009	1245	1	50		18.0	11	20	30			12
741010	1335	1	50		19.0	8	10	10			9
741011	1330	1	50		20.0	3	10	15			11
741012	1615	1	50		21.0	3	15	25			12
741013	1635	1	50		21.0	4	15	25			9
741014	1330	1	50		21.0	2	25	30			13
741015	1335	1	50		21.0	3	20	35			[illegible]
741016	1340	1	50		19.0	2	15	20			12
741016	1515	1	50		17.8	4	15	30	240	6.9	13
741015	1540	1	50		17.0	5	15	30	250	6.4	9
741017	1350	1	50		18.0	5	20	25			[illegible]
741018	1330	1	50		18.0	5	20	30			13
741019	1325	1	50		17.0	3	15	20			11

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 110.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	00010 WATER TEMP CENT	00070 TURB JKSN JTU	00080 COLOR PT-CO UNITS	00081 AP COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00335 COD LOWLEVEL MG/L
741020	1815	1	50		16.0	3	25	40			14
741021	1205	1	50		14.0	3	25	40			18
741022	1300	1	50		16.0	6	10	25			8
741023	1345	1	50		16.0	4	5	20			8
741024	1345	1	50		16.0	1	15	20			12
741025	1300	1	50		17.0	3	25	35			14
741026	1345	1	50		20.0	3	25	35			13
741027	1715	1	50		18.0	4	25	35			11
741028	1230	1	50		20.0	5	25	35			14
741029	1330	1	50		20.0	10	10	35			15
~~741030~~	~~0924~~	~~1~~	~~50~~		~~16.0~~	~~8~~	~~10~~	~~25~~			~~3~~
741030	1330	1	50		21.0	12	15	35			7
741031	1300	1	50		22.0	8	10	25			6
741101	1415	1	50		22.0	4	20	25			9
741102	1410	1	50		22.0	4	15	15			8
741103	1700	1	50		21.0	2	20	30			15
741104	1215	1	50		19.0	1	10	15			11
741105	1345	1	50		21.0	4	25	35			15
741106	1330	1	50		19.0	5	30	35			17
741106	1400	1	50		18.3	5	30	35	440	5.6	17
741106	1425	1	50		19.4	8	30	35	430	5.2	19
741107	1330	1	50		17.0	4	10	15			10
741108	1215	1	50		16.0	3	10	25			5
741109	1410	1	50		18.0	5	15	30			2
741110	1545	1	50		17.0	3	10	15			3
741111	1315	1	50		17.0	3	10	10			2
741112	1315	1	50		16.0	4	25	30			13
741113	1215	1	50		14.0	10	10	15			10
741114	1330	1	50		14.0	5	10	10			6
741115	1215	1	50		14.0	3	10	15			12
741116	0915	1	50		12.0	7	10	20			9
741116	1315	1	50		15.0	5	15	20			7
741116	1630	1	50		16.0	3	10	20			5
741117	1015	1	50		13.0	4	5	20			6
741117	1410	1	50		15.0	3	5	20			6
741117	1755	1	50		14.0	2	5	25			3
741118	0710	1	50		12.0	2	15	20			5
741118	1205	1	50		14.0	3	20	25			7
741118	1615	1	50		14.0	3	20	25			12
741119	0720	1	50		16.0	13	15	35			37
741119	1205	1	50		15.0	8	10	20			9
741119	1610	1	50		15.0	4	15	20			10
741120	0720	1	50		16.0	10	20	25			16
741120	1210	1	50		16.0	6	15	20			9
741120	1620	1	50		15.0	8	20	30			17
741121	0720	1	50		12.0	120	60	220			35
741121	1230	1	50		11.0	58	35	100			
741121	1600	1	50		12.0	60	35	90			26
741122	0800	1	50		11.0	32	15	30			17

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	00010 WATER TEMP CENT	00070 TURB JKSN JTU	00080 COLOR PT-CO UNITS	00081 AP COLOR PT-CO UNITS	00095 CNDUCTVY AT 25C MICROMHO	00300 DO MG/L	00335 COD LOWLEVEL MG/L
741122	1210	1	50		13.0	21	10	25			15
741122	1615	1	50		13.0	23	15	30			10
741123	0820	1	50		10.0	16	15	30			9
741123	1335	1	50		13.0	12	20	30			10
741123	1620	1	50		13.0	12	15	30			10
741124	1005	1	50		13.0	10	10	25			14
741124	1325	1	50		14.0	7	10	25			9
741124	1720	1	50		12.0	7	10	20			8
741125	0720	1	50		12.0	10	15	20			14
741125	1210	1	50		12.0	7	10	20			11
741125	1615	1	50		12.0	6	10	15			8
741126	0725	1	50		10.0	3	10	15			8
741126	1215	1	50		12.0	5	10	10			9
741126	1610	1	50		12.0	6	10	15			11
741127	0720	1	50		9.0	4	15	20			12
741127	1205	1	50		13.0	3	10	15			10
741127	1610	1	50		12.0	3	10	15			8
741128	1015				11.0	8	10	20			5
741128	1315				12.0	6	10	20			9
741128	1645				12.0	6	10	15			7
741129	0805				9.0	4	15	20			10
741129	1145				12.0	6	20	25			15
741129	1620				12.0	4	15	20			9
741130	0745				9.0	5	10	20			8
741130	1215				11.0	5	10	15			5
741130	1545				11.0	7	15	25			11
740128											
NUMBER		107			122	123	123	123	15	16	122
MAXIMUM		1			23.9	120	60	220	440	10.5	37
MINIMUM		1			9.0	1	5	10	210	5.2	2
SUM		107			2034.3	1025	1820	3225	4420	137.7	1313
SUM SQ.		107			35772.4	29714	34100	138725	1293600	1226.1	17710
MEAN		1			16.7	8	15	26	276	8.6	11
VARIANCE		0			15.3	174	59	444	4833	2.7	29
STD.DEV.		0			3.9	13	8	21	70	1.7	5
STD.ERR.		0			0.4	1	1	2	17	0.4	0
COEF VAR		0			23.5	158	52	80	25	19.2	50
LOG MEAN		1			16.2	6	13	23	269	8.4	10
741130											

TENNESSEE VALLEY AUTHORITY

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	00400 PH SU	00410 T ALK CACO3 MG/L	00415 PHEN-PH-LFIN ALK MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N-TOTAL MG/L
740128	1450	1	50	24	6.9	55	0	23	0.20	0.19	0.78
740410	1000	1	50		7.6	85	0	21	0.18	0.25	0.84
740508	1455	1	50		7.9	85	0	7	0.29	0.20	0.75
740508	1530	1	50		8.0	82	0	4	0.19	0.17	0.70
740512	1240	1	50		9.1	77	0	6	0.14	0.19	0.67
740612	1300	1	50		8.1	76	0	6	0.14	0.20	0.63
740710	1355	1	50		8.1	63	0	9	0.14	0.13	0.81
740710	1415	1	50		8.0	70	0	9	0.13	0.14	0.81
740807	1415	1	50		8.1	69	0	6	0.28	0.36	0.76
740807	1440	1	50		8.1	68	0	8	0.32	0.37	0.75
740911	1620	1	50		7.2	90	0	5	0.31	0.27	0.83
740911	1621	1	50		6.9	83	0	4	0.11	0.52	0.84
740916	0720	1	50					4	0.19	0.20	0.92
740917	0725	1	50					13	0.53	0.59	0.85
740918	1335								0.35	0.79	0.73
740919	1310	1	50					4	0.20	0.24	0.73
740920	1345							2	0.26	0.10	0.65
740921	1610							3	0.24	0.14	0.69
740922	1615							7	0.28	0.40	0.72
740923	1340							4	0.34	0.22	0.85
740924	1340							7	0.58	0.20	0.75
740925	1335	1	50					21	0.34	0.32	0.77
740926	1345							7	0.13	0.11	0.53
740927	1320	1	50					8	0.26	1.20	0.82
740928	1635	1	50					6	0.29	0.49	0.90
740929	1320	1	50					3	0.22	0.20	1.10
740930	1345	1	50					2	0.43	0.71	1.20
741001	1340	1	50					7	0.22	0.15	0.86
741002	1340	1	50					6	0.33	0.45	0.93
741003	1340	1	50					3	0.25	0.22	0.85
741004	1235	1	50					5	0.23	0.20	0.85
741005	1545	1	50					6	0.26	0.11	0.57
741006	1815	1	50					5	0.52	0.59	0.55
741007	1330	1	50					3	0.33	0.10	0.99
741008	1330	1	50					6	0.34	0.34	0.94
741009	1245	1	50					5	0.23	0.27	0.99
741010	1335	1	50					3	0.92	0.34	0.84
741011	1330	1	50					4	0.26	0.30	0.79
741012	1615	1	50					6	0.37	0.26	0.50
741013	1635	1	50					6	0.39	0.09	0.90
741014	1330	1	50					2	0.44	0.55	0.90
741015	1235	1	50					3	0.43	0.44	0.63
741016	1340	1	50					4	0.23	0.37	3.50
741016	1515	1	50		7.0	70	0	6	0.31	0.25	0.86
741016	1540	1	50		7.4	67	0	5	0.32	0.25	0.84
741017	1350	1	50					6	0.24	0.18	0.76
741018	1330	1	50					7	0.25	0.31	1.10
741019	1325	1	50					4	0.28	0.22	0.95

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STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	00400 PH SU	00410 T ALK CACO3 MG/L	00415 PHEN-PH-LFIN ALK MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N-TOTAL MG/L
741020	1815	1	50					2	0.32	0.23	0.95
741021	1205	1	50					5	0.35	0.55	0.78
741022	1300	1	50					4	0.13	0.07	0.88
741023	1345	1	50					4	0.15	0.05	0.92
741024	1345	1	50					2	0.24	0.42	5.10
741025	1300	1	50					3	0.26	0.75	1.10
741026	1345	1	50					2	0.27	0.59	1.00
741027	1715	1	50					5	0.43	0.55	1.10
741028	1230	1	50					6	0.41	0.13	0.89
741029	1330	1	50					8	0.33	0.42	0.95
741030	0924	1	50					11	0.15	0.01K	0.30
741030	1330	1	50					11	0.31	0.45	1.30
741031	1300	1	50					7	0.26	0.28	1.00
741101	1415	1	50					3	0.38	0.20	1.20
741102	1430	1	50					7	0.27	0.28	0.81
741103	1700	1	50					5	0.25	0.57	0.84
741104	1215	1	50					2	0.23	0.37	1.00
741105	1345	1	50					7	0.33	1.20	0.91
741106	1330	1	50					6	0.46	1.00	4.30
741106	1400	1	50		7.3	84	0	7	0.29	0.96	0.76
741106	1425	1	50		7.2	85	0	6	0.33	1.00	0.76
741107	1330	1	50					7	0.09	0.29	0.83
741108	1215	1	50					4	0.18	0.20	0.80
741109	1410	1	50					6	0.27	0.24	0.30
741110	1545	1	50					5	0.19	0.10	0.75
741111	1315	1	50					7	0.10	0.20	0.78
741112	1315	1	50					2	0.39	0.35	0.67
741113	1215	1	50					18	0.27	0.09	0.68
741114	1330	1	50					2	0.22	0.15	0.83
741115	1215	1	50					5	0.34	0.17	0.75
741116	0915	1	50					17	0.20	0.12	0.68
741116	1315	1	50					9	0.17	0.10	0.68
741116	1630	1	50					5	0.18	0.08	0.69
741117	1015	1	50					2	0.23	0.19	0.65
741117	1410	1	50					2	0.19	0.15	0.80
741117	1755	1	50					2	0.23	0.13	0.79
741118	0710	1	50					2	0.19	0.21	0.92
741118	1205	1	50					2	0.25	0.33	0.65
741118	1615	1	50					3	0.35	0.47	0.69
741119	0720	1	50					29	0.40	0.50	6.90
741119	1205	1	50					18	0.23	0.18	0.73
741119	1310	1	50					5	0.24	0.14	3.10
741120	0720	1	50					13	0.37	0.35	5.30
741120	1210	1	50					8	0.28	0.23	1.00
741120	1620	1	50					12	0.31	0.40	1.10
741121	0720	1	50					75	0.53	0.22	6.10
741121	1230	1	50					99	0.22	0.15	0.73
741121	1600	1	50					100	0.26	0.19	0.76
741122	0800	1	50					70	0.31	0.15	3.20

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	00400 PH SU	00410 T ALK CACO3 MG/L	00415 PHEN-PH-LFIN ALK MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L	00610 NH3-N TOTAL MG/L	00630 NO2&NO3 N-TOTAL MG/L
741122	1210	1	50					61	0.19	0.17	0.76
741122	1615	1	50					48	0.21	0.15	2.60
741123	0820	1	50					24	0.19	0.19	0.67
741123	1335	1	50					19	0.27	0.19	0.74
741123	1620	1	50					25	0.31	0.15	2.60
741124	1005	1	50					14	0.37	0.18	0.65
741124	1325	1	50					9	0.24	0.15	0.65
741124	1720	1	50					10	0.20	0.12	0.65
741125	0720	1	50					13	0.35	0.20	3.90
741125	1210	1	50					11	0.21	0.25	0.59
741125	1615	1	50					7	0.17	0.11	0.72
741126	0725	1	50					12	0.17	0.24	0.70
741126	1215	1	50					17	0.31	0.09	0.80
741126	1610	1	50					12	0.19	0.12	0.69
741127	0720	1	50					13			
741127	1205	1	50					10	0.29	0.09	0.55
741127	1610	1	50					7	0.27	0.07	0.65
741128	1015							8	0.16	0.08	4.20
741128	1315							8	0.19	0.09	0.53
741128	1645							7	0.27	0.09	9.90
741129	0805							4	0.25	0.17	3.70
741129	1145							4	0.20	0.25	2.90
741129	1520							5	0.28	0.13	3.20
741130	0745							4	0.35	0.19	0.88
741130	1215							8	0.27	0.19	0.75
741130	1545							7	0.33	0.27	0.76

740128

		00003	00002	00008	00400	00410	00415	00530	00605	00610	00630
NUMBER		107			16	16	16	122	122	122	122
MAXIMUM		1			8.1	90	0	100	0.92	1.20	9.90
MINIMUM		1			6.9	67	0	2	0.09	0.01K	0.38
SUM		107			122.1	1244	0	1311	34.50	36.39	163.35
SUM SQ.		107			935.2	97672	0	46051	11.50	17.86	522.03
MEAN		1			7.6	78	0	11	0.28	0.30	1.34
VARIANCE		0			0.2	63	0	264	0.01	0.06	2.51
STD.DEV.		0			0.5	8	0	16	0.12	0.24	1.58
STD.ERR.		0			0.1	2	0	1	0.01	0.02	0.14
COEF VAR		0			6.3	10	0	151	42.40	80.69	118.24
LOG MEAN		1			7.6	77	0	7	0.26	0.23	1.01

741130

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	00665 PHOS-TOT MG/L P	00680 T ORG C C MG/L	00900 TOT HARD CACO3 MG/L	00916 CALCIUM CA-TOT MG/L	00927 MGNSIUM MG,TOT MG/L	00929 SODIUM NA,TOT MG/L	00937 PTSSIUM K,TOT MG/L
740128	1450	1	50	24	0.07		120	36.00	7.60	8.2	2.2
740410	1000	1	50		0.08		100	29.00	6.80	10.0	1.9
740508	1455	1	50		0.05		100	31.00	6.20	8.3	1.5
740508	1530	1	50		0.05		100	30.00	6.20	8.5	1.8
740612	1240	1	50		0.05		89	26.00	5.90	8.4	1.5
740612	1300	1	50		0.06		87	25.00	5.90	6.4	1.6
740710	1355	1	50		0.05	2.6	88	25.00	6.20	7.8	1.8
740710	1415	1	50		0.04	1.9	66	25.00	6.20	8.0	1.9
740807	1415	1	50		0.34	2.4	98	25.00	6.20	[illegible]	1.8
740807	1440	1	50		0.35	3.4	86	24.00	6.40	[illegible]	2.1
740911	1620	1	50		0.05	2.2	110	31.00	8.40	17.0	2.0
740911	1621	1	50		0.10	2.2	110	31.00	8.50	16.0	2.0
740916	0720	1	50		0.08		85	23.00	6.70	9.3	1.8
740917	0725	1	50		0.16		120	33.00	8.90	26.0	2.5
740918	1335				0.14		100	27.00	8.10	17.0	2.3
740919	1310	1	50		0.09		75	20.00	6.00	8.1	1.7
740920	1345				0.06		76	21.00	5.60	7.6	1.5
740921	1610				0.10		83	23.00	6.20	8.7	1.7
740922	1615				0.14		100	29.00	7.50	19.0	2.5
740923	1340				0.10		130	36.00	8.90	21.0	2.4
740924	1340				0.09		83	23.00	6.10	7.2	1.8
740925	1335	1	50		0.11		92	25.00	7.10	11.0	2.4
740926	1345				0.06		83	23.00	6.10	7.6	1.7
740927	1320	1	50		1.20		100	28.00	7.70	[illegible]	2.4
740928	1635	1	50		0.13		110	31.00	8.30	22.0	2.1
740929	1320	1	50		0.11		94	25.00	7.00	15.0	1.7
740930	1345	1	50		0.14		130	36.00	9.20	34.0	2.3
741001	1340	1	50		0.07		87	24.00	6.50	[illegible]	1.5
741002	1340	1	50		0.10		94	26.00	7.10	15.0	2.1
741003	1340	1	50		0.07		87	24.00	6.50	12.0	1.8
741004	1235	1	50		0.05		91	25.00	7.50	9.9	1.8
741005	1545	1	50		0.07		94	26.00	7.30	9.8	1.9
741006	1815	1	50		0.12		120	32.00	8.70	24.0	2.9
741007	1330	1	50		0.10		83	23.00	6.30	9.2	1.8
741008	1330	1	50		0.08		91	25.00	7.00	12.0	1.9
741009	1245	1	50		0.08		87	24.00	6.50	11.0	1.9
741010	1335	1	50		0.08		86	24.00	6.40	11.0	1.8
741011	1330	1	50		0.10		88	24.00	6.90	11.0	1.9
741012	1615	1	50		0.10		95	26.00	7.40	12.0	2.0
741013	1635	1	50		0.09		95	27.90	6.60	11.0	1.9
741014	1330	1	50		0.12		130	33.00	9.00	25.0	2.0
741015	1335	1	50		0.14		100	29.00	7.20	17.0	2.3
741016	1340	1	50		0.08		91	25.00	6.90	9.8	2.0
741016	1515	1	50		0.10	2.8	86	24.00	6.30	11.0	2.2
741016	1540	1	50		0.10	2.5	86	24.00	6.30	11.0	2.3
741017	1350	1	50		0.08		110	30.00	7.70	11.0	2.4
741018	1330	1	50		0.10		110	33.00	7.40	15.0	2.6
741019	1325	1	50		0.09		110	33.00	6.90	18.0	2.3

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	00665 PHOS-TOT MG/L P	00680 T ORG C C MG/L	00900 TOT HARD CACO3 MG/L	00916 CALCIUM CA-TOT MG/L	00927 MGNSIUM MG,TOT MG/L	00929 SODIUM NA,TOT MG/L	00937 PTSSIUM K,TOT MG/L
741020	1815	1	50		0.12		150	46.00	8.50	25.0	2.7
741021	1205	1	50		0.17		150	45.00	8.60	43.0	3.0
741022	1300	1	50		0.08		87	24.00	6.60	8.5	1.8
741023	1345	1	50		0.08		88	24.00	6.80	8.8	1.9
741024	1345	1	50		0.11		120	32.00	8.90	15.0	2.3
741025	1300	1	50		0.20		160	35.00	18.00	21.0	2.6
741026	1345	1	50		0.21		120	33.00	9.20	26.0	2.6
741027	1715	1	50		0.22		130	35.00	9.70	24.0	2.6
741028	1230	1	50		0.22		130	34.00	10.90	25.0	2.5
741029	1330	1	50		0.18		110	31.00	8.70	11.0	2.4
741030	0924	1	50		0.09		17	4.00	1.00	2.2	1.5
741030	1330	1	50		0.17		87	23.00	7.10	16.0	2.4
741031	1300	1	50		0.16		84	23.00	5.50	15.0	2.4
741101	1415	1	50		0.17		92	25.00	7.20	11.0	2.4
741102	1410	1	50		0.14		75	20.00	6.20	11.0	2.0
741103	1700	1	50		0.16		63	29.00	3.10	16.0	2.4
741104	1215	1	50		0.10		78	21.00	6.10	8.7	1.8
741105	1345	1	50		0.19		110	32.00	5.10	2.2	2.4
741106	1330	1	50		0.20		120	35.00	5.30	29.0	2.5
741105	1400	1	50		0.20	4.1	120	34.00	5.30	29.0	2.5
741106	1425	1	50		0.21	4.4	120	35.00	5.40	28.0	1.5
741107	1330	1	50		0.10		97	25.00	6.60	12.0	2.0
741108	1215	1	50		0.09		91	26.00	6.30	9.5	2.0
741109	1410	1	50		0.13		98	29.00	6.20	11.0	2.1
741110	1545	1	50		0.08		68	25.00	6.10	3.3	1.9
741111	1315	1	50		0.08		90	25.00	6.70	8.8	1.9
741112	1315	1	50		0.12		110	31.00	8.60	16.0	2.4
741113	1215	1	50		0.10		89	25.00	6.50	9.5	1.9
741114	1330	1	50		0.07		96	27.00	6.90	14.0	2.0
741115	1215	1	50		0.09		92	26.00	6.70	10.0	1.9
741116	0915	1	50		0.10		94	26.00	7.00	9.2	2.0
741116	1315	1	50		0.07		96	27.00	7.00	8.6	1.9
741116	1630	1	50		0.07		93	26.00	6.80	5.1	1.6
741117	1015	1	50		0.09		100	29.00	7.50	12.5	2.1
741117	1410	1	50		0.08		100	28.00	7.40	11.0	2.3
741117	1755	1	50		0.08		100	28.00	7.30	10.0	1.9
741118	0710	1	50		0.09		120	35.00	9.00	16.0	2.1
741118	1205	1	50		0.11		110	33.00	4.70	22.0	2.4
741118	1615	1	50		0.14		140	42.00	9.10	28.0	2.6
741119	0720	1	50		0.22		110	30.00	8.00	14.0	2.4
7-1119	1205	1	50		0.12		90	25.00	6.70	9.5	2.0
741119	1610	1	50		0.09		89	25.00	6.50	8.7	1.9
741120	0720	1	50		0.14		110	30.00	7.20	14.0	2.3
741120	1210	1	50		0.11		110	30.00	7.00	12.5	2.2
741120	1620	1	50		0.16		120	33.00	8.20	15.0	2.6
741121	0720	1	50		0.23		140	42.00	9.40	14.0	5.5
741121	1230	1	50		0.14		130	39.00	8.00	22.0	3.8
741121	1600	1	50		0.14		140	41.00	8.30	34.0	3.6
741122	0800	1	50		0.17		100	30.00	6.30	15.0	2.3

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	00665 PHOS-TOT MG/L P	00680 T ORG C C MG/L	00900 TOT HARD CACO3 MG/L	00916 CALCIUM CA-TOT MG/L	00927 MGNSIUM MG,TOT MG/L	00929 SODIUM NA,TOT MG/L	00937 PTSSIUM K,TOT MG/L
741122	1210	1	50		0.11		100	30.00	6.40	10.0	2.2
741122	1615	1	50		0.12		98	29.00	6.20	11.0	2.3
741123	0820	1	50		0.07		110	32.00	6.70	15.0	2.2
741123	1335	1	50		0.09		100	30.00	6.90	10.0	2.2
741123	1620	1	50		0.10		94	27.00	6.60	9.3	2.2
741124	1005	1	50		0.05		90	25.00	6.60	6.5	2.0
741124	1325	1	50		0.10		89	25.00	5.50	6.9	2.1
741124	1720	1	50		0.07		89	25.00	6.40	5.4	2.2
741125	0720	1	50		0.08		89	25.00	6.50	8.3	2.1
741125	1210	1	50		0.07		86	24.00	6.30	7.9	2.0
741125	1615	1	50		0.06		88	25.00	6.20	9.2	2.0
741126	0725	1	50		0.15		83	23.00	6.10	7.5	2.0
741126	1215	1	50		0.00		79	22.00	5.90	7.1	2.0
741126	1610	1	50		0.08		82	23.00	6.00	7.0	1.9
741127	0720	1	50				89	25.00	6.50	9.0	2.2
741127	1205	1	50		0.03		79	22.00	5.95	6.9	2.0
741127	1610	1	50		0.07		82	23.00	5.90	6.5	1.9
741128	1015				0.05		78	22.00	5.60	6.6	2.0
741128	1315				0.06		79	22.00	5.60	9.2	2.0
741128	1645				0.06		78	22.50	5.70	9.1	2.0
741129	0805				0.08		97	23.00	5.60	10.0	2.2
741129	1145				0.09		91	25.00	7.00	15.0	2.5
741129	1620				0.08		89	25.00	6.50	12.0	2.3
741130	0745				0.09		93	23.00	6.20	8.8	2.3
741130	1215				0.03		84	24.00	5.80	5.2	2.0
741130	1545				0.09		100	29.00	7.10	12.0	2.3
740128											
NUMBER		107			122	10	123	123	123	123	123
MAXIMUM		1			1.20	4.4	160	46.00	18.00	43.0	5.5
MINIMUM		1			0.04	1.9	17	4.00	1.60	2.3	1.5
SUM		107			14.66	28.5	12107	3421.00	871.49	1638.2	266.6
SUM SQ.		107			3.27	87.6	1236825	99217.00	6463.55	27058.3	605.1
MEAN		1			0.12	2.8	93	27.81	7.09	13.3	2.2
VARIANCE		0			0.01	0.7	370	33.35	2.41	49.5	0.2
STD.DEV.		0			0.11	0.8	19	5.77	1.55	7.0	0.5
STD.ERR.		0			0.01	0.3	2	0.52	0.14	0.5	0.0
COEF VAR		0			92.97	29.6	20	20.76	21.90	52.8	21.3
LOG MEAN		1			0.10	2.7	96	27.11	6.93	11.9	2.1
741130											

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	00940 CHLORIDE CL MG/L	00945 SULFATE SO4-TOT MG/L	00951 FLUORIDE F,TOTAL MG/L	00956 SILICA TOTAL MG/L	01002 ARSENIC AS,TOT UG/L	01007 BARIUM BA,TOT UG/L	01012 BERYLIUM BE,TOT UG/L
740128	1450	1	50	24	11.0	19	0.06	6.4	5K	200	10K
740410	1000	1	50		10.0	16	0.08	6.6			
740508	1455	1	50		16.0	14	0.05	5.2			
740508	1530	1	50		16.0	18	0.05	5.2			
740612	1240	1	50		9.0	14	0.09	5.2			
740612	1300	1	50		8.0	14	0.09	5.3			
740710	1355	1	50		9.0	11	0.08	1.5			
740710	1415	1	50		8.0	13	0.07	2.7	5K	100	10K
740807	1415	1	50		10.0	21	0.10	4.3	5K	100K	10K
740807	1440	1	50		9.0	20	0.08	7.0		100K	10K
740911	1620	1	50		28.0	24	0.08	3.9		100K	10K
740911	1621	1	50		26.0	23	0.08	4.1			
740916	0720	1	50		11.0	19	0.09	5.4			
740917	0725	1	50		40.0	40	0.12	6.0			
740918	1335				21.0	38	0.09	5.6			
740919	1310	1	50		8.0	20	0.08	6.1			
740920	1345				10.0	16	0.09	5.7			
740921	1610				12.0	18	0.09	6.3			
740922	1615				24.0	28	0.12	5.1			
740923	1340				37.0	31	0.10	4.8			
740924	1340				8.0	16	0.07	6.8			
740925	1335	1	50		14.0	27	0.07	5.3			
740926	1345				9.0	12	0.08	6.3			
740927	1320	1	50		16.0	33	0.08	5.8			
740928	1635	1	50		24.0	40	0.09	6.1			
740929	1320	1	50		4.0	22	0.08	4.3			
740930	1345	1	50		40.0	47	0.08	5.3			
741001	1340	1	50		10.0	18	0.08	6.9			
741002	1340	1	50		14.0	26	0.09	6.2			
741003	1340	1	50		12.0	22	0.08	4.5			
741004	1235	1	50		10.0	27	0.08	5.2			
741005	1545	1	50		11.0	24	0.08	5.6			
741006	1815	1	50		30.0	52	0.09	5.0			
741007	1330	1	50		10.0	20	0.09	4.6			
741008	1330	1	50		15.0	25	0.09	5.6			
741009	1245	1	50		11.0	21	0.09	5.3			
741010	1335	1	50		2.0	19	0.09	4.4			
741011	1330	1	50		10.0	24	0.08	5.8			
741012	1615	1	50		16.0	26	0.09	5.0			
741013	1635	1	50		12.0	19	0.07	4.4			
741014	1330	1	50		40.0	49	0.08	4.1			
741015	1335	1	50		19.0	35	0.08	5.3			
741016	1340	1	50		12.0	16	0.07	4.9			
741016	1515	1	50		12.0	24	0.07	5.4	5K	100K	10K
741016	1540	1	50		13.0	25	0.08	5.6	5K	100K	10K
741017	1350	1	50		19.0	19	0.12	5.6			
741018	1330	1	50		26.0	26	0.07	5.8			
741019	1325	1	50		35.0	24	0.07	4.9			

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	00940 CHLORIDE CL MG/L	00945 SULFATE SO4-TOT MG/L	00951 FLUORIDE F,TOTAL MG/L	00956 SILICA TOTAL MG/L	01002 ARSENIC AS,TOT UG/L	01007 BARIUM BA,TOT UG/L	01012 BERYLIUM BE,TOT UG/L
741020	1815	1	50		54.0	22	0.07	4.8			
741021	1205	1	50		71.0	29	0.07	4.9			
741022	1300	1	50		10.0	13	0.07	5.1			
741023	1345	1	50		6.0	14	0.08	5.3			
741024	1345	1	50		16.0	40	0.07	4.1			
741025	1300	1	50		19.0	46	0.05	5.8			
741026	1345	1	50		29.0	41	0.06	5.0			
741027	1715	1	50		30.0	43	0.05	4.5			
741028	1230	1	50		29.0	50	0.06	5.0			
741029	1330	1	50		26.0	33	0.05	4.6			
741030	0924	1	50		4.0	12	0.07	10.0			
741030	1330	1	50		16.0	21	0.10	5.9			
741031	1300	1	50		17.0	15	0.10	5.3			
741101	1415	1	50		22.0	27	0.10	4.2			
741102	1410	1	50		11.0	17	0.10	5.3			
741103	1700	1	50		21.0	28	0.09	4.6			
741104	1215	1	50		9.0	17	0.09	3.5			
741105	1345	1	50		26.0	19	0.09	4.7			
741106	1330	1	50		38.0	31	0.09	4.7			
741106	1400	1	50		39.0	25	0.10	5.0			
741106	1425	1	50		38.0	27	0.10	4.8			
741107	1330	1	50		15.0	17	0.08	4.7			
741108	1215	1	50		9.0	17	0.08	5.1			
741109	1410	1	50		10.0	19	0.08	4.7			
741110	1545	1	50		7.0	15	0.11	5.0			
741111	1315	1	50		6.0	17	0.08	4.7			
741112	1315	1	50		20.0	38	0.10	4.7			
741113	1215	1	50		9.0	18	0.08	5.0			
741114	1330	1	50		18.0	19	0.09	5.0			
741115	1215	1	50		12.0	19	0.08	6.4			
741116	0915	1	50		10.0	18	0.09	5.7			
741116	1315	1	50		9.0	19	0.08	5.5	300		
741116	1630	1	50		8.0	17	0.08	5.5			
741117	1015	1	50		15.0	22	0.09	5.7			
741117	1410	1	50		13.0	19	0.08	5.8			
741117	1755	1	50		12.0	18	0.09	5.3			
741118	0710	1	50		30.0	22	0.10	5.0			
741118	1205	1	50		40.0	31	0.09	5.0			
741118	1615	1	50		48.0	37	0.10	5.3			
741119	0720	1	50		16.0	26	0.08	7.8			
741119	1205	1	50		10.0	19	0.09	5.2			
741119	1610	1	50		10.0	19	0.09	7.8			
741120	0720	1	50		17.0	28	0.08	6.9			
741120	1210	1	50		17.0	23	0.09	5.9			
741120	1620	1	50		18.0	30	0.09	6.7			
741121	0720	1	50		32.0	25	0.08	8.3			
741121	1230	1	50		53.0	23	0.08	7.0			
741121	1600	1	50		56.0	25	0.08	7.6			
741122	0800	1	50		20.0	18	0.08	6.2			

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DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	00940 CHLORIDE CL MG/L	00945 SULFATE SO4-TOT MG/L	00951 FLUORIDE F,TOTAL MG/L	00956 SILICA TOTAL MG/L	01002 ARSENIC AS,TOT UG/L	01007 BARIUM BA,TOT UG/L	01012 BERYLLIUM BE,TOT UG/L
741122	1210	1	50		11.0	17	0.08	6.0			
741122	1615	1	50		16.0	13	0.03	5.8			
741123	0820	1	50		24.0	16	0.07	7.0			
741123	1335	1	50		13.0	17	0.08	7.0			
741123	1620	1	50		11.0	16	0.08	6.8			
741124	1005	1	50		6.0	15	0.08	7.0			
741124	1325	1	50		7.0	15	0.08	6.3			
741124	1720	1	50		6.0	13	0.08	6.7			
741125	0720	1	50		8.0	15	0.09	6.0			
741125	1210	1	50		8.0	15	0.08	6.3			
741125	1615	1	50		10.0	13	0.08	6.8			
741126	0725	1	50		6.0	18	0.08	5.7			
741126	1215	1	50		6.0	17	0.08	5.4			
741126	1610	1	50		5.0	18	0.08	5.6			
741127	0720	1	50		8.0	21	0.03	5.7			
741127	1205	1	50		6.5	17	0.08	5.3			
741127	1610	1	50		6.0	16	0.08	5.4			
741128	1015				9.0	32	0.08	5.3			
741128	1315				9.0	21	0.08	5.9			
741128	1645				8.0	18	0.08	5.8			
741129	0805				20.0	30	0.08	5.8			
741129	1145				16.0	15	0.09	5.7			
741129	1620				10.0	38	0.08	5.7			
741130	0745				8.0	15	0.08	5.6			
741130	1215				10.0	24	0.03	5.6			
741130	1545				16.0	24	0.08	5.5			
740128											
NUMBER		107			123	123	123	123	6	7	7
MAXIMUM		1			71.0	52	0.12	10.0	300	200	10K
MINIMUM		1			2.0	11	0.05	1.5	5K	100K	10K
SUM		107			2111.0	2841	10.18	682.4	335	800	70
SUM SQ.		107			54829.0	75565	0.86	3920.9	90135	100000	700
MEAN		1			17.2	23	0.08	5.5	54	114	10
VARIANCE		0			152.4	82	0.00	1.1	14564	1429	0
STD.DEV.		0			12.3	9	0.01	1.1	120	38	0
STD.ERR.		0			1.1	1	0.00	0.1	49	14	0
COEF VAR		0			71.9	39	14.54	19.0	222	33	0
LOG MEAN		1			14.0	22	0.08	5.4	10	110	10
741130											

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	01022 BORON B,TOT UG/L	01027 CADMIUM CD,TOT UG/L	01034 CHROMIUM CR,TOT UG/L	01042 COPPER CU,TOT UG/L	01045 IRON FE,TOT UG/L	01051 LEAD PB,TOT UG/L	01055 MANGNESE MN UG/L
740128	1450	1	50	24	100K	1	5K	70	1900	10	700
740410	1000	1	50						930		120
740508	1455	1	50						160		30
740508	1530	1	50						330		70
740612	1240	1	50						150		30
740612	1300	1	50						160		40
740710	1355	1	50		100K	1K	5K	10K	320	10K	40
740710	1415	1	50		100K	1K	5K	10K	370	10K	40
740807	1415	1	50			1K	5K	10K	510	14	80
740807	1440	1	50			1K	5K	10	520	32	80
740911	1620	1	50						210		50
740911	1621	1	50						150		60
740916	0720	1	50			3		10K	170	10K	40
740917	0725	1	50			2		10K	380	23	100
740918	1335					1K		20	190	13	80
740919	1310	1	50			1K		10K	150	14	80
740920	1345					1		10K	150	20	50
740921	1610					2		10K	130	13	40
740922	1615					1K		90	450	11	70
740923	1340					3		10K	170	12	30
740924	1340					1K		10K	230	10K	30
740925	1335	1	50			1		10	350	10	230
740926	1345					1		10K	270	11	50
740927	1320	1	50			2		30	220	10	40
740928	1635	1	50			5		30	240	10	70
740929	1320	1	50			1K		10K	180	10K	40
740930	1345	1	50			1K		10K	110	11	50
741001	1340	1	50			2		10K	200	10K	50
741002	1340	1	50			9		10K	310	10K	60
741003	1340	1	50			1		10K	240	12	50
741004	1235	1	50			2		10K	190	12	60
741005	1545	1	50			1		10K	210	10	40
741006	1815	1	50			1K		10K	120	10	60
741007	1330	1	50			1K		10K	50	14	20
741008	1330	1	50			1K		380	140	10K	70
741009	1245	1	50			2		40	250	10K	60
741010	1335	1	50			2		10K	150	10K	30
741011	1330	1	50			2		50	120	10K	140
741012	1615	1	50			1K		10	150	10K	40
741013	1635	1	50			3		20	210	10K	30
741014	1330	1	50			1K		20	70	10K	50
741015	1335	1	50			1		20	70	10K	230
741016	1340	1	50			2		30	170	10K	30
741016	1515	1	50		100K	1K	5K	20	300	10K	60
741016	1540	1	50		100K	1K	5K	20	310	10K	60
741017	1350	1	50			3		10K	430	10K	60
741018	1330	1	50			2		30	260	10K	60
741019	1325	1	50			5		10	120	10K	40

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DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	01022 BORON B,TOT UG/L	01027 CADMIUM CD,TOT UG/L	01034 CHROMIUM CR,TOT UG/L	01042 COPPER CU,TOT UG/L	01045 IRON FE,TOT UG/L	01051 LEAD PB,TOT UG/L	01055 MANGANESE MN UG/L
741020	1815	1	50			2		10K	160	10K	40
741021	1205	1	50			2		20	180	10K	70
741022	1300	1	50			2		10K	190	10K	40
741023	1345	1	50			2		50	190	10K	30
741024	1345	1	50			1		700	50	10K	70
741025	1300	1	50			4		10K	1000	10K	50
741026	1345	1	50			2		10	1000	10K	50
741027	1715	1	50			3		10K	150	10K	60
741028	1230	1	50			7		10	170	10K	170
741029	1330	1	50			2		10K	280	10K	100
741030	0924	1	50			2		10K	970	10K	40
741030	1330	1	50			1K		10K	330	10K	70
741031	1300	1	50			1		10K	220	10K	60
741101	1415	1	50			1		10K	170	10K	60
741102	1410	1	50			1K		10	220	10K	70
741103	1700	1	50			2		70	300	10K	2900
741104	1215	1	50			2		10K	50K	10K	30
741105	1345	1	50			1		20	110	10K	320
741106	1330	1	50			4		20	200	10K	160
741106	1400	1	50					10K	160		170
741106	1425	1	50					10K	120		120
741107	1330	1	50			2		10	220	10K	120
741108	1215	1	50			1K		10K	220	10K	120
741109	1410	1	50			3		10K	300	10K	120
741110	1545	1	50			12		10K	150	10K	110
741111	1315	1	50			2		10K	140	10K	70
741112	1315	1	50			2		10K	130	10K	80
741113	1215	1	50			1K		10K	440	10K	240
741114	1330	1	50			2		10K	80	10K	40
741115	1215	1	50			3		10	150	10K	50
741116	0915	1	50			1		10K	370	10K	200
741116	1315	1	50			1		10K	230	10K	90
741116	1630	1	50			1K		10K	210	10K	70
741117	1015	1	50			1K		10K	60	10K	40
741117	1410	1	50			4		10K	30	10K	30
741117	1755	1	50			2		10K	50	10K	30
741118	0710	1	50			1K		10	60	10K	20
741118	1205	1	50			4		20	90	10K	20
741118	1615	1	50			5		10K	100	10K	20
741119	0720	1	50			1K		10K	720	10K	430
741119	1205	1	50			6		10K	430	10K	120
741119	1610	1	50			2		20	130	10K	80
741120	0720	1	50			1K		10K	300	10K	100
741120	1210	1	50			2		10	330	10K	60
741120	1620	1	50			1K		10K	400	10K	70
741121	0720	1	50			1K		10	3500	10K	410
741121	1230	1	50			1K		10K	2500	10K	300
741121	1600	1	50			1K		10	2200	10K	270
741122	0800	1	50			1		20	2300	10K	430

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	01022 BORON B,TOT UG/L	01027 CADMIUM CD,TOT UG/L	01034 CHROMIUM CR,TOT UG/L	01042 COPPER CU,TOT UG/L	01045 IRON FE,TOT UG/L	01051 LEAD PB,TOT UG/L	01055 MANGNESE MN UG/L
741122	1210	1	50			1K		20	2200	10K	420
741122	1615	1	50			1K		20	1800	10K	280
741123	0820	1	50			1K		10K	1600	10K	120
741123	1335	1	50			4		20	830	10K	120
741123	1620	1	50			1K		20	960	10K	180
741124	1005	1	50			1K		10K	590	10K	100
741124	1325	1	50			2		20	500	10K	80
741124	1720	1	50			1K		20	420	10K	100
741125	0720	1	50			1K		20	550	10K	100
741125	1210	1	50			2		20	450	10K	90
741125	1615	1	50			1K		10K	[illegible]	10K	50
741126	0725	1	50			1K		20	570	10K	130
741126	1215	1	50			1K		10K	710	10K	140
741126	1610	1	50			1K		10	490	10K	100
741127	0720	1	50			1		110	540	10K	120
741127	1205	1	50			1K		20	470	10K	100
741127	1610	1	50			1K		10	390	10K	80
741128	1015					1		10	[illegible]	10K	70
741128	1315					2		10K	270	10K	60
741128	1645					1K		60	[illegible]	10K	60
741129	0805					3		40	210	10K	40
741129	1145					1K		10	200	10K	60
741129	1620					1K		20	240	10K	60
741130	0745					1K		10K	220	10K	50
741130	1215					1K		10K	250	10K	40
741130	1545					1K		10	250	10K	80
740128											
NUMBER		107			5	114	7	116	123	114	123
MAXIMUM		1			100K	12	5K	700	3500	32	2900
MINIMUM		1			100K	1K	5K	10K	50K	10K	20
SUM		107			500	216	35	3060	52540	1217	15020
SUM SQ.		107			50000	718	175	702400	[illegible]	[illegible]	[illegible]
MEAN		1			100	2	5	26	[illegible]	11	[illegible]
VARIANCE		0			0	3	0	5405	[illegible]	8	73933
STD.DEV.		0			0	2	0	74	549	3	272
STD.ERR.		0			0	0	0	7	50	0	25
COEF VAR		0			0	87	0	279	133	27	223
LOG MEAN		1			100	2	5	15	274	10	76
741130											

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	01067 NICKEL NI,TOTAL UG/L	01077 SILVER AG,TOT UG/L	01092 ZINC ZN,TOT UG/L	01105 ALUMINUM AL,TOT UG/L	01132 LITHIUM LI,TOT UG/L	01147 SELENIUM SE,TOT UG/L
740128	1450	1	50	24	50K	10K	180	3000		3
740710	1355	1	50		50K	10K	40	500	10K	2K
740710	1415	1	50		50K	10K	30	500	10K	2K
740807	1415	1	50		50K	10K	30	1000	10K	
740807	1440	1	50		50K	10K	30	1100	10K	
740916	0720	1	50				10	800		
740917	0725	1	50				20	1200		
740918	1335						20	300		
740919	1310	1	50				20	200		
740920	1345						30	200K		
740921	1610						20	400		
740922	1615						20	800		
740923	1340						10K	400		
740924	1340						40	500		
740925	1335	1	50				60	1700		
740926	1345						10K	600		
740927	1320	1	50				10	400		
740928	1635	1	50				10	300		
740929	1320	1	50				10K	200		
740930	1345	1	50				10K	400		
741001	1340	1	50				10K	500		
741002	1340	1	50				10K	800		
741003	1340	1	50				10K	300		
741004	1235	1	50				10	600		
741005	1545	1	50				10K	600		
741006	1815	1	50				40	600		
741007	1330	1	50				40	500		
741008	1330	1	50				40	600		
741009	1245	1	50				30	800		
741010	1335	1	50				20	500		
741011	1330	1	50				20	300		
741012	1515	1	50				10K	300		
741013	1635	1	50				10K	800		
741014	1330	1	50				10K	500		
741015	1335	1	50				30	600		
741016	1240	1	50				10K	1500		
741016	1515	1	50		50K	10K	10K	1100	10K	2K
741016	1540	1	50		50K	10K	10K	1500	10K	10
741017	1350	1	50				30	720		
741018	1330	1	50				30	1400		
741019	1325	1	50				20	1000		
741020	1815	1	50				20	200		
741021	1205	1	50				30	300		
741022	1300	1	50				20	500		
741023	1345	1	50				50	500		
741024	1345	1	50				30	100K		
741025	1300	1	50				20	500		
741026	1345	1	50				20	400		

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 1.8.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	01067 NICKEL NI,TOTAL UG/L	01077 SILVER AG,TOT UG/L	01092 ZINC ZN,TOT UG/L	01105 ALUMINUM AL,TOT UG/L	01132 LITHIUM LI,TOT UG/L	01147 SELENIUM SE,TOT UG/L
741027	1715	1	50				20	200		
741028	1230	1	50				30	300		
741029	1330	1	50				20	500		
741030	0924	1	50				70	700		
741030	1330	1	50				20	300		
741031	1350	1	50				10K	100		
741101	1415	1	50				10	200		
741102	1410	1	50				20	100		
741103	1700	1	50				40	100K		
741104	1215	1	50				10K	100K		
741105	1345	1	50				30	100K		
741106	1330	1	50				30	200		
741106	1400	1	50				30			
741106	1425	1	50				40			
741107	1330	1	50				20	400		
741108	1215	1	50				20	300		
741109	1410	1	50				30	500		
741110	1545	1	50				20	300		
741111	1315	1	50				20	300		
741112	1315	1	50				20	300		
741113	1215	1	50				40	500		
741114	1330	1	50				10	100K		
741115	1215	1	50				20	200		
741116	0915	1	50				30	500		
741116	1315	1	50				20			
741116	1630	1	50				10	200		
741117	1015	1	50				10K	100K		
741117	1410	1	50				20	100		
741117	1755	1	50				10	100K		
741118	0710	1	50				10K	100		
741118	1205	1	50				20	100		
741118	1615	1	50				20	100K		
741119	0720	1	50				90	1000		
741119	1205	1	50				40	700		
741119	1610	1	50				20	200		
741120	0720	1	50				40	600		
741120	1210	1	50				40	400		
741120	1620	1	50				20	400		
741121	0720	1	50				70	3900		
741121	1230	1	50				50	2600		
741121	1600	1	50				60	2100		
741122	0800	1	50				90	1400		
741122	1210	1	50				80	1200		
741122	1615	1	50				80	800		
741123	0820	1	50				30	1600		
741123	1335	1	50				30	500		
741123	1620	1	50				50	1700		
741124	1005	1	50				40	1100		
741124	1325	1	50				30	700		

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	01067 NICKEL NI,TOTAL UG/L	01077 SILVER AG,TOT UG/L	01092 ZINC ZN,TOT UG/L	01105 ALUMINUM AL,TOT UG/L	01132 LITHIUM LI,TOT UG/L	01147 SELENIUM SE,TOT UG/L
741124	1720	1	50				30	600		
741125	0720	1	50				40	1000		
741125	1210	1	50				40	700		
741125	1615	1	50				20	400		
741126	0725	1	50				40	800		
741126	1215	1	50				50	1300		
741126	1610	1	50				30	700		
741127	0720	1	50				50	800		
741127	1205	1	50				50	700		
741127	1610	1	50				40	700		
741128	1015						40	700		
741128	1315						30	400		
741128	1645						10K	300		
741129	0605						40	400		
741129	1145						40	500		
741129	1620						40	400		
741130	0745						30	200		
741130	1215						20	400		
741130	1545						40	500		
740128										
NUMBER		107			7	7	116	113	6	5
MAXIMUM		1			50K	10K	180	3900	10K	10
MINIMUM		1			50K	10K	10K	100K	10K	2K
SUM		107			350	70	3470	72000	60	1[illegible]
SUM SQ.		107			17500	700	160700	84820000	600	121
MEAN		1			50	10	30	637	10	4
VARIANCE		0			0	0	495	347714	0	12
STD.DEV.		0			0	0	22	590	0	3
STD.ERR.		0			0	0	2	55	0	2
COEF VAR		0			0	0	74	93	0	92
LOG MEAN		1			50	10	24	459	10	3
741130										

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 116.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	01152 TITANIUM TI,TOT UG/L	70300 RESIDUE DISS-180 C MG/L	71900 MERCURY HG,TOTAL UG/L	00310 BOD 5 DAY MG/L	31501 TOT COLI MFIMENDO /100ML	31616 FEC COLI MFM-FCBR /100ML
740128	1450	1	50	24		120	0.7	1.0K	90	10
740410	1000	1	50			110				
740508	1455	1	50			140				
740508	1530	1	50			140				
740612	1240	1	50			120				
740612	1300	1	50			120				
740710	1355	1	50		1000K	120		1.6	40	10
740710	1415	1	50		1000K	100		1.5	20	10K
740807	1415	1	50		1000K	120		2.7	270	150
740807	1440	1	50		1000K	130		2.9	1440	240
740911	1520	1	50			180		1.2	60	10
740911	1521	1	50			180		1.1	105	10K
740916	0720	1	50			120	0.2K			
740917	0725	1	50			220	0.2K			
740918	1335						0.2K			
740919	1310	1	50			120	0.2K			
740920	1345					120	0.2K			
740921	1610					120	0.2K			
740922	1615					150	0.4			
740923	1340					220	0.2K			
740924	1340					100	0.2K			
740925	1325	1	50			140	0.6			
740926	1345					110	0.2K			
740927	1320	1	50			150	0.2K			
740928	1635	1	50			180	0.2K			
740929	1320	1	50			140	0.2K			
740930	1345	1	50			230	0.2K			
741001	1340	1	50			120	0.2K			
741002	1340	1	50			150	0.2K			
741003	1340	1	50			140	0.2K			
741004	1235	1	50			130	0.2K			
741005	1545	1	50			130	0.8			
741006	1315	1	50			210	0.2K			
741007	1330	1	50			120	0.2K			
741008	1330	1	50			150	0.2K			
741009	1245	1	50			130	0.2K			
741010	1335	1	50			130				
741011	1330	1	50			130	0.2K			
741012	1615	1	50			150	0.2K			
741013	1635	1	50			140	0.2K			
741014	1330	1	50			230	0.2K			
741015	1335	1	50			170	0.2K			
741015	1340	1	50			130	0.2K			
741016	1515	1	50		1000K	140		1.8	640	10
741016	1540	1	50		1000K	140		1.4	280	40
741017	1350	1	50			150	1.1			
741018	1330	1	50			160	3.4			
741019	1325	1	50			170	0.2			

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 116.4

DATE TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	01152 TITANIUM TI,TOT UG/L	70300 RESIDUE DISS-180 C MG/L	71900 MERCURY HG,TOTAL UG/L	00310 BOD 5 DAY MG/L	31501 TOT COLI MFIMENDO /100ML	31616 FEC COLI MFM-FCBR /100ML
740128 1450	1	50	24		120	0.7	1.0K	90	10
740410 1000	1	50			110				
740506 1455	1	50			140				
740508 1530	1	50			140				
740612 1240	1	50			120				
740612 1300	1	50			120				
740710 1355	1	50		1000K	120		1.6	40	10
740710 1415	1	50		1000K	100		1.5	20	10K
740807 1415	1	50		1000K	120		2.7	270	100
740807 1440	1	50		1000K	120		2.9	1440	240
740911 1520	1	50			180		1.2	60	10
740911 1521	1	50			180		1.1	105	10K
740916 0720	1	50			120	0.2K			
740917 0725	1	50			220	0.2K			
740918 1335						0.2K			
740919 1310	1	50			120	0.2K			
740920 1345					120	0.2K			
740921 1610					120	0.2K			
740922 1615					150	0.4			
740923 1340					220	0.2K			
740924 1340					100	0.2K			
740925 1335	1	50			140	0.6			
740926 1345					110	0.2K			
740927 1320	1	50			150	0.2K			
740928 1635	1	50			180	0.2K			
740929 1320	1	50			140	0.2K			
740930 1345	1	50			230	0.2K			
741001 1340	1	50			120	0.2K			
741002 1340	1	50			150	0.2K			
741003 1340	1	50			140	0.2K			
741004 1235	1	50			130	0.2K			
741005 1545	1	50			130	0.8			
741006 1315	1	50			210	0.2K			
741007 1330	1	50			120	0.2K			
741008 1330	1	50			150	0.2K			
741009 1245	1	50			130	0.2K			
741010 1335	1	50			130				
741011 1330	1	50			130	0.2K			
741012 1615	1	50			150	0.2K			
741013 1635	1	50			140	0.2K			
741014 1330	1	50			230	0.2K			
741015 1335	1	50			170	0.2K			
741015 1340	1	50			130	0.2K			
741016 1515	1	50		1000K	140		1.8	640	10
741016 1540	1	50		1000K	140		1.4	280	40
741017 1350	1	50			150	1.1			
741018 1330	1	50			160	3.4			
741019 1325	1	50			170	0.2			

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	01152 TITANIUM TI,TOT UG/L	70300 RESIDUE DISS-180 C MG/L	71900 MERCURY HG,TOTAL UG/L	00310 BOD 5 DAY MG/L	31501 TOT COLI MFIMENDO /100ML	31616 FEC COLI MFM-FCBR /100ML
741020	1815	1	50			250	0.2			
741021	1205	1	50			200	5.4			
741022	1300	1	50			130	0.8			
741023	1345	1	50			110	0.2K			
741024	1345	1	50			130	0.2K			
741025	1300	1	50			200	0.2K			
741026	1345	1	50			200	0.2K			
741027	1715	1	50			210	0.2K			
741028	1230	1	50			220	0.2K			
741029	1330	1	50			180	0.3			
741030	0924	1	50			[illegible]	0.2K			
741030	1330	1	50			160	3.6			
741031	1300	1	50			160	0.2K			
741101	1415	1	50			180	0.2K			
741102	1410	1	50			130	0.2K			
741103	1700	1	50			180	0.2K			
741104	1215	1	50			130	0.2K			
741105	1345	1	50			220	0.2K			
741106	1330	1	50			230	0.2K			
741106	1400	1	50			240		3.2	260	30
741106	1425	1	50			240		3.4	200	20
741107	1330	1	50			140	0.2			
741108	1215	1	50			130	0.2K			
741109	1410	1	50			140	0.2K			
741110	1545	1	50			120	0.2K			
741111	1315	1	50			130	0.2K			
741112	1315	1	50			190	0.2K			
741113	1215	1	50			130	0.2			
741114	1330	1	50			150	0.2K			
741115	1215	1	50			140	0.2K			
741116	0915	1	50			140	0.2K			
741116	1315	1	50			130	0.2K			
741116	1630	1	50			130	0.2			
741117	1015	1	50			160	0.2K			
741117	1410	1	50			140	0.2K			
741117	1755	1	50			140	3.2			
741118	0710	1	50			180	0.2K			
741118	1205	1	50			230	0.2K			
741118	1615	1	50			250	0.2K			
741119	0720	1	50			150	0.2K			
741119	1205	1	50			120	0.2K			
741119	1610	1	50			120	0.2K			
741120	0720	1	50			60	0.2K			
741120	1210	1	50			150	0.2K			
741120	1620	1	50			170	0.2K			
741121	0720	1	50			200	0.2K			
741121	1230	1	50			230	2.7			
741121	1600	1	50			240	0.2K			
741122	0800	1	50			150				

STATION - 475070 BRIDGE AT SURGOINSVILLE HOLSTON RIVER 118.4

DATE	TIME	00003 DEPTH FEET	00002 HSAMPLOC % FROM RT BANK	00008 LAB IDENT. NUMBER	01152 TITANIUM TI,TOT UG/L	70300 RESIDUE DISS-180 C MG/L	71900 MERCURY HG,TOTAL UG/L	00310 BOD 5 DAY MG/L	31501 TOT COLI MFIMENDO /100ML	31616 FEC COLI MFM-FCBR /100ML
741122	1210	1	50			130	0.2K			
741122	1615	1	50			130	0.2K			
741123	0820	1	50			160	0.2K			
741123	1335	1	50			140	0.2K			
741123	1620	1	50			130	0.2K			
741124	1005	1	50			100	0.2K			
741124	1325	1	50			170	0.2K			
741124	1720	1	50			120	0.2K			
741125	0720	1	50			120	0.2K			
741125	1210	1	50			120	0.2K			
741125	1615	1	50			120	0.2K			
741126	0725	1	50			120	0.2K			
741126	1215	1	50			110	0.2K			
741126	1610	1	50			110	0.2K			
741127	0720	1	50			120	0.2K			
741127	1205	1	50			110	0.2K			
741127	1610	1	50			110	0.2K			
741128	1015					110	0.2K			
741128	1315					110	0.3			
741128	1645					110	15.0			
741129	0805					150	0.4			
741129	1145					160	0.2K			
741129	1620					130	0.2K			
741130	0745					120	0.2K			
741130	1215					120	0.2K			
741130	1545					150	10.0			

740128										
NUMBER		107			0	122	105	11	11	11
MAXIMUM		1			1000K	290	15.0	3.4	1440	240
MINIMUM		1			1000K	60	0.2K	1.0K	30	10K
SUM		107			6000	18360	67.2	21.3	3405	490
SUM SQ.		107			6000000	2975600	404.2	51.2	2766525	71100
MEAN		1			1000	150	0.6	2.0	310	[illegible]
VARIANCE		0			0	1757	3.4	0.8	171232	4927
STD.DEV.		0			0	42	1.9	0.9	414	70
STD.ERR.		0			0	4	0.2	0.3	125	21
COEF VAR		0			0	28	292.7	45.0	134	153
LOG MEAN		1			1000	145	0.3	1.8	159	22
741130										

APPENDIX C

RF-1; CROSS TABULATIONS; CROSS BREAKDOWNS OF AGGRESSIVE INDEX

RPI - copy 2

Crosstabs

```
OPERATING SYSTEM =  NOS 2.0-562/552 AK    82/10/10. PRINTED = 82/11/04. 20.04.58.

AM2I          JSN =  AGEJ      FAMILY         = KRONOS        JOB ORIGIN     = BATCH.
CREATING JSN  =  AGBM      USER NUMBER    = DUB2027       SERVICE CLASS  = BATCH.

BBBBBBBBBBBB   PPPPPPPPPPP    LL
BBBBBBBBBBBBB  PPPPPPPPPPPP   LL
BB         BB  PP        PP   LL
BB         BB  PP        PP   LL
BB         BB  PP        PP   LL
BB         BB  PP        PP   LL
BB         BB  PPPPPPPPPPPP   LL
BBBBBBBBBBBBB  PPPPPPPPPPP    LL
BBBBBBBBBBBB   PP             LL
BB         BB  PP             LL
BB         BB  PP             LL
BB         BB  PP             LL
BB         BB  PP             LL
BB         BB  PP             LL          LL
BBBBBBBBBBBBB  PP             LLLLLLLLLLLL
BBBBBBBBBBBB   PP             LLLLLLLLLLLL

******************** NEWS AS OF 82/11/01. 15.37 ********************
*                                                                  *
*      ***** DALHOUSIE UNIVERSITY COMPUTER USERS' GROUP *****      *
*      ------------------------------------------------------      *
*  DUCUG IS HOLDING A GENERAL MEETING ON TUESDAY, NOVEMBER 9, AT   *
*  2:30 P.M. IN ROOM 312 OF THE SCHOOL OF BUSINESS BUILDING        *
*  (ART COLLEGE) TO DISCUSS THE STATUS OF DALHOUSIE'S COMPUTING    *
*  RESOURCES WITH SENIOR ADMINISTRATION OFFICIALS.  EVERYONE WHO   *
*  USES OR IS AFFECTED BY COMPUTING AT DAL IS INVITED TO ATTEND.   *
*  FOR FURTHER INFORMATION, RUN "BGN,DUCUG/LIB".                   *
*                                                                  *
*                      +++++++++++++++++++                         *
*                      + REMEMBRANCE DAY +                         *
*                      +++++++++++++++++++                         *
*                                                                  *
* ON REMEMBRANCE DAY, NOVEMBER 11, THE COMPUTER CENTRE OPERATIONS  *
* AREA, INCLUDING TERMINAL ROOMS B504 AND B507, WILL BE OPEN FROM  *
* 9 AM TO 5 PM.  UNATTENDED IAF/RBF WILL BE AVAILABLE OUTSIDE OF   *
* THESE HOURS.  THE MAIN COMPUTER CENTRE OFFICES WILL BE CLOSED.   *
*                                                                  *
********************************************************************
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COMPUTER CENTRE                                                        82/11/04.    17.52.21.    PAGE    1
DALHOUSIE UNIVERSITY

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- APRIL 1981


RUN NAME       RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)
GET FILE       RUFUS

          FILE RUFUS    HAS  15 VARIABLES

          THE SUBFILES ARE..

                      N OF
          NAME        CASES

          E11          1609
          E13          1939
          E29          2022
          E32          2078
          E34          1859
          E41          2034
          E38          1672
          E36          1938
          E50          1624
          E51          1612
          E52          1830
          E53          1666
          E54          1779
          E55          1851

          TOTAL       25513


COMPUTE        WT=SEC*10
WEIGHT         WT

RUN SUBFILES   (E11,E13),(E29,E32),(E34,E41),(E36,E38)
               (E50,E51),(E52,E53),(E54,E55)

TASK NAME      ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
CROSSTABS      VARIABLES=ALPHA(1,99),HR(1,9)/TABLES=ALPHA BY HR
OPTIONS        3,5,7
STATISTICS     1
   00056100 CM NEEDED FOR CROSSTABS
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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS          82/11/04.    17.52.21.     PAGE    2

          OPTION - 1
          IGNORE MISSING VALUE INDICATORS
          (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

          OPTION - 3
          DELETE ROW PERCENTAGES

          OPTION - 5
          DELETE TOTAL PERCENTAGES
```

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 3
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 3

ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
BI	2	0 0	20 .1	0 0	0 0	10 .1	10 .1	0 0	10 .0	0 0	50 .0
NP	3	20 .1	30 .1	0 0	0 0	90 .5	30 .2	50 .2	60 .3	20 .1	300 .2
CH	4	0 0	230 1.1	40 .2	10 .1	170 .9	100 .5	20 .1	20 .1	0 0	590 .3
BU	5	20 .1	0 0	40 .2	120 .7	50 .3	90 .5	20 .1	60 .3	30 .1	430 .2
HH	7	330 1.6	200 1.0	590 2.7	380 2.1	120 .7	240 1.3	930 4.3	860 4.2	500 2.1	4150 2.2
TH	8	270 1.3	300 1.4	350 1.6	240 1.3	50 .3	180 1.0	310 1.4	350 1.7	470 2.0	2520 1.4
FD	9	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .1	20 .0
ND	10	0 0	60 .3	40 .2	60 .3	0 0	20 .1	60 .3	110 .5	30 .1	380 .2
TB	11	0 0	60 .3	40 .2	0 0	0 0	90 .5	350 1.6	250 1.2	0 0	790 .4
CI	12	50 .2	130 .6	30 .1	0 0	0 0	70 .4	20 .1	230 1.1	60 .2	590 .3
HW	13	0 0	0 0	0 0	0 0	0 0	10 .1	0 0	0 0	0 0	10 .0
M3	14	20 .1	70 .3	0 0	0 0	0 0	80 .4	0 0	30 .1	20 .1	220 .1
M2	15	110 .5	330 1.6	190 .9	170 .9	130 .7	40 .2	330 1.5	120 .6	80 .3	1500 .8
M1	16	140 .7	150 .7	180 .8	200 1.1	30 .2	120 .7	150 .7	100 .5	170 .7	1240 .7
AP	17	210 1.0	510 2.5	430 2.0	690 3.8	850 4.6	490 2.7	250 1.2	130 .6	430 1.8	3990 2.2
LD	18	470 2.2	130 .6	560 2.5	710 3.9	240 1.3	100 .5	400 1.9	620 3.1	820 3.4	4050 2.2
	COLUMN TOTAL	21130 11.4	20780 11.2	22020 11.9	18380 9.9	18360 9.9	18270 9.9	21520 11.6	20300 11.0	24020 13.0	184780 100.0

(CONTINUED)

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 4
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 3

ALPHA	COUNT COL PCT	HR 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
DE	19	20 .1	20 .1	60 .3	20 .1	60 .3	20 .1	10 .0	20 .1	20 .1	250 .1
HS	20	40 .2	50 .2	0 0	0 0	120 .7	200 1.1	30 .1	30 .1	0 0	470 .3
IG	21	20 .1	0 0	20 .1	0 0	70 .4	30 .2	30 .1	30 .1	0 0	200 .1
SP	22	0 0	0 0	0 0	20 .1	0 0	10 .1	0 0	0 0	0 0	30 .0
DG	23	0 0	20 .1	0 0	0 0	30 .2	60 .3	0 0	20 .1	0 0	130 .1
SS	24	20 .1	190 .9	20 .1	0 0	120 .7	0 0	30 .1	280 1.4	0 0	660 .4
CB	25	190 .9	510 2.5	140 .6	350 1.9	170 .9	290 1.6	260 1.2	180 .9	780 3.2	2870 1.6
HO	26	3410 16.1	530 2.6	1210 5.5	990 5.4	1700 9.3	1000 5.5	1540 7.2	1530 7.5	1100 4.6	13010 7.0
R4	27	0 0	30 .1	2030 9.2	0 0	450 2.5	270 1.5	670 3.1	0 0	0 0	3450 1.9
R3	28	5010 23.7	4030 19.4	5210 23.7	4770 26.0	2580 14.1	3430 18.8	5250 24.4	4730 23.3	3810 15.9	38820 21.0
TU	29	160 .8	570 2.7	360 1.6	320 1.7	320 1.7	250 1.4	220 1.0	70 .3	210 .9	2480 1.3
ST	30	0 0	20 .1	40 .2	50 .3	30 .2	10 .1	20 .1	30 .1	0 0	200 .1
EX	31	40 .2	0 0	0 0	0 0	50 .3	20 .1	40 .2	0 0	170 .7	320 .2
CR	32	3560 16.8	5910 28.4	3740 17.0	4020 21.9	8030 43.7	6020 33.0	2790 13.3	3690 18.2	3420 14.2	41180 22.3
BA	33	40 .2	40 .2	60 .3	40 .2	20 .1	20 .1	20 .1	10 .0	40 .2	290 .2
SC	34	0 0	0 0	0 0	0 0	70 .4	0 0	0 0	0 0	0 0	70 .0
	COLUMN TOTAL	21130 11.4	20780 11.2	22020 11.9	18380 9.9	18360 9.9	18270 9.9	21520 11.6	20300 11.0	24020 13.0	184780 100.0

(CONTINUED)

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                 82/11/04.     17.52.21.      PAGE    5
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE    RUFUS      (CREATION DATE =  82/11/04.)
SUBFILE    E11              E13

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N   O F * * * * * * * * * * * * * * * * * * * *
      ALPHA        ALPHA FISH BEHAVIOUR CODES                  BY   HR          EXP, TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * PAGE  3 OF  3
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ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
CD	35	60 .3	20 .1	10 .0	0 0	0 0	10 .1	0 0	0 0	70 .3	170 .1
R2	37	1300 6.2	860 4.1	540 2.5	1020 5.5	450 2.5	340 1.9	2130 9.9	2540 12.5	1330 5.5	10510 5.7
R1	38	50 .2	360 1.7	140 .6	1950 10.6	280 1.5	1050 5.7	580 2.7	540 2.7	420 1.7	5370 2.9
SA	39	0 0	20 .1	0 0	0 0	10 .1	0 0	0 0	0 0	0 0	30 .0
BT	40	30 .1	0 0	20 .1	40 .2	60 .3	60 .3	0 0	0 0	0 0	210 .1
HA	42	10 .0	90 .4	0 0	0 0	10 .1	10 .1	0 0	20 .1	0 0	140 .1
RV	43	450 2.1	340 1.6	190 .9	540 2.9	440 2.4	500 2.7	290 1.3	290 1.4	610 2.5	3650 2.0
RO	44	120 .6	80 .4	280 1.3	90 .5	90 .5	230 1.3	180 .8	340 1.7	510 2.1	1920 1.0
BQ	45	0 0	0 0	0 0	20 .1	0 0	0 0	0 0	0 0	0 0	20 .0
QI	46	20 .1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .1	40 .0
RS	47	100 .5	40 .2	0 0	250 1.4	0 0	0 0	0 0	200 1.0	770 3.2	1360 .7
AV	48	30 .1	20 .1	0 0	90 .5	90 .5	0 0	40 .2	80 .4	390 1.6	740 .4
DA	49	10 .0	10 .0	10 .0	20 .1	10 .1	20 .1	10 .0	20 .1	0 0	110 .1
FL	50	0 0	0 0	0 0	0 0	10 .1	0 0	20 .1	0 0	0 0	30 .0
NULL	99	4800 22.7	4800 23.1	5450 24.8	1200 6.5	1350 7.4	2750 15.1	4470 20.8	2700 13.3	7700 32.1	35220 19.1
	COLUMN TOTAL	21130 11.4	20780 11.2	22020 11.9	18360 9.9	18360 9.9	18270 9.9	21520 11.5	20300 11.0	24020 13.0	184780 100.0

RAW CHI SQUARE = 57023.11008 WITH 368 DEGREES OF FREEDOM. SIGNIFICANCE = 0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                    82/11/04.     17.52.21.     PAGE     6
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE     RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E29          E32

* * * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * *
     ALPHA      ALPHA FISH BEHAVIOUR CODES                    BY  HR      EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  3
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ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
BI	2	0 0	0 0	0 0	0 0	30 .1	0 0	10 .0	10 .0	10 .1	60 .0
NP	3	0 0	10 .1	0 0	0 0	90 .4	120 .5	100 .5	30 .1	90 .5	440 .2
CH	4	0 0	20 .1	10 .0	10 .0	100 .5	100 .5	160 .7	120 .5	180 .9	700 .4
BU	5	0 0	0 0	30 .1	150 .6	190 .9	120 .5	140 .6	40 .2	110 .6	780 .4
HH	7	110 .5	160 .8	170 .8	220 .9	300 1.5	140 .6	130 .6	430 2.0	230 1.2	1890 1.0
TH	8	120 .5	100 .5	80 .4	180 .7	130 .6	70 .3	30 .1	150 .7	80 .4	940 .5
FD	9	0 0	0 0	0 0	0 0	30 .1	20 .1	30 .1	0 0	0 0	80 .0
ND	10	50 .2	0 0	10 .0	200 .8	100 .5	30 .1	0 0	0 0	60 .3	450 .2
TB	11	80 .4	0 0	40 .2	40 .2	20 .1	80 .4	0 0	80 .4	0 0	340 .2
CI	12	0 0	70 .4	0 0	80 .3	90 .4	80 .4	0 0	70 .3	0 0	390 .2
HW	13	0 0	20 .1	0 0	0 0	20 .1	0 0	0 0	10 .0	0 0	50 .0
M3	14	0 0	0 0	0 0	0 0	30 .1	30 .1	0 0	0 0	0 0	60 .0
M2	15	20 .1	0 0	20 .1	0 0	180 .9	220 1.0	40 .2	20 .1	130 .7	630 .3
M1	16	90 .4	30 .2	40 .2	70 .3	270 1.3	240 1.1	140 .5	150 .7	190 1.0	1220 .6
AP	17	740 3.3	300 1.5	210 1.0	320 1.3	650 3.2	780 3.6	630 2.8	500 2.3	1020 5.2	5150 2.7
LD	18	210 .9	40 .2	300 1.5	210 .8	710 3.5	1130 5.2	470 2.1	640 2.9	700 3.5	4410 2.3
	COLUMN TOTAL	22280 11.5	19790 10.2	20360 10.5	25490 13.1	20570 10.6	21340 11.2	22200 11.4	21960 11.3	19740 10.2	194230 100.0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                    82/11/04.    17.52.21.    PAGE    7
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE   E29              E32

* * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * *
     ALPHA      ALPHA FISH BEHAVIOUR CODES                    BY   HR         EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  2 OF  3
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ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
DE	19	130 .6	20 .1	90 .4	110 .4	30 .1	60 .3	40 .2	70 .3	40 .2	590 .3
HS	20	90 .4	0 0	20 .1	50 .2	0 0	70 .3	120 .5	170 .8	120 .6	640 .3
IG	21	200 .9	100 .5	100 .5	20 .1	170 .8	30 .1	200 .9	20 .1	40 .2	880 .5
SP	22	60 .3	50 .3	40 .2	0 0	80 .4	0 0	100 .5	0 0	0 0	330 .2
DG	23	120 .5	0 0	20 .1	0 0	40 .2	20 .1	50 .2	60 .3	30 .2	340 .2
SS	24	100 .4	50 .3	60 .3	310 1.2	100 .5	60 .3	30 .1	20 .1	40 .2	770 .4
CB	25	370 1.7	270 1.4	60 .3	120 .5	160 .8	260 1.2	920 4.1	430 2.0	310 1.6	2900 1.5
HO	26	740 3.3	850 4.3	700 3.4	830 3.3	990 4.8	890 4.1	1090 4.9	1140 5.2	1210 6.1	8440 4.3
R4	27	1980 8.9	7570 38.3	6210 30.5	4420 17.3	1730 8.4	2860 13.1	3630 16.4	340 1.5	450 2.3	29190 15.0
R3	28	2350 10.5	3000 15.2	5190 25.5	5270 20.7	3700 18.0	3180 14.6	2510 11.3	5950 27.1	5270 26.7	36420 18.8
TU	29	530 2.4	330 1.7	210 1.0	480 1.9	420 2.0	430 2.0	460 2.1	420 1.9	540 2.7	3820 2.0
ST	30	230 1.0	160 .8	140 .7	220 .9	160 .8	180 .8	110 .5	50 .2	30 .2	1280 .7
EX	31	140 .6	0 0	0 0	0 0	140 .7	60 .3	70 .3	20 .1	40 .2	470 .2
CR	32	6300 28.3	1680 8.5	1790 8.8	2230 8.7	4640 22.6	4460 20.4	4010 18.1	3840 17.5	5730 29.0	34680 17.9
BA	33	30 .1	70 .4	40 .2	90 .4	20 .1	50 .2	130 .6	60 .3	20 .1	510 .3
CD	35	0 0	0 0	0 0	10 .0	0 0	0 0	0 0	0 0	0 0	10 .0
	COLUMN TOTAL	22280 11.5	19790 10.2	20360 10.5	25490 13.1	20570 10.6	21840 11.2	22200 11.4	21960 11.3	19740 10.2	194230 100.0

(CONTINUED)

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT)
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS   82/11/04.   17.52.21.   PAGE 8
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * C R O S S T A B U L A T I O N O F * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* * * * * PAGE 3 OF 3

ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	870 3.9	200 1.0	40 .2	570 2.2	1670 8.1	430 2.0	190 .9	740 3.4	220 1.1	4930 2.5
R1	38	190 .9	40 .2	60 .3	20 .1	60 .3	0 0	70 .3	240 1.1	50 .3	730 .4
SA	39	0 0	0 0	0 0	0 0	0 0	0 0	10 .0	0 0	10 .1	20 .0
BT	40	90 .4	0 0	20 .1	100 .4	40 .2	60 .3	60 .3	80 .4	80 .4	530 .3
DD	41	10 .0	20 .1	20 .1	0 0	0 0	0 0	0 0	0 0	0 0	50 .0
HA	42	0 0	10 .1	0 0	0 0	0 0	0 0	0 0	0 0	10 .1	20 .0
RV	43	290 1.3	460 2.3	580 2.8	240 .9	570 2.8	1010 4.6	440 2.0	520 2.4	760 3.9	4870 2.5
RO	44	50 .2	0 0	70 .3	50 .2	80 .4	60 .3	30 .1	120 .5	80 .4	540 .3
BQ	45	0 0	0 0	0 0	0 0	0 0	30 .1	0 0	0 0	20 .1	50 .0
AV	48	560 2.5	200 1.0	90 .4	160 .6	190 .9	170 .8	20 .1	0 0	20 .1	1410 .7
DA	49	0 0	30 .2	0 0	10 .0	40 .2	10 .0	0 0	20 .1	10 .1	120 .1
FL	50	30 .1	30 .2	0 0	0 0	0 0	0 0	0 0	0 0	10 .1	70 .0
NULL	99	5400 24.2	3900 19.7	3900 19.2	8700 34.1	2600 12.6	4300 19.7	6030 27.2	5400 24.6	1800 9.1	42030 21.6
	COLUMN TOTAL	22280 11.5	19790 10.2	20360 10.5	25490 13.1	20570 10.6	21840 11.2	22200 11.4	21960 11.3	19740 10.2	194230 100.0

RAW CHI SQUARE = 52280.64617 WITH 352 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 9
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 4

ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
MF	1	0 / 0	0 / 0	0 / 0	0 / 0	30 / .1	30 / .1	0 / 0	0 / 0	30 / .2	90 / .0
BI	2	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	20 / .1	0 / 0	0 / 0	0 / 0	20 / .0
CH	4	0 / 0	0 / 0	20 / .1	0 / 0	20 / .1	100 / .5	110 / .6	70 / .4	110 / .6	430 / .2
BU	5	0 / 0	30 / .1	0 / 0	0 / 0	20 / .1	20 / .1	80 / .4	90 / .5	20 / .1	260 / .1
M4	6	0 / 0	0 / 0	0 / 0	0 / 0	20 / .1	10 / .0	0 / 0	0 / 0	0 / 0	30 / .0
HH	7	70 / .3	160 / .7	270 / 1.0	330 / 1.6	260 / 1.1	210 / 1.0	600 / 3.2	360 / 1.8	180 / 1.0	2440 / 1.2
TH	8	150 / .6	230 / 1.0	260 / .9	180 / .9	150 / .6	220 / 1.1	240 / 1.3	330 / 1.7	110 / .6	1870 / 1.0
FD	9	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	20 / .1	0 / 0	20 / .0
ND	10	60 / .2	30 / .1	190 / .7	0 / 0	20 / .1	20 / .1	50 / .3	40 / .2	0 / 0	410 / .2
TB	11	0 / 0	170 / .7	10 / .0	20 / .1	90 / .4	0 / 0	0 / 0	0 / 0	40 / .2	330 / .2
CI	12	100 / .4	0 / 0	80 / .3	110 / .5	50 / .2	160 / .8	50 / .3	20 / .1	30 / .2	600 / .3
HW	13	0 / 0	0 / 0	0 / 0	20 / .1	0 / 0	20 / .1	0 / 0	0 / 0	20 / .1	60 / .0
M3	14	0 / 0	40 / .2	0 / 0	0 / 0	100 / .4	70 / .3	0 / 0	30 / .2	20 / .1	260 / .1
M2	15	10 / .0	50 / .2	30 / .1	0 / 0	80 / .3	180 / .9	100 / .5	190 / 1.0	80 / .5	720 / .4
M1	16	60 / .2	90 / .4	20 / .1	90 / .4	110 / .5	240 / 1.2	380 / 2.0	320 / 1.6	130 / .7	1440 / .7
AP	17	320 / 1.3	160 / .7	700 / 2.5	20 / .1	240 / 1.0	270 / 1.3	250 / 1.3	380 / 1.9	120 / .7	2400 / 1.3
	COLUMN TOTAL	24610 / 12.6	22800 / 11.7	27920 / 14.3	20370 / 10.4	23570 / 12.1	20300 / 10.4	18780 / 9.6	19660 / 10.1	17430 / 8.9	195440 / 100.0

(CONTINUED)

ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
*

ALPHA	COUNT / COL PCT (HR)	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
LD	18	210 .9	350 1.5	420 1.5	570 2.8	640 2.7	820 4.0	620 3.3	760 3.9	170 1.0	4560 2.3
DE	19	30 .1	40 .2	40 .1	0 0	20 .1	0 0	20 .1	30 .2	0 0	180 .1
HS	20	30 .1	80 .4	90 .3	50 .2	430 1.8	240 1.2	160 .9	110 .6	110 .6	1300 .7
IG	21	120 .5	0 0	60 .2	120 .6	140 .6	190 .9	150 .8	30 .2	90 .5	900 .5
SP	22	50 .2	0 0	40 .1	40 .2	80 .3	110 .5	60 .3	0 0	0 0	380 .2
DG	23	0 0	20 .1	40 .1	40 .2	160 .7	40 .2	70 .4	100 .5	60 .3	530 .3
SS	24	30 .1	0 0	10 .0	280 1.4	20 .1	100 .5	100 .5	50 .3	230 1.3	820 .4
CB	25	290 1.2	490 2.1	500 1.8	0 0	280 1.2	1110 5.5	900 4.8	200 1.0	400 2.3	4170 2.1
HU	26	1860 7.6	1000 4.4	2230 8.0	1670 8.2	1460 6.2	1380 6.8	2310 12.3	2580 13.1	1460 8.4	15950 8.2
R4	27	0 0	140 .6	1700 6.1	160 .8	30 .1	0 0	0 0	410 2.1	120 .7	2560 1.3
R3	28	5580 22.7	4770 20.9	7450 26.7	6220 30.5	9300 39.5	3940 19.4	2780 14.8	2940 15.0	2610 15.0	45590 23.3
TU	29	230 .9	490 2.1	600 2.1	240 1.2	280 1.2	640 3.2	140 .7	530 2.7	450 2.6	3600 1.8
ST	30	340 1.4	270 1.2	440 1.6	110 .5	190 .8	60 .3	20 .1	20 .1	90 .5	1540 .8
EX	31	100 .4	0 0	20 .1	0 0	90 .4	190 .9	0 0	80 .4	30 .2	510 .3
CR	32	6210 25.2	4180 18.3	5450 19.5	830 4.1	5600 23.8	5070 25.0	6190 33.0	5120 26.0	4870 27.9	43520 22.3
BA	33	80 .3	60 .3	50 .2	40 .2	60 .3	20 .1	80 .4	270 1.4	60 .3	720 .4
	COLUMN TOTAL	24510 12.6	22800 11.7	27920 14.3	20370 10.4	23570 12.1	20300 10.4	18780 9.6	19660 10.1	17430 8.9	195440 100.0

(CONTINUED)

ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 3 OF 4

ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
SC	34	0	0	0	0	20	20	0	20	50	110
		0	0	0	0	.1	.1	0	.1	.3	.1
CD	35	20	60	70	0	10	10	30	10	30	240
		.1	.3	.3	0	.0	.0	.2	.1	.2	.1
R2	37	1160	2270	1870	3800	1300	680	610	450	3940	16080
		4.7	10.0	6.7	18.7	5.5	3.3	3.2	2.3	22.6	8.2
R1	38	2320	1850	210	730	300	710	240	60	20	6440
		9.4	8.1	.8	3.6	1.3	3.5	1.3	.3	.1	3.3
SA	39	0	0	10	0	0	0	0	0	0	10
		0	0	.0	0	0	0	0	0	0	.0
BT	40	30	0	20	0	0	50	40	20	0	160
		.1	0	.1	0	0	.2	.2	.1	0	.1
DD	41	0	10	0	0	0	0	40	0	0	50
		0	.0	0	0	0	0	.2	0	0	.0
HA	42	0	10	0	0	0	10	20	10	40	90
		0	.0	0	0	0	.0	.1	.1	.2	.0
RV	43	140	540	540	720	190	250	140	290	110	2920
		.6	2.4	1.9	3.5	.8	1.2	.7	1.5	.6	1.5
RO	44	90	50	90	280	80	170	20	150	90	1020
		.4	.2	.3	1.4	.3	.8	.1	.8	.5	.5
BQ	45	0	0	30	0	0	0	0	0	0	30
		0	0	.1	0	0	0	0	0	0	.0
QI	46	0	0	0	0	0	20	10	0	0	30
		0	0	0	0	0	.1	.1	0	0	.0
RS	47	0	300	70	460	0	80	0	0	0	910
		0	1.3	.3	2.3	0	.4	0	0	0	.5
AV	48	630	550	490	240	150	60	40	110	10	2280
		2.6	2.4	1.8	1.2	.6	.3	.2	.6	.1	1.2
DA	49	0	10	0	0	0	0	30	10	0	50
		0	.0	0	0	0	0	.2	.1	0	.0
FL	50	40	20	50	0	0	0	0	0	0	110
		.2	.1	.2	0	0	0	0	0	0	.1
	COLUMN TOTAL	24610	22800	27920	20370	23570	20300	18780	19660	17430	195440
		12.6	11.7	14.3	10.4	12.1	10.4	9.6	10.1	8.9	100.0

(CONTINUED)

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 12
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 4 OF 4

ALPHA (COUNT / COL PCT) \ HR	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
99 NULL	4250 17.3	4280 18.8	3750 13.4	3000 14.7	1550 6.6	2760 13.6	2100 11.2	3450 17.5	1500 8.6	26640 13.6
COLUMN TOTAL	24610 12.6	22800 11.7	27920 14.3	20370 10.4	23570 12.1	20300 10.4	18780 9.6	19660 10.1	17430 8.9	195440 100.0

RAW CHI SQUARE = 59370.32234 WITH 384 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CRUSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 13
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E38 E36

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 3

ALPHA	COUNT / COL PCT (HR)	1 HR 1	2 HR 2	4 HR 3	8 HR 4	15 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
BI	2	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .1	20 .0
NP	3	0 0	0 0	0 0	10 .0	0 0	0 0	10 .1	20 .1	10 .0	50 .0
CH	4	0 0	0 0	0 0	0 0	0 0	40 .2	40 .2	40 .2	170 .8	290 .1
BU	5	0 0	0 0	20 .1	20 .1	20 .1	40 .2	20 .1	20 .1	20 .1	160 .1
HH	7	110 .5	60 .3	220 .9	300 1.4	270 1.1	120 .6	140 .7	160 .8	420 2.1	1800 .9
TH	8	40 .2	0 0	160 .7	40 .2	60 .2	110 .6	190 1.0	160 .8	100 .5	860 .4
FD	9	0 0	0 0	0 0	0 0	10 .0	20 .1	0 0	0 0	0 0	30 .0
ND	10	0 0	0 0	0 0	0 0	10 .0	20 .1	0 0	0 0	40 .2	70 .0
TB	11	60 .3	0 0	80 .3	0 0	80 .3	0 0	90 .5	150 .7	190 .9	650 .3
CI	12	0 0	0 0	0 0	50 .2	20 .1	100 .5	50 .3	20 .1	230 1.1	470 .2
HW	13	0 0	0 0	0 0	0 0	0 0	40 .2	20 .1	0 0	0 0	60 .0
M2	15	20 .1	0 0	0 0	0 0	0 0	20 .1	160 .8	150 .7	90 .4	440 .2
M1	16	0 0	10 .0	20 .1	20 .1	70 .3	110 .5	60 .3	130 .6	80 .4	500 .3
AP	17	70 .3	50 .2	60 .2	120 .6	150 .6	430 2.3	380 1.9	360 1.7	490 2.4	2110 1.1
LD	18	160 .7	90 .4	150 .6	250 1.2	550 2.2	470 2.5	440 2.2	310 1.5	390 1.9	2810 1.4
DE	19	80 .3	10 .0	10 .0	0 0	20 .1	20 .1	50 .3	30 .1	40 .2	260 .1
	COLUMN TOTAL	23620 12.2	20250 10.4	24440 12.6	20700 10.7	24980 12.9	18800 9.7	19770 10.2	21210 10.9	20380 10.5	194150 100.0

(CONTINUED)

* * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED

ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	110	0	0	40	70	180	160	80	170	810
		.5	0	0	.2	.3	1.0	.8	.4	.8	.4
IG	21	160	190	250	150	170	120	180	80	60	1360
		.7	.9	1.0	.7	.7	.6	.9	.4	.3	.7
SP	22	60	60	140	80	120	50	80	20	10	620
		.3	.3	.6	.4	.5	.3	.4	.1	.0	.3
DG	23	20	0	0	0	40	40	30	0	40	170
		.1	0	0	0	.2	.2	.2	0	.2	.1
SS	24	100	110	110	150	410	110	310	260	370	1930
		.4	.5	.5	.7	1.6	.6	1.6	1.2	1.8	1.0
CB	25	330	30	60	370	210	630	680	620	330	3260
		1.4	.1	.2	1.8	.8	3.4	3.4	2.9	1.6	1.7
HO	26	620	680	850	920	790	400	680	2330	1560	8830
		2.6	3.4	3.5	4.4	3.2	2.1	3.4	11.0	7.7	4.5
R4	27	6300	6200	4580	5950	2750	620	280	670	0	27350
		26.7	30.6	18.7	28.7	11.0	3.3	1.4	3.2	0	14.1
R3	28	5270	5950	6020	4150	5520	2190	1300	3820	2680	36900
		22.3	29.4	24.6	20.0	22.1	11.6	6.5	18.0	13.2	19.0
TU	29	480	130	60	250	260	290	270	380	370	2790
		2.0	.6	.2	1.2	1.0	1.5	2.9	1.8	1.8	1.4
ST	30	600	290	320	160	100	60	70	40	40	1680
		2.5	1.4	1.3	.8	.4	.3	.4	.2	.2	.9
EX	31	90	0	0	0	20	40	20	40	0	210
		.4	0	0	0	.1	.2	.1	.2	0	.1
CR	32	3240	1310	450	1780	2690	5150	4570	5060	6950	31200
		13.7	6.5	1.8	8.6	10.8	27.4	23.1	23.9	34.1	16.1
BA	33	40	60	40	0	50	40	60	20	30	340
		.2	.3	.2	0	.2	.2	.3	.1	.1	.2
SC	34	30	20	0	0	0	0	0	0	0	50
		.1	.1	0	0	0	0	0	0	0	.0
CD	35	20	40	0	20	0	40	10	0	0	130
		.1	.2	0	.1	0	.2	.1	0	0	.1
	COLUMN TOTAL	23620	20250	24440	20700	24980	18800	19770	21210	20380	194150
		12.2	10.4	12.6	10.7	12.9	9.7	10.2	10.9	10.5	100.0

(CONTINUED)

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                82/11/04.     17.32.21.     PAGE    15
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE     RUFUS     (CREATION DATE =   82/11/04.)
SUBFILE    E38          E36
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C R O S S T A B U L A T I O N   O F ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED

PAGE 3 OF 3

ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
YA	36	0	0	0	0	0	0	0	0	20	20
		0	0	0	0	0	0	0	0	.1	.0
R2	37	800	930	1570	700	4170	2320	4120	1800	1640	18050
		3.4	4.6	6.4	3.4	16.7	12.3	20.8	8.5	8.0	9.3
R1	38	100	80	290	300	280	80	270	190	20	1610
		.4	.4	1.2	1.4	1.1	.4	1.4	.9	.1	.8
SA	39	0	70	20	20	30	0	0	20	0	160
		0	.3	.1	.1	.1	0	0	.1	0	.1
BT	40	0	0	0	20	0	0	20	0	0	40
		0	0	0	.1	0	0	.1	0	0	.0
DD	41	20	80	20	60	20	0	0	0	0	200
		.1	.4	.1	.3	.1	0	0	0	0	.1
HA	42	0	10	0	0	0	0	10	0	10	30
		0	.0	0	0	0	0	.1	0	.0	.0
RV	43	430	290	260	90	70	290	290	230	130	2080
		1.8	1.4	1.1	.4	.3	1.5	1.5	1.1	.6	1.1
RO	44	160	20	160	210	100	60	60	0	30	800
		.7	.1	.7	1.0	.4	.3	.3	0	.1	.4
BQ	45	0	50	150	70	20	0	0	0	0	290
		0	.2	.6	.3	.1	0	0	0	0	.1
QI	46	0	30	0	0	0	10	0	0	0	40
		0	.1	0	0	0	.1	0	0	0	.0
RS	47	30	80	0	180	0	0	0	0	0	290
		.1	.4	0	.9	0	0	0	0	0	.1
AV	48	150	90	20	240	120	30	90	100	0	840
		.6	.4	.1	1.2	.5	.2	.5	.5	0	.4
DA	49	0	30	0	40	10	10	20	10	30	150
		0	.1	0	.2	.0	.1	.1	.0	.1	.1
FL	50	20	0	0	40	0	0	40	20	0	120
		.1	0	0	.2	0	0	.2	.1	0	.1
NULL	99	3900	3200	8350	3900	5700	4500	4200	3870	3600	41220
		16.5	15.8	34.2	18.8	22.8	23.9	21.2	18.2	17.7	21.2
	COLUMN TOTAL	23620	20250	24440	20700	24980	18800	19770	21210	20380	194150
		12.2	10.4	12.6	10.7	12.9	9.7	10.2	10.9	10.5	100.0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                82/11/04.    17.52.21.    PAGE  16
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
RAW CHI SQUARE = 66691.49387 WITH   376 DEGREES OF FREEDOM.  SIGNIFICANCE =      0
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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 17
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 3

ALPHA	COUNT COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
MF	1	0 0	0 0	0 0	40 .2	0 0	30 .2	0 0	0 0	0 0	70 .0
NP	3	20 .1	0 0	0 0	0 0	0 0	50 .3	0 0	20 .1	0 0	90 .1
CH	4	0 0	20 .1	20 .1	50 .2	20 .1	180 .9	60 .3	120 .7	20 .2	490 .3
BU	5	110 .6	20 .1	80 .4	140 .7	0 0	0 0	0 0	20 .1	0 0	370 .2
HH	7	730 3.7	660 3.6	500 2.5	530 2.6	220 1.3	460 2.4	410 2.3	350 2.1	290 3.0	4150 2.6
TH	8	240 1.2	100 .6	230 1.2	320 1.6	280 1.6	220 1.1	320 1.8	300 3.0	280 2.9	2490 1.6
ND	10	0 0	50 .3	60 .3	50 .2	20 .1	70 .4	40 .2	60 .4	40 .4	390 .2
TB	11	0 0	0 0	90 .5	110 .5	0 0	0 0	80 .4	60 .4	0 0	340 .2
CI	12	0 0	0 0	0 0	80 .4	0 0	20 .1	0 0	130 .8	0 0	230 .1
HW	13	0 0	40 .2	0 0	0 0	0 0	20 .1	0 0	0 0	0 0	60 .0
M3	14	10 .1	0 0	150 .8	210 1.0	60 .4	60 .3	70 .4	70 .4	0 0	630 .4
M2	15	150 .8	100 .6	140 .7	720 3.6	280 1.6	270 1.4	290 1.6	360 2.2	170 1.8	2480 1.6
M1	16	170 .9	130 .7	120 .6	240 1.2	110 .6	100 .5	130 .7	130 .8	50 .5	1180 .7
AP	17	740 3.7	670 3.7	640 3.3	580 2.9	410 2.4	670 3.5	300 1.7	230 1.4	260 2.7	4500 2.8
LD	18	210 1.1	170 .9	190 1.0	540 2.7	130 .8	170 .9	160 .9	80 .5	0 0	1650 1.0
DE	19	60 .3	30 .2	0 0	20 .1	10 .1	10 .1	0 0	0 0	10 .1	140 .1
	COLUMN TOTAL	19850 12.6	18140 11.5	19640 12.4	20130 12.7	17040 10.8	19250 12.2	17980 11.4	16450 10.4	9650 6.1	158130 100.0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                          82/11/04.    17.52.21.    PAGE   18
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE    E50          E51
* * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * *
    ALPHA      ALPHA FISH BEHAVIOUR CODES                      BY   HR            EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  2 OF  3
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ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	470	210	170	0	140	270	50	40	0	1350
		2.4	1.2	.9	0	.8	1.4	.3	.2	0	.9
IG	21	60	20	80	0	70	20	30	20	0	300
		.3	.1	.4	0	.4	.1	.2	.1	0	.2
DG	23	40	20	0	0	0	40	0	0	0	100
		.2	.1	0	0	0	.2	0	0	0	.1
SS	24	100	100	140	10	50	110	0	210	0	720
		.5	.6	.7	.0	.3	.6	0	1.3	0	.5
CB	25	680	430	800	160	710	200	150	170	0	3300
		3.4	2.4	4.1	.8	4.2	1.0	.8	1.0	0	2.1
HD	26	1060	1830	2080	1620	870	1160	1250	3390	490	13750
		5.3	10.1	10.6	8.0	5.1	6.0	7.0	20.6	5.1	8.7
R4	27	120	0	430	450	0	1040	390	30	1960	4420
		.6	0	2.2	2.2	0	5.4	2.2	.2	20.3	2.8
R3	28	830	1960	2840	3100	2700	1260	3820	3520	1250	21280
		4.2	10.8	14.5	15.4	15.8	6.5	21.2	21.4	13.0	13.5
TU	29	260	240	170	190	180	370	220	120	100	1850
		1.3	1.3	.9	.9	1.1	1.9	1.2	.7	1.0	1.2
ST	30	80	80	20	20	40	30	20	10	0	300
		.4	.4	.1	.1	.2	.2	.1	.1	0	.2
EX	31	30	70	50	40	0	60	0	0	0	250
		.2	.4	.3	.2	0	.3	0	0	0	.2
CR	32	9780	8020	6610	5400	7410	9250	7110	4790	2120	60490
		49.3	44.2	33.7	26.8	43.5	48.1	39.5	29.1	22.0	38.3
BA	33	0	60	70	40	20	10	0	0	0	200
		0	.3	.4	.2	.1	.1	0	0	0	.1
SC	34	0	10	0	0	0	0	20	0	0	30
		0	.1	0	0	0	0	.1	0	0	.0
CD	35	10	0	40	0	0	0	10	10	10	80
		.1	0	.2	0	0	0	.1	.1	.1	.1
YA	36	0	0	70	0	0	0	0	0	0	70
		0	0	.4	0	0	0	0	0	0	.0
	COLUMN TOTAL	19850	18140	19640	20130	17040	19250	17980	16450	9550	158130
		12.6	11.5	12.4	12.7	10.8	12.2	11.4	10.4	6.1	100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 19
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED PAGE 3 OF 3

ALPHA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
R2	37	1160 5.8	1190 6.6	890 4.5	380 1.9	400 2.3	470 2.4	1150 6.4	230 1.4	80 .8	5950 3.8
R1	38	160 .8	210 1.2	250 1.3	90 .4	20 .1	140 .7	410 2.3	190 1.2	0 0	1470 .9
SA	39	0 0	10 .1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	10 .0
BT	40	20 .1	20 .1	0 0	0 0	0 0	20 .1	40 .2	30 .2	0 0	130 .1
DD	41	0 0	0 0	20 .1	20 .1	0 0	0 0	0 0	0 0	0 0	40 .0
HA	42	10 .1	20 .1	10 .1	50 .2	0 0	10 .1	0 0	40 .2	0 0	140 .1
RV	43	330 1.7	270 1.5	380 1.9	630 3.1	260 1.5	550 2.9	380 2.1	550 3.3	120 1.2	3470 2.2
RO	44	180 .9	80 .4	530 2.7	550 2.7	90 .5	220 1.1	410 2.3	190 1.2	250 2.6	2500 1.6
RS	47	0 0	0 0	0 0	0 0	30 .2	40 .2	170 .9	140 .9	0 0	380 .2
AV	48	300 1.5	620 3.4	400 2.0	530 2.6	200 1.2	220 1.1	40 .2	30 .2	0 0	2340 1.5
DA	49	0 0	0 0	0 0	10 .0	0 0	10 .1	0 0	10 .1	0 0	30 .0
FL	50	0 0	50 .3	90 .5	210 1.0	0 0	70 .4	0 0	0 0	0 0	420 .3
NULL	99	1730 8.7	630 3.5	1280 6.5	3000 14.9	2310 13.6	1350 7.0	450 2.5	600 3.6	2150 22.3	13500 8.5
	COLUMN TOTAL	19850 12.6	18140 11.5	19640 12.4	20130 12.7	17040 10.8	19250 12.2	17980 11.4	16450 10.4	9650 6.1	158130 100.0

RAW CHI SQUARE = 47238.77662 WITH 352 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 20
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* * * * * * * * * * PAGE 1 OF 3

ALPHA	HR → COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
MF	1	0 0	0 0	20 .1	0 0	0 0	0 0	0 0	0 0	0 0	20 .0
NP	3	0 0	0 0	10 .1	0 0	10 .1	10 .1	20 .1	0 0	0 0	50 .0
CH	4	30 .2	0 0	20 .1	0 0	20 .1	0 0	30 .2	0 0	0 0	100 .1
BU	5	0 0	50 .3	0 0	0 0	0 0	100 .6	0 0	0 0	150 .9	300 .2
M4	6	0 0	0 0	0 0	0 0	30 .2	0 0	0 0	0 0	0 0	30 .0
HH	7	250 1.4	420 2.3	180 .9	230 1.3	350 2.0	400 2.3	140 .8	230 1.3	320 1.9	2520 1.6
TH	8	170 .9	210 1.1	230 1.2	280 1.5	330 1.8	400 2.3	120 .7	20 .1	310 1.8	2070 1.3
ND	10	0 0	60 .3	40 .2	0 0	50 .3	0 0	0 0	0 0	20 .1	170 .1
TB	11	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	50 .3	50 .0
CI	12	0 0	0 0	20 .1	30 .2	20 .1	30 .2	60 .3	40 .2	30 .2	230 .1
HW	13	0 0	20 .1	0 0	20 .1	0 0	0 0	0 0	0 0	0 0	40 .0
M3	14	0 0	0 0	30 .2	0 0	30 .2	0 0	0 0	0 0	80 .5	140 .1
M2	15	60 .3	110 .6	40 .2	80 .4	70 .4	80 .5	20 .1	60 .3	170 1.0	690 .4
M1	16	0 0	50 .3	160 .8	40 .2	80 .4	110 .6	110 .5	50 .3	130 .8	730 .5
AP	17	690 3.7	670 3.6	770 4.0	300 1.7	590 3.3	710 4.2	550 3.0	570 3.3	430 2.5	5280 3.3
LD	18	110 .6	250 1.4	470 2.4	400 2.2	280 1.6	520 3.0	110 .6	290 1.7	80 .5	2510 1.6
	COLUMN TOTAL	18510 11.4	18360 11.3	19310 11.9	18140 11.2	17910 11.1	17100 10.6	18140 11.2	17220 10.6	17220 10.6	161910 100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 21
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 3

ALPHA	HR COUNT COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
DE	19	0 0	20 .1	0 0	0 0	20 .1	0 0	20 .1	60 .3	0 0	120 .1
HS	20	260 1.4	280 1.5	230 1.2	60 .3	150 .8	50 .3	130 .7	0 0	30 .2	1190 .7
IG	21	90 .5	0 0	30 .2	0 0	0 0	0 0	70 .4	30 .2	30 .2	250 .2
SP	22	0 0	0 0	10 .1	0 0	0 0	0 0	10 .1	0 0	30 .2	50 .0
DG	23	60 .3	130 .7	120 .6	40 .2	0 0	0 0	0 0	0 0	0 0	350 .2
SS	24	90 .5	0 0	0 0	0 0	0 0	0 0	0 0	80 .5	0 0	170 .1
CB	25	680 3.7	340 1.9	460 2.4	0 0	220 1.2	370 2.2	220 1.2	90 .5	190 1.1	2570 1.6
HO	26	780 4.2	1460 8.0	1370 7.1	1530 8.4	2310 12.9	2340 13.7	2530 14.5	2770 16.1	980 5.7	16170 10.0
R3	28	1280 6.9	860 4.7	490 2.5	180 1.0	270 1.5	520 3.0	680 3.7	1610 9.3	1950 11.3	7840 4.8
TU	29	140 .8	90 .5	290 1.5	160 .9	170 .9	120 .7	160 .9	70 .4	170 1.0	1370 .8
ST	30	60 .3	80 .4	20 .1	30 .2	40 .2	10 .1	10 .1	30 .2	40 .2	320 .2
EX	31	50 .3	20 .1	20 .1	20 .1	20 .1	0 0	0 0	10 .1	0 0	140 .1
CR	32	8360 47.9	7950 43.3	9100 47.1	5700 31.4	8410 47.0	5780 33.8	6880 37.9	5990 34.8	6280 36.5	64950 40.1
BA	33	20 .1	100 .5	60 .3	0 0	20 .1	40 .2	20 .1	50 .3	40 .2	350 .2
SC	34	0 0	0 0	0 0	0 0	0 0	20 .1	0 0	70 .4	0 0	90 .1
CD	35	0 0	10 .1	10 .1	0 0	10 .1	0 0	0 0	0 0	10 .1	40 .0
	COLUMN TOTAL	18510 11.4	18360 11.3	19310 11.9	18140 11.2	17910 11.1	17100 10.6	18140 11.2	17220 10.6	17220 10.6	161910 100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 22
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 3 OF 3

ALPHA	COUNT / COL PCT (HR)	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
YA	36	0 0	0 0	0 0	0 0	20 .1	0 0	0 0	0 0	0 0	20 .0
R2	37	860 4.6	730 4.0	410 2.1	1100 6.1	280 1.6	460 2.7	90 .5	810 4.7	980 5.7	5720 3.5
R1	38	2300 12.4	2410 13.1	2310 12.0	5130 28.3	1900 10.6	1810 10.6	3820 21.1	2110 12.3	2850 16.6	24640 15.2
SA	39	0 0	0 0	0 0	0 0	0 0	10 .1	0 0	0 0	0 0	10 .0
BT	40	20 .1	0 0	0 0	0 0	0 0	0 0	0 0	20 .1	0 0	40 .0
DD	41	0 0	20 .1	0 0	0 0	0 0	30 .2	20 .1	0 0	0 0	70 .0
HA	42	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	10 .1	10 .0
RV	43	110 .6	210 1.1	420 2.2	80 .4	230 1.3	290 1.7	190 1.0	280 1.6	100 .6	1910 1.2
RO	44	160 .9	430 2.3	430 2.2	520 2.9	470 2.6	690 4.0	260 1.4	430 2.5	150 .9	3540 2.2
BQ	45	0 0	20 .1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .0
RS	47	0 0	10 .1	120 .6	290 1.6	150 .8	540 3.2	110 .6	230 1.3	250 1.5	1700 1.0
AV	48	680 3.7	520 2.8	370 1.9	320 1.8	450 2.5	660 3.9	300 1.7	380 2.2	90 .5	3770 2.3
DA	49	0 0	0 0	20 .1	10 .1	0 0	40 .2	20 .1	40 .2	20 .1	150 .1
FL	50	100 .5	80 .4	80 .4	90 .5	10 .1	60 .4	40 .2	0 0	0 0	460 .3
NULL	99	600 3.2	750 4.1	950 4.9	1500 8.3	900 5.0	900 5.3	1300 7.2	800 4.6	1250 7.3	8950 5.5
	COLUMN TOTAL	18510 11.4	18360 11.3	19310 11.9	18140 11.2	17910 11.1	17100 10.6	18140 11.2	17220 10.6	17220 10.6	161910 100.0

RAW CHI SQUARE = 27181.35600 WITH 368 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 23
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 3

ALPHA	COUNT / COL PCT (HR)	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
MF	1	0 0	0 0	0 0	210 1.2	0 0	0 0	0 0	0 0	0 0	210 .1
BI	2	0 0	0 0	0 0	0 0	0 0	0 0	20 .1	0 0	10 .0	30 .0
NP	3	20 .1	10 .1	10 .1	30 .2	0 0	20 .1	30 .2	30 .2	60 .3	210 .1
CH	4	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .1	20 .1	40 .0
BU	5	0 0	20 .1	40 .2	20 .1	0 0	70 .3	0 0	0 0	70 .3	220 .1
M4	6	0 0	0 0	20 .1	0 0	0 0	0 0	0 0	40 .2	0 0	60 .0
HH	7	350 1.8	950 5.1	650 3.5	820 4.8	910 4.6	1150 5.4	840 4.6	1180 5.9	1040 4.7	7890 4.5
TH	8	160 .8	290 1.6	310 1.7	310 1.8	470 2.4	380 1.8	410 2.2	500 2.5	690 3.1	3520 2.0
FD	9	0 0	0 0	0 0	50 .3	0 0	0 0	0 0	0 0	20 .1	70 .0
ND	10	10 .1	50 .3	50 .3	20 .1	50 .3	160 .8	70 .4	70 .4	100 .5	580 .3
TB	11	20 .1	50 .3	130 .7	0 0	30 .2	0 0	360 2.0	200 1.0	60 .3	850 .5
CI	12	20 .1	0 0	20 .1	40 .2	0 0	0 0	40 .2	0 0	10 .0	130 .1
HW	13	0 0	0 0	40 .2	0 0	0 0	0 0	0 0	0 0	0 0	40 .0
M3	14	60 .3	0 0	40 .2	110 .6	0 0	50 .2	20 .1	0 0	30 .1	310 .2
M2	15	200 1.0	120 .6	360 1.9	210 1.2	160 .8	170 .8	120 .7	280 1.4	120 .5	1740 1.0
M1	16	20 .1	50 .3	70 .4	30 .2	90 .5	180 .8	110 .5	160 .8	90 .4	800 .5
	COLUMN TOTAL	19400 11.1	18500 10.6	18750 10.7	16930 9.7	19740 11.3	21190 12.1	18260 10.5	19990 11.4	21930 12.6	174690 100.0

(CONTINUED)

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 24
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 3

ALPHA	COUNT / COL PCT (HR)	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
AP	17	400 2.1	400 2.2	190 1.0	310 1.8	390 2.0	310 1.5	260 1.4	350 1.8	310 1.4	2920 1.7
LD	18	280 1.4	320 1.7	440 2.3	260 1.5	220 1.1	580 2.7	920 5.0	315 1.6	780 3.6	4110 2.4
HS	20	30 .2	0 0	120 .6	30 .2	60 .3	30 .1	30 .2	280 1.4	30 .1	610 .3
IG	21	100 .5	30 .2	0 0	60 .4	0 0	0 0	0 0	0 0	0 0	190 .1
SP	22	0 0	10 .1	0 0	10 .1	0 0	0 0	0 0	0 0	0 0	20 .0
DG	23	0 0	0 0	40 .2	0 0	0 0	20 .1	20 .1	100 .5	20 .1	200 .1
SS	24	30 .2	0 0	0 0	20 .1	0 0	0 0	0 0	0 0	0 0	50 .0
CB	25	450 2.3	110 .6	190 1.0	430 2.5	260 1.3	40 .2	390 2.1	430 2.2	630 2.9	2930 1.7
HD	26	1050 5.4	1730 9.4	1770 9.4	1490 8.8	2550 12.9	1960 9.2	1550 8.5	2470 12.4	1960 8.9	16530 9.5
R4	27	0 0	330 1.8	1300 6.9	2820 16.7	240 1.2	640 3.0	0 0	0 0	0 0	5330 3.1
R3	28	2960 15.3	3170 17.1	4300 22.9	1680 9.9	3090 15.7	4320 20.4	5630 30.8	3850 19.3	3520 16.1	32520 18.6
TU	29	150 .8	270 1.5	190 1.0	230 1.4	150 .8	170 .8	120 .7	120 .6	130 .6	1530 .9
ST	30	80 .4	60 .3	30 .2	60 .4	20 .1	30 .1	20 .1	0 0	0 0	300 .2
EX	31	80 .4	0 0	0 0	0 0	100 .5	0 0	0 0	150 .8	130 .6	460 .3
CR	32	3500 18.0	2430 13.1	2920 15.6	3540 20.9	3140 15.9	3300 15.6	1950 10.7	4010 20.1	3000 13.7	27790 15.9
BA	33	20 .1	40 .2	60 .3	30 .2	40 .2	20 .1	130 .7	0 0	0 0	340 .2
	COLUMN TOTAL	19400 11.1	18500 10.6	18750 10.7	16930 9.7	19740 11.3	21190 12.1	18260 10.5	19990 11.4	21930 12.6	174690 100.0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                82/11/04.     17.52.21.     PAGE   25
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE    E54          E55

* * * * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * * * * *
* * ALPHA  * * ALPHA FISH BEHAVIOUR CODES * * * * * * * * * * * BY  HR * * * * EXP. TIME ELAPSED * * * *   PAGE  3 OF  3
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ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
CD	35	10	30	10	20	30	0	20	0	10	130
		.1	.2	.1	.1	.2	0	.1	0	.0	.1
R2	37	4660	2360	2260	1000	1460	720	960	390	1190	15000
		24.0	12.8	12.1	5.9	7.4	3.4	5.3	2.0	5.4	8.6
R1	38	1430	2070	550	270	1600	170	1210	400	940	8640
		7.4	11.2	2.9	1.6	8.1	.8	6.6	2.0	4.3	4.9
BT	40	0	60	10	0	0	20	0	0	0	90
		0	.3	.1	0	0	.1	0	0	0	.1
DD	41	10	0	0	0	10	0	0	0	0	20
		.1	0	0	0	.1	0	0	0	0	.0
HA	42	0	20	10	70	0	20	0	10	20	150
		0	.1	.1	.4	0	.1	0	.1	.1	.1
RV	43	400	490	220	390	440	700	420	120	590	3770
		2.1	2.6	1.2	2.3	2.2	3.3	2.3	.6	2.7	2.2
RO	44	580	630	380	410	770	670	750	470	810	5470
		3.0	3.4	2.0	2.4	3.9	3.2	4.1	2.4	3.7	3.1
BQ	45	0	0	20	0	0	0	0	0	0	20
		0	0	.1	0	0	0	0	0	0	.0
RS	47	70	240	800	450	870	760	770	30	970	4960
		.4	1.3	4.3	2.7	4.4	3.6	4.2	.2	4.4	2.8
AV	48	680	500	210	500	350	150	170	120	470	3150
		3.5	2.7	1.1	3.0	1.8	.7	.9	.6	2.1	1.8
DA	49	50	20	20	20	20	40	20	0	0	190
		.3	.1	.1	.1	.1	.2	.1	0	0	.1
FL	50	20	40	70	80	70	40	0	0	0	320
		.1	.2	.4	.5	.4	.2	0	0	0	.2
NULL	99	1500	1600	900	900	2150	4300	900	3900	4100	20250
		7.7	8.6	4.8	5.3	10.9	20.3	4.9	19.5	18.7	11.6
	COLUMN TOTAL	19400	18500	18750	16930	19740	21170	18260	19990	21930	174690
		11.1	10.6	10.7	9.7	11.3	12.1	10.5	11.4	12.6	100.0

RAW CHI SQUARE = 53427.23420 WITH 360 DEGREES OF FREEDOM. SIGNIFICANCE = 0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                    82/11/04.    17.52.21.     PAGE   26
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLAS

CPU TIME REQUIRED..     57.7020 SECONDS

                 TASK NAME        BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
                 CROSSTABS        VARIABLES=BETA(1,99),HR(1,9)/TABLES=BETA BY HR
                 OPTIONS          3,5,7
                 STATISTICS       1

          00054000 CM NEEDED FOR CROSSTABS

          OPTION - 1
          IGNORE MISSING VALUE INDICATORS
          (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

          OPTION - 3
          DELETE ROW PERCENTAGES

          OPTION - 5
          DELETE TOTAL PERCENTAGES
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BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 3

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
NP	3	20	0	0	0	0	0	10	0	0	30
		.1	0	0	0	0	0	.0	0	0	.0
CH	4	0	0	0	10	0	0	0	0	80	90
		0	0	0	.1	0	0	0	0	.3	.0
BU	5	20	0	140	60	0	60	0	20	60	360
		.1	0	.6	.3	0	.3	0	.1	.2	.2
M4	6	0	0	0	0	30	0	0	0	0	30
		0	0	0	0	.2	0	0	0	0	.0
HH	7	430	220	360	320	100	520	450	720	810	3930
		2.0	1.1	1.6	1.7	.5	2.8	2.1	3.5	3.4	2.1
TH	8	280	200	390	100	60	280	410	400	450	2570
		1.3	1.0	1.8	.5	.3	1.5	1.9	2.0	1.9	1.4
ND	10	40	80	60	90	0	140	20	10	40	480
		.2	.4	.3	.5	0	.8	.1	.0	.2	.3
TB	11	0	0	20	0	0	0	0	30	390	440
		0	0	.1	0	0	0	0	.1	1.6	.2
CI	12	40	70	170	0	250	110	20	20	60	740
		.2	.3	.8	0	1.4	.6	.1	.1	.2	.4
HW	13	0	0	40	0	0	0	0	0	0	40
		0	0	.2	0	0	0	0	0	0	.0
M3	14	0	0	0	0	0	20	0	0	0	20
		0	0	0	0	0	.1	0	0	0	.0
M2	15	50	0	50	0	90	20	30	120	150	510
		.2	0	.2	0	.5	.1	.1	.6	.6	.3
M1	16	30	60	120	40	80	110	130	70	60	700
		.1	.3	.5	.2	.4	.6	.6	.3	.2	.4
AP	17	230	550	510	720	190	420	350	430	320	3720
		1.1	2.6	2.3	3.9	1.0	2.3	1.6	2.1	1.3	2.0
LD	18	240	90	850	750	230	190	410	820	580	4160
		1.1	.4	3.9	4.1	1.3	1.0	1.9	4.0	2.4	2.3
DE	19	20	0	0	0	20	0	0	10	20	70
		.1	0	0	0	.1	0	0	.0	.1	.0
	COLUMN TOTAL	21130	20780	22020	18380	18360	18270	21520	20300	24020	184780
		11.4	11.2	11.9	9.9	9.9	9.9	11.6	11.0	13.0	100.0

(CONTINUED)

BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 3

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	170 .8	0 0	0 0	90 .5	120 .7	170 .9	140 .7	0 0	50 .2	740 .4
IG	21	50 .2	0 0	0 0	0 0	50 .3	30 .2	90 .4	20 .1	0 0	240 .1
SP	22	0 0	0 0	0 0	0 0	0 0	10 .1	20 .1	0 0	0 0	30 .0
DG	23	60 .3	0 0	0 0	20 .1	30 .2	0 0	20 .1	0 0	0 0	130 .1
SS	24	60 .3	310 1.5	0 0	30 .2	100 .5	0 0	30 .1	130 .6	0 0	660 .4
CB	25	40 .2	540 2.6	400 1.8	1490 8.1	550 3.0	380 2.1	530 2.5	350 1.7	0 0	4280 2.3
HD	26	3010 14.2	580 2.8	1070 4.9	750 4.1	710 3.9	970 5.3	2180 10.1	1630 8.0	2010 8.4	12910 7.0
R4	27	0 0	1210 5.8	1130 5.1	0 0	230 1.3	0 0	490 2.3	240 1.2	0 0	3300 1.8
R3	28	2950 14.0	3620 17.4	3730 16.9	1600 8.7	3650 19.9	1810 9.9	4210 19.6	2940 14.5	4120 17.2	28630 15.5
TU	29	270 1.3	320 1.5	350 1.6	570 3.1	150 .8	110 .6	240 1.1	240 1.2	380 1.6	2630 1.4
ST	30	30 .1	20 .1	10 .0	0 0	10 .1	20 .1	10 .0	0 0	20 .1	120 .1
EX	31	60 .3	0 0	0 0	0 0	90 .5	0 0	40 .2	50 .2	60 .2	300 .2
CR	32	4350 20.6	5150 24.8	3220 14.6	7110 38.7	5060 27.6	5210 28.5	4130 19.2	5690 28.0	3000 12.5	42920 23.2
BA	33	40 .2	40 .2	60 .3	40 .2	20 .1	30 .2	20 .1	10 .0	40 .2	300 .2
SC	34	0 0	0 0	0 0	0 0	80 .4	0 0	0 0	0 0	0 0	80 .0
CD	35	0 0	10 .0	0 0	0 0	0 0	20 .1	10 .0	10 .0	0 0	50 .0
	COLUMN TOTAL	21130 11.4	20780 11.2	22020 11.9	18380 9.9	18360 9.9	18270 9.9	21520 11.5	20300 11.0	24020 13.0	184780 100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 29
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 3 OF 3

BETA	HR COUNT COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
YA	36	0 0	30 .1	0 0	0 0	20 .1	0 0	0 0	0 0	0 0	50 .0
R2	37	1210 5.7	960 4.6	1710 7.8	2200 12.0	1670 9.1	2850 15.6	1290 6.0	1940 9.6	1510 6.3	15340 8.3
R1	38	990 4.7	390 1.9	270 1.2	70 .4	1720 9.4	680 3.7	320 1.5	120 .6	410 1.7	4970 2.7
SA	39	0 0	10 .0	0 0	10 .1	0 0	0 0	0 0	10 .0	0 0	30 .0
BT	40	30 .1	40 .2	40 .2	120 .7	0 0	0 0	20 .1	90 .4	0 0	340 .2
DD	41	40 .2	50 .2	50 .2	10 .1	40 .2	20 .1	0 0	0 0	40 .2	250 .1
HA	42	10 .0	0 0	20 .1	0 0	0 0	10 .1	30 .1	30 .1	0 0	100 .1
RV	43	110 .5	430 2.1	440 2.0	320 1.7	120 .7	120 .7	390 1.8	420 2.1	470 2.0	2820 1.5
RO	44	140 .7	130 .6	400 1.8	130 .7	270 1.5	150 .8	270 1.3	350 1.7	310 1.3	2150 1.2
BQ	45	0 0	0 0	0 0	0 0	70 .4	30 .2	0 0	30 .1	0 0	130 .1
RS	47	1070 5.1	110 .5	150 .7	40 .2	180 1.0	190 1.0	60 .3	120 .6	650 2.7	2570 1.4
AV	48	90 .4	530 2.6	720 3.3	430 2.3	470 2.6	500 2.7	510 2.4	420 2.1	110 .5	3780 2.0
DA	49	40 .2	10 .0	10 .0	20 .1	40 .2	50 .3	30 .1	40 .2	10 .0	250 .1
FL	50	110 .5	220 1.1	80 .4	40 .2	510 2.8	290 1.6	140 .7	70 .3	110 .5	1570 .8
NULL	99	4300 22.7	4800 23.1	5450 24.8	1200 6.5	1350 7.4	2750 15.1	4470 20.8	2700 13.3	7700 32.1	35220 19.1
	COLUMN TOTAL	21130 11.4	20780 11.2	22020 11.9	18380 9.9	18360 9.9	18270 9.9	21520 11.6	20300 11.0	24020 13.0	184730 100.0

RAW CHI SQUARE = 51187.18605 WITH 368 DEGREES OF FREEDOM. SIGNIFICANCE = 0

BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED

BETA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
NP	3	0 0	10 .1	30 .1	0 0	10 .0	0 0	0 0	0 0	0 0	50 .0
CH	4	80 .4	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	80 .0
BU	5	40 .2	120 .6	140 .7	130 .5	20 .1	170 .8	60 .3	100 .5	40 .2	820 .4
M4	6	80 .4	30 .2	0 0	0 0	0 0	30 .1	0 0	0 0	0 0	140 .1
HH	7	190 .9	310 1.6	230 1.1	460 1.8	250 1.2	160 .7	310 1.4	150 .7	130 .7	2190 1.1
TH	8	110 .5	360 1.8	90 .4	400 1.6	140 .7	70 .3	200 .9	150 .7	70 .4	1590 .8
FD	9	0 0	20 .1	0 0	0 0	50 .2	0 0	0 0	0 0	0 0	70 .0
ND	10	80 .4	90 .5	100 .5	220 .9	160 .8	40 .2	60 .3	170 .8	50 .3	970 .5
TB	11	40 .2	0 0	0 0	0 0	20 .1	0 0	0 0	0 0	0 0	60 .0
CI	12	0 0	0 0	30 .1	110 .4	0 0	40 .2	20 .1	90 .4	0 0	290 .1
HW	13	0 0	20 .1	30 .1	0 0	0 0	0 0	0 0	40 .2	0 0	90 .0
M3	14	160 .7	40 .2	40 .2	20 .1	90 .4	80 .4	0 0	20 .1	0 0	450 .2
M2	15	190 .9	110 .6	150 .7	90 .4	210 1.0	240 1.1	170 .8	0 0	60 .3	1220 .6
M1	16	180 .8	100 .5	60 .3	80 .3	190 .9	170 .8	10 .0	100 .5	120 .6	1010 .5
AP	17	790 3.5	780 3.9	970 4.8	910 3.6	580 2.8	650 3.0	730 3.4	590 2.7	670 3.4	6700 3.4
LD	18	430 1.9	640 3.2	400 2.0	750 2.9	520 2.5	1550 7.1	850 3.8	700 3.2	920 4.7	6770 3.5
	COLUMN TOTAL	22280 11.5	19790 10.2	20360 10.5	25490 13.1	20570 10.6	21840 11.2	22200 11.4	21960 11.3	19740 10.2	194230 100.0

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BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 3

BETA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
DE	19	70	40	30	60	30	30	10	0	0	270
		.3	.2	.1	.2	.1	.1	.0	0	0	.1
HS	20	120	30	60	20	30	40	20	0	90	410
		.5	.2	.3	.1	.1	.2	.1	0	.5	.2
IG	21	70	170	50	0	40	0	20	0	20	370
		.3	.9	.2	0	.2	0	.1	0	.1	.2
SP	22	0	20	10	0	20	0	0	0	0	50
		0	.1	.0	0	.1	0	0	0	0	.0
DG	23	50	20	20	20	0	20	0	0	30	160
		.2	.1	.1	.1	0	.1	0	0	.2	.1
SS	24	200	1230	450	270	20	10	40	0	30	2250
		.9	6.2	2.2	1.1	.1	.0	.2	0	.2	1.2
CB	25	630	1140	670	350	520	50	510	490	680	5040
		2.8	5.8	3.3	1.4	2.5	.2	2.3	2.2	3.4	2.6
HO	26	790	780	910	1040	1330	800	780	760	990	8180
		3.5	3.9	4.5	4.1	6.5	3.7	3.5	3.5	5.0	4.2
R4	27	0	40	0	320	0	0	170	40	100	670
		0	.2	0	1.3	0	0	.8	.2	.5	.3
R3	28	5220	3920	4670	2690	4360	3160	2300	2760	2010	31090
		23.4	19.8	22.9	10.6	21.2	14.5	10.4	12.6	10.2	16.0
TU	29	360	340	570	720	540	190	400	370	530	4020
		1.6	1.7	2.8	2.8	2.6	.9	1.8	1.7	2.7	2.1
ST	30	10	0	0	20	80	20	10	10	10	160
		.0	0	0	.1	.4	.1	.0	.0	.1	.1
EX	31	40	30	120	40	60	0	0	0	70	360
		.2	.2	.6	.2	.3	0	0	0	.4	.2
CR	32	4080	3510	4610	5310	5850	2860	3570	3870	5460	39120
		18.3	17.7	22.6	20.8	28.4	13.1	16.1	17.6	27.7	20.1
BA	33	30	100	40	90	20	50	130	60	20	540
		.1	.5	.2	.4	.1	.2	.6	.3	.1	.3
SC	34	30	0	0	0	0	0	0	0	60	90
		.1	0	0	0	0	0	0	0	.3	.0
	COLUMN TOTAL	22280	19790	20360	25490	20570	21840	22200	21960	19740	194230
		11.5	10.2	10.5	13.1	10.6	11.2	11.4	11.3	10.2	100.0

(CONTINUED)

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 32
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 3 OF 3

BETA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
YA	36	20 .1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .0
R2	37	2060 9.2	1150 5.8	1050 5.2	2090 8.2	1740 8.5	3870 17.7	3330 15.0	3900 17.8	3120 15.8	22310 11.5
R1	38	100 .4	110 .6	220 1.1	90 .4	30 .1	1850 8.5	1060 4.8	550 2.5	660 3.3	4670 2.4
SA	39	0 0	0 0	0 0	0 0	20 .1	0 0	0 0	0 0	10 .1	30 .0
BT	40	0 0	0 0	20 .1	50 .2	80 .4	0 0	70 .3	40 .2	120 .6	370 .2
DD	41	80 .4	20 .1	60 .3	50 .2	0 0	30 .1	40 .2	60 .3	30 .2	370 .2
HA	42	10 .0	10 .1	10 .0	0 0	10 .0	0 0	10 .0	20 .1	0 0	70 .0
RV	43	150 .7	180 .9	360 1.8	240 .9	130 .6	350 1.6	380 1.7	110 .5	290 1.5	2190 1.1
RO	44	0 0	190 1.0	30 .1	60 .2	210 1.0	130 .6	80 .4	70 .3	190 1.0	960 .5
BQ	45	0 0	60 .3	0 0	90 .4	80 .4	0 0	0 0	30 .1	50 .3	310 .2
RS	47	100 .4	40 .2	0 0	0 0	0 0	220 1.0	0 0	230 1.0	40 .2	630 .3
AV	48	250 1.1	80 .4	150 .8	10 .0	390 1.9	260 1.2	320 1.4	720 3.3	660 3.3	2850 1.5
DA	49	40 .2	0 0	60 .3	0 0	50 .2	10 .0	40 .2	40 .2	60 .3	300 .2
FL	50	0 0	50 .3	10 .0	0 0	90 .4	380 1.7	450 2.0	310 1.4	550 2.8	1840 .9
NULL	99	5400 24.2	3900 19.7	3900 19.2	8700 34.1	2600 12.5	4300 19.7	6030 27.2	5400 24.6	1800 9.1	42030 21.6
	COLUMN TOTAL	22280 11.5	19790 10.2	20360 10.5	25490 13.1	20570 10.6	21840 11.2	22200 11.4	21960 11.3	19740 10.2	194230 100.0

RAW CHI SQUARE = 44038.74673 WITH 368 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 33
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 3

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
MF	1	0 0	0 0	0 0	0 0	30 .1	30 .1	0 0	0 0	30 .2	90 .0
CH	4	30 .1	20 .1	90 .3	80 .4	0 0	0 0	0 0	20 .1	0 0	240 .1
BU	5	130 .5	130 .6	20 .1	60 .3	40 .2	80 .4	20 .1	100 .5	0 0	580 .3
M4	6	0 0	0 0	30 .1	0 0	0 0	0 0	0 0	0 0	0 0	30 .0
HH	7	640 2.6	830 3.6	140 .5	590 2.9	770 3.3	220 1.1	100 .5	270 1.4	60 .3	3620 1.9
TH	8	630 2.6	450 2.0	370 1.3	440 2.2	390 1.7	150 .7	0 0	60 .3	160 .9	2650 1.4
FD	9	0 0	0 0	40 .1	0 0	0 0	0 0	0 0	20 .1	0 0	60 .0
ND	10	150 .6	70 .3	70 .3	70 .3	90 .4	0 0	0 0	20 .1	30 .2	500 .3
TB	11	120 .5	40 .2	0 0	0 0	0 0	20 .1	0 0	0 0	0 0	180 .1
CI	12	0 0	0 0	50 .2	0 0	0 0	0 0	50 .3	60 .3	30 .2	190 .1
HW	13	0 0	0 0	0 0	0 0	90 .4	40 .2	0 0	0 0	0 0	130 .1
M3	14	80 .3	60 .3	60 .2	0 0	60 .3	0 0	30 .2	0 0	0 0	290 .1
M2	15	200 .8	20 .1	60 .2	60 .3	80 .3	0 0	0 0	50 .3	0 0	470 .2
M1	16	60 .2	60 .3	90 .3	20 .1	40 .2	20 .1	120 .6	150 .8	40 .2	600 .3
AP	17	380 1.5	530 2.3	500 1.8	270 1.3	470 2.0	270 1.3	700 3.7	760 3.9	530 3.0	4410 2.3
LD	18	340 1.4	460 2.0	630 2.3	740 3.6	1050 4.5	370 1.8	440 2.3	460 2.3	140 .8	4630 2.4
	COLUMN TOTAL	24610 12.6	22800 11.7	27720 14.3	20370 10.4	23570 12.1	20300 10.4	18780 9.6	19660 10.1	17430 8.9	195440 100.0

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BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 3

BETA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
DE	19	10 .0	30 .1	20 .1	0 0	20 .1	0 0	0 0	0 0	0 0	80 .0
HS	20	140 .6	30 .1	60 .2	30 .1	400 1.7	110 .5	80 .4	60 .3	120 .7	1030 .5
IG	21	60 .2	60 .3	0 0	0 0	0 0	40 .2	90 .5	0 0	30 .2	280 .1
SP	22	0 0	40 .2	0 0	0 0	0 0	0 0	0 0	0 0	0 0	40 .0
DG	23	50 .2	20 .1	40 .1	20 .1	470 2.0	50 .2	50 .3	0 0	20 .1	720 .4
SS	24	10 .0	20 .1	0 0	0 0	30 .1	0 0	90 .5	20 .1	200 1.1	370 .2
CB	25	310 1.3	220 1.0	630 2.3	160 .8	710 3.0	160 .8	490 2.6	220 1.1	380 2.2	3280 1.7
HO	26	1870 7.6	1680 7.4	1660 5.9	1550 7.6	2220 9.4	2090 10.3	2070 11.0	1800 9.2	1220 7.0	16160 8.3
R4	27	140 .6	480 2.1	1120 4.0	650 3.2	230 1.0	0 0	0 0	0 0	320 1.8	2940 1.5
R3	28	3350 13.6	3440 15.1	5580 20.0	3100 15.2	1600 6.8	5170 25.5	1460 7.8	2990 15.2	2000 11.5	28690 14.7
TU	29	380 1.5	160 .7	720 2.6	390 1.9	340 1.4	280 1.4	320 1.7	400 2.0	300 1.7	3290 1.7
ST	30	10 .0	90 .4	70 .3	0 0	40 .2	0 0	10 .1	30 .2	10 .1	260 .1
EX	31	140 .6	20 .1	120 .4	30 .1	230 1.0	0 0	0 0	150 .8	70 .4	760 .4
CR	32	8190 33.3	7530 33.0	7820 28.0	5550 27.2	8520 36.1	4620 22.8	7430 39.6	5560 28.3	6810 39.1	62030 31.7
BA	33	80 .3	60 .3	50 .2	40 .2	60 .3	20 .1	80 .4	270 1.4	60 .3	720 .4
SC	34	20 .1	0 0	0 0	20 .1	0 0	0 0	10 .1	10 .1	0 0	60 .0
	COLUMN TOTAL	24610 12.6	22800 11.7	27920 14.3	20370 10.4	23570 12.1	20300 10.4	18760 9.6	19600 10.1	17430 8.9	195440 100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 35
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* * * * * * * * * PAGE 3 OF 3

BETA	HR → COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
CD	35	0 0	30 .1	30 .1	0 0	30 .1	30 .1	10 .1	20 .1	0 0	150 .1
R2	37	2110 8.6	1440 6.3	3380 12.1	2690 13.2	2920 12.4	2030 10.0	1090 5.8	820 4.2	1950 11.2	18430 9.4
R1	38	170 .7	110 .5	0 0	370 1.8	160 .7	580 2.9	250 1.3	270 1.4	160 .9	2070 1.1
BT	40	170 .7	0 0	0 0	50 .2	10 .0	30 .1	0 0	20 .1	10 .1	290 .1
DO	41	0 0	0 0	0 0	0 0	0 0	0 0	20 .1	0 0	0 0	20 .0
HA	42	10 .0	0 0	40 .1	20 .1	20 .1	0 0	30 .2	30 .2	30 .2	180 .1
RV	43	230 .9	250 1.1	300 1.1	200 1.0	500 2.1	130 .6	250 1.3	480 2.4	370 2.1	2710 1.4
RO	44	80 .3	30 .1	210 .8	70 .3	110 .5	100 .5	140 .7	80 .4	90 .5	910 .5
BQ	45	0 0	20 .1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .0
RS	47	0 0	0 0	0 0	0 0	0 0	290 1.4	590 3.1	40 .2	140 .8	1060 .5
AV	48	30 .1	40 .2	170 .6	90 .4	260 1.1	380 1.9	580 3.1	840 4.3	510 2.9	2900 1.5
DA	49	40 .2	50 .2	0 0	10 .0	10 .0	10 .0	10 .1	0 0	10 .1	140 .1
FL	50	0 0	0 0	0 0	0 0	20 .1	220 1.1	70 .4	130 .7	100 .6	540 .3
NULL	99	4250 17.3	4280 18.8	3750 13.4	3000 14.7	1550 6.6	2760 13.6	2100 11.2	3450 17.5	1500 8.6	26640 13.6
	COLUMN TOTAL	24610 12.6	22800 11.7	27920 14.3	20370 10.4	23570 12.1	20300 10.4	18760 9.6	19660 10.1	17430 8.9	195440 100.0

RAW CHI SQUARE = 37931.95407 WITH 360 DEGREES OF FREEDOM. SIGNIFICANCE = 0

BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E38 E36

* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 3

BETA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
BI	2	40	0	0	0	0	0	0	0	0	40
		.2	0	0	0	0	0	0	0	0	.0
NP	3	20	0	10	50	0	0	20	50	0	150
		.1	0	.0	.2	0	0	.1	.2	0	.1
CH	4	0	0	0	20	50	0	50	0	0	120
		0	0	0	.1	.2	0	.3	0	0	.1
BU	5	150	130	270	250	270	40	30	0	0	1140
		.6	.6	1.1	1.2	1.1	.2	.2	0	0	.6
HH	7	510	560	890	790	510	120	370	540	250	4540
		2.2	2.8	3.6	3.8	2.0	.6	1.9	2.5	1.2	2.3
TH	8	230	540	650	910	560	110	750	320	20	4090
		1.0	2.7	2.7	4.4	2.2	.6	3.8	1.5	.1	2.1
FD	9	0	80	0	0	0	0	0	0	0	80
		0	.4	0	0	0	0	0	0	0	.0
ND	10	60	100	140	90	180	50	60	40	10	730
		.3	.5	.6	.4	.7	.3	.3	.2	.0	.4
TB	11	0	0	0	80	0	0	0	0	0	80
		0	0	0	.4	0	0	0	0	0	.0
CI	12	70	40	0	30	20	90	140	20	0	410
		.3	.2	0	.1	.1	.5	.7	.1	0	.2
HW	13	0	0	0	0	0	0	0	0	20	20
		0	0	0	0	0	0	0	0	.1	.0
M2	15	150	90	60	130	30	0	0	50	20	530
		.6	.4	.2	.6	.1	0	0	.2	.1	.3
M1	16	70	20	70	10	30	20	60	80	10	370
		.3	.1	.3	.0	.1	.1	.3	.4	.0	.2
AP	17	600	440	580	410	360	410	420	550	710	4480
		2.5	2.2	2.4	2.0	1.4	2.2	2.1	2.6	3.5	2.3
LO	18	190	130	160	670	540	510	340	190	510	3240
		.8	.6	.7	3.2	2.2	2.7	1.7	.9	2.5	1.7
DE	19	20	80	20	40	60	20	0	0	0	240
		.1	.4	.1	.2	.2	.1	0	0	0	.1
	COLUMN TOTAL	23620	20250	24440	20700	24980	18800	19770	21210	20380	194150
		12.2	10.4	12.6	10.7	12.9	9.7	10.2	10.9	10.5	100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 37
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E38 E36

* C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 3

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	0 0	20 .1	20 .1	60 .3	100 .4	70 .4	60 .3	150 .7	40 .2	520 .3
IG	21	30 .1	50 .2	50 .2	110 .5	70 .3	60 .3	60 .3	190 .9	20 .1	640 .3
SP	22	0 0	0 0	10 .0	0 0	0 0	20 .1	10 .1	60 .3	0 0	100 .1
DG	23	0 0	0 0	20 .1	40 .2	70 .3	40 .2	20 .1	40 .2	0 0	230 .1
SS	24	150 .6	60 .3	100 .4	100 .5	160 .6	10 .1	30 .2	350 1.7	170 .8	1130 .6
CB	25	690 2.9	470 2.3	920 3.8	490 2.4	200 .8	150 .8	280 1.4	480 2.3	400 2.0	4080 2.1
HO	26	3740 15.8	630 3.1	2350 9.6	1480 7.1	2690 10.8	2860 15.2	1730 8.8	2300 10.8	2610 12.8	20390 10.5
R4	27	0 0	0 0	0 0	630 3.0	110 .4	0 0	290 1.5	1240 5.8	130 .6	2400 1.2
R3	28	1680 7.1	4900 24.2	2050 8.4	5200 25.1	2720 10.9	3360 17.9	2990 15.1	2540 12.0	2510 12.3	27950 14.4
TU	29	280 1.2	460 2.3	560 2.3	290 1.4	650 2.6	270 1.4	200 1.0	180 .8	190 .9	3060 1.6
ST	30	0 0	30 .1	10 .0	10 .0	10 .0	30 .2	10 .1	50 .2	0 0	150 .1
EX	31	20 .1	0 0	0 0	80 .4	70 .3	0 0	20 .1	0 0	20 .1	210 .1
CR	32	5060 21.4	4380 21.6	3760 15.4	3660 17.7	6930 27.7	4350 23.1	3710 18.8	5800 27.3	6470 31.7	44120 22.7
BA	33	40 .2	60 .3	40 .2	0 0	50 .2	60 .3	60 .3	20 .1	30 .1	360 .2
SC	34	0 0	20 .1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .0
CD	35	20 .1	0 0	0 0	0 0	0 0	0 0	0 0	10 .0	0 0	30 .0
	COLUMN TOTAL	23620 12.2	20250 10.4	24440 12.6	20700 10.7	24980 12.9	18800 9.7	19770 10.2	21210 10.9	20380 10.5	194150 100.0

(CONTINUED)

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 38
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E38 E36

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 3 OF 3

BETA	COUNT / COL PCT	HR: 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
R2	37	4680 19.8	2780 13.7	2370 9.7	700 3.4	2100 8.4	920 4.9	2620 13.3	1190 5.6	1170 5.7	18530 9.5
R1	38	240 1.0	760 3.8	660 2.7	70 .3	60 .2	40 .2	90 .5	50 .2	50 .2	2020 1.0
SA	39	30 .1	30 .1	0 0	20 .1	0 0	0 0	0 0	0 0	10 .0	90 .0
BT	40	10 .0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	40 .2	50 .0
DD	41	10 .0	0 0	0 0	0 0	0 0	0 0	20 .1	20 .1	20 .1	70 .0
HA	42	0 0	10 .0	0 0	20 .1	30 .1	10 .1	40 .2	10 .0	30 .1	150 .1
RV	43	380 1.6	90 .4	250 1.0	240 1.2	370 1.5	100 .5	580 2.9	270 1.3	220 1.1	2500 1.3
RO	44	120 .5	60 .3	50 .2	60 .3	50 .2	130 .7	100 .5	0 0	100 .5	670 .3
RS	47	210 .9	0 0	0 0	0 0	0 0	0 0	0 0	30 .1	120 .6	360 .2
AV	48	160 .7	30 .1	20 .1	20 .1	220 .9	430 2.3	290 1.5	370 1.7	690 3.4	2230 1.1
DA	49	60 .3	0 0	0 0	40 .2	10 .0	20 .1	50 .3	30 .1	50 .2	260 .1
FL	50	0 0	0 0	0 0	0 0	0 0	0 0	70 .4	120 .6	140 .7	330 .2
NULL	99	3900 16.5	3200 15.8	8350 34.2	3900 18.8	5700 22.8	4500 23.9	4200 21.2	3870 18.2	3600 17.7	41220 21.2
	COLUMN TOTAL	23620 12.2	20250 10.4	24440 12.6	20700 10.7	24980 12.9	18800 9.7	19770 10.2	21210 10.9	20380 10.5	194150 100.0

RAW CHI SQUARE = 43193.80636 WITH 352 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 39
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 3

BETA	COUNT / COL PCT (HR)	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
MF	1	0 0	0 0	0 0	40 .2	0 0	30 .2	0 0	0 0	0 0	70 .0
NP	3	0 0	20 .1	40 .2	0 0	0 0	40 .2	0 0	20 .1	0 0	120 .1
CH	4	70 .4	120 .7	60 .3	280 1.4	50 .3	70 .4	0 0	0 0	0 0	650 .4
BU	5	50 .3	60 .3	140 .7	170 .8	20 .1	40 .2	80 .4	20 .1	40 .4	620 .4
HH	7	350 1.8	450 2.5	590 3.0	650 3.2	210 1.2	230 1.2	460 2.6	450 2.7	270 2.8	3660 2.3
TH	8	370 1.9	420 2.3	800 4.1	400 2.0	360 2.1	160 .8	360 2.0	400 2.4	270 2.8	3540 2.2
ND	10	0 0	30 .2	20 .1	0 0	0 0	0 0	20 .1	0 0	0 0	70 .0
TB	11	0 0	140 .8	30 .2	40 .2	0 0	60 .3	80 .4	0 0	20 .2	370 .2
CI	12	0 0	0 0	0 0	80 .4	0 0	0 0	0 0	70 .4	80 .8	230 .1
HW	13	0 0	20 .1	50 .3	20 .1	20 .1	0 0	0 0	0 0	0 0	110 .1
M3	14	50 .3	0 0	50 .3	0 0	0 0	70 .4	30 .2	0 0	0 0	200 .1
M2	15	330 1.7	80 .4	330 1.7	240 1.2	60 .4	190 1.0	20 .1	50 .3	50 .5	1350 .9
M1	16	110 .6	130 .7	50 .3	60 .3	40 .2	70 .4	60 .3	70 .4	100 1.0	690 .4
AP	17	110 .6	370 2.0	340 1.7	560 2.8	320 1.9	110 .6	890 4.9	250 1.5	20 .2	2970 1.9
LD	18	320 1.6	370 2.0	550 2.8	680 3.4	90 .5	390 2.0	190 1.1	250 1.5	290 3.0	3130 2.0
DE	19	20 .1	10 .1	0 0	20 .1	0 0	0 0	0 0	0 0	0 0	50 .0
	COLUMN TOTAL	19850 12.6	18140 11.5	19640 12.4	20130 12.7	17040 10.8	19250 12.2	17980 11.4	16430 10.4	9650 6.1	158130 100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 40
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED PAGE 2 OF 3

BETA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
HS	20	40 .2	420 2.3	190 1.0	380 1.9	150 .9	260 1.4	170 .9	120 .7	0 0	1730 1.1
IG	21	60 .3	50 .3	130 .7	0 0	50 .3	20 .1	0 0	50 .3	0 0	360 .2
SP	22	10 .1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	10 .0
DG	23	20 .1	40 .2	60 .3	40 .2	20 .1	60 .3	40 .2	60 .4	0 0	340 .2
SS	24	30 .2	60 .3	290 1.5	0 0	80 .5	0 0	0 0	370 2.2	0 0	830 .5
CB	25	240 1.2	180 1.0	260 1.3	460 2.3	190 1.1	370 1.9	880 4.9	250 1.5	30 .3	2860 1.8
HO	26	880 4.4	1400 7.7	1400 7.1	1140 5.7	1580 9.3	780 4.1	1200 6.7	2240 13.6	700 7.3	11320 7.2
R4	27	3330 16.8	2770 15.3	4430 22.6	470 2.3	2370 13.9	370 1.9	510 2.8	680 4.1	1090 11.3	16020 10.1
R3	28	8240 41.5	4480 24.7	3190 16.2	3920 19.5	2370 13.9	8880 46.1	2910 16.2	3170 19.3	1890 19.6	39030 24.7
TU	29	110 .6	80 .4	110 .6	240 1.2	100 .6	60 .3	320 1.8	90 .5	0 0	1110 .7
ST	30	0 0	20 .1	10 .1	20 .1	10 .1	20 .1	20 .1	10 .1	0 0	110 .1
EX	31	0 0	0 0	70 .4	0 0	20 .1	20 .1	80 .4	0 0	0 0	190 .1
CR	32	2210 11.1	4610 25.4	3390 17.3	3890 19.3	5010 29.4	3550 18.4	7480 41.6	3830 23.3	960 9.9	34980 22.1
BA	33	0 0	60 .3	70 .4	40 .2	20 .1	10 .1	0 0	0 0	0 0	200 .1
CD	35	20 .1	0 0	0 0	20 .1	0 0	0 0	80 .4	0 0	0 0	120 .1
R2	37	520 2.6	680 3.7	720 3.7	920 4.6	380 2.2	1070 5.6	370 2.1	630 3.8	260 2.7	5550 3.5
	COLUMN TOTAL	19850 12.6	18140 11.5	19640 12.4	20130 12.7	17040 10.8	19250 12.2	17980 11.4	16450 10.4	9650 6.1	158130 100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 41
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 3 OF 3

BETA	COUNT / COL PCT (HR)	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
R1	38	30 .2	60 .3	90 .5	350 1.7	50 .3	50 .3	160 .9	660 4.0	140 1.5	1590 1.0
SA	39	0 0	0 0	0 0	10 .0	0 0	10 .1	0 0	0 0	0 0	20 .0
BT	40	0 0	20 .1	20 .1	20 .1	0 0	0 0	100 .6	30 .2	0 0	190 .1
DD	41	0 0	0 0	20 .1	20 .1	10 .1	10 .1	0 0	0 0	10 .1	70 .0
HA	42	20 .1	10 .1	0 0	40 .2	0 0	10 .1	0 0	10 .1	0 0	90 .1
RV	43	200 1.0	130 .7	260 1.3	610 3.0	360 2.1	280 1.5	300 1.7	470 2.9	400 4.1	3010 1.9
RO	44	280 1.4	70 .4	330 1.7	570 2.8	140 .8	250 1.3	110 .6	240 1.5	400 4.1	2390 1.5
BQ	45	0 0	0 0	40 .2	40 .2	50 .3	0 0	0 0	0 0	0 0	130 .1
RS	47	0 0	0 0	80 .4	520 2.6	530 3.1	0 0	120 .7	970 5.9	110 1.1	2330 1.5
AV	48	90 .5	150 .8	120 .6	130 .6	60 .4	170 .9	380 2.1	180 1.1	320 3.3	1600 1.0
DA	49	10 .1	0 0	30 .2	30 .1	10 .1	40 .2	10 .1	30 .2	10 .1	170 .1
FL	50	0 0	0 0	0 0	10 .0	0 0	150 .8	100 .6	130 .8	40 .4	430 .3
NULL	99	1730 8.7	630 3.5	1280 6.5	3000 14.9	2310 13.6	1350 7.0	450 2.5	600 3.6	2150 22.3	13500 8.5
	COLUMN TOTAL	19850 12.6	18140 11.5	19640 12.4	20130 12.7	17040 10.8	19250 12.2	17980 11.4	16450 10.4	9650 6.1	158130 100.0

RAW CHI SQUARE = 52709.00570 WITH 352 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 42
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 4

BETA	COUNT COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
MF	1	0 0	0 0	20 .1	0 0	0 0	0 0	0 0	0 0	0 0	20 .0
BI	2	20 .1	0 0	0 0	0 0	0 0	0 0	20 .1	0 0	0 0	40 .0
NP	3	20 .1	30 .2	30 .2	30 .2	0 0	0 0	0 0	0 0	0 0	110 .1
CH	4	130 .7	80 .4	90 .5	60 .3	40 .2	100 .6	90 .5	0 0	10 .1	600 .4
BU	5	40 .2	40 .2	30 .2	0 0	100 .6	20 .1	40 .2	40 .2	80 .5	390 .2
M4	6	0 0	0 0	0 0	50 .3	0 0	110 .6	0 0	30 .2	0 0	190 .1
HH	7	470 2.5	710 3.9	430 2.2	420 2.3	760 4.2	810 4.7	170 .9	490 2.8	720 4.2	4980 3.1
TH	8	300 1.6	560 3.1	410 2.1	740 4.1	310 1.7	260 1.5	220 1.2	380 2.2	280 1.6	3460 2.1
ND	10	20 .1	40 .2	40 .2	20 .1	120 .7	60 .4	0 0	70 .4	70 .4	440 .3
TB	11	0 0	0 0	0 0	0 0	30 .2	0 0	0 0	0 0	0 0	30 .0
CI	12	0 0	0 0	0 0	0 0	40 .2	0 0	20 .1	250 1.5	110 .6	420 .3
HW	13	0 0	20 .1	50 .3	0 0	0 0	0 0	0 0	10 .1	0 0	80 .0
M3	14	0 0	50 .3	100 .5	100 .6	30 .2	250 1.5	0 0	0 0	0 0	530 .3
M2	15	180 1.0	420 2.3	250 1.3	130 .7	140 .8	210 1.2	80 .4	150 .9	20 .1	1580 1.0
M1	16	240 1.3	80 .4	70 .4	150 .8	150 .8	180 1.1	40 .2	70 .4	30 .2	1010 .6
AP	17	890 4.8	590 3.2	470 2.4	640 3.5	440 2.5	410 2.4	490 2.7	350 2.0	520 3.0	4800 3.0
	COLUMN TOTAL	18510 11.4	18360 11.3	19310 11.9	18140 11.2	17910 11.1	17100 10.6	18140 11.2	17220 10.6	17220 10.6	161910 100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 43
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 4

BETA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
LD	18	30	370	510	310	480	340	120	50	110	2320
		.2	2.0	2.6	1.7	2.7	2.0	.7	.3	.6	1.4
DE	19	0	40	30	0	20	30	60	40	0	220
		0	.2	.2	0	.1	.2	.3	.2	0	.1
HS	20	240	120	320	20	250	30	170	170	260	1580
		1.3	.7	1.7	.1	1.4	.2	.9	1.0	1.5	1.0
IG	21	80	0	110	20	0	0	30	30	30	300
		.4	0	.6	.1	0	0	.2	.2	.2	.2
SP	22	0	0	30	0	0	0	0	0	10	40
		0	0	.2	0	0	0	0	0	.1	.0
DG	23	130	20	170	0	70	0	0	20	20	430
		.7	.1	.9	0	.4	0	0	.1	.1	.3
SS	24	260	0	0	0	0	0	20	70	30	380
		1.4	0	0	0	0	0	.1	.4	.2	.2
CB	25	1310	640	460	920	90	280	1080	360	1390	6530
		7.1	3.5	2.4	5.1	.5	1.6	6.0	2.1	8.1	4.0
HO	26	500	1190	1220	1020	1690	1480	1480	1070	750	10400
		2.7	6.5	6.3	5.6	9.4	8.7	8.2	6.2	4.4	6.4
R4	27	0	0	120	0	0	0	0	130	0	250
		0	0	.6	0	0	0	0	.8	0	.2
R3	28	2580	2710	3540	3400	3100	6770	3410	3830	1520	30860
		13.9	14.8	18.3	18.7	17.3	39.6	18.8	22.2	8.8	19.1
TU	29	140	90	230	90	80	180	250	230	170	1460
		.8	.5	1.2	.5	.4	1.1	1.4	1.3	1.0	.9
ST	30	20	0	10	10	0	20	10	0	20	90
		.1	0	.1	.1	0	.1	.1	0	.1	.1
EX	31	20	60	110	130	20	60	90	20	0	510
		.1	.3	.6	.7	.1	.4	.5	.1	0	.3
CR	32	9370	8400	8670	6770	6850	3300	7420	5270	7930	63980
		50.6	45.8	44.9	37.3	38.2	19.3	40.9	30.6	46.1	39.5
BA	33	20	100	60	0	20	40	20	50	50	360
		.1	.5	.3	0	.1	.2	.1	.3	.3	.2
	COLUMN TOTAL	18510	18360	19310	18140	17910	17100	18140	17220	17220	161910
		11.4	11.3	11.9	11.2	11.1	10.6	11.2	10.6	10.6	100.0

(CONTINUED)

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 44
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 3 OF 4

BETA	COUNT / COL PCT (HR)	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
SC	34	0 0	0 0	0 0	0 0	20 .1	40 .2	60 .3	20 .1	0 0	140 .1
CD	35	0 0	0 0	10 .1	10 .1	20 .1	0 0	20 .1	10 .1	20 .1	90 .1
YA	36	20 .1	0 0	0 0	20 .1	0 0	30 .2	0 0	20 .1	0 0	90 .1
R2	37	520 2.8	640 3.5	310 1.6	640 3.5	640 3.6	430 2.5	460 2.5	940 5.5	980 5.7	5560 3.4
R1	38	0 0	160 .9	80 .4	350 1.9	840 4.7	50 .3	100 .6	1400 8.1	260 1.5	3240 2.0
SA	39	0 0	0 0	0 0	20 .1	0 0	0 0	0 0	0 0	0 0	20 .0
BT	40	0 0	0 0	20 .1	0 0	0 0	0 0	0 0	0 0	0 0	20 .0
DD	41	0 0	0 0	0 0	0 0	20 .1	0 0	0 0	20 .1	0 0	40 .0
HA	42	0 0	0 0	20 .1	30 .2	10 .1	10 .1	0 0	0 0	10 .1	80 .0
RV	43	180 1.0	90 .5	100 .5	300 1.7	210 1.2	240 1.4	260 1.4	170 1.0	130 .8	1680 1.0
RO	44	40 .2	160 .9	80 .4	90 .5	100 .6	280 1.6	250 1.4	210 1.2	150 .9	1360 .8
BQ	45	0 0	50 .3	20 .1	0 0	30 .2	100 .6	0 0	20 .1	0 0	220 .1
RS	47	0 0	0 0	0 0	0 0	0 0	0 0	0 0	270 1.6	0 0	270 .2
AV	48	140 .8	150 .8	140 .7	140 .8	270 1.5	70 .4	320 1.8	160 .9	260 1.5	1650 1.0
DA	49	0 0	0 0	0 0	10 .1	0 0	0 0	0 0	0 0	10 .1	20 .0
FL	50	0 0	0 0	0 0	0 0	20 .1	10 .1	40 .2	0 0	20 .1	90 .1
	COLUMN TOTAL	18510 11.4	18360 11.3	19310 11.9	18140 11.2	17910 11.1	17100 10.6	18140 11.2	17220 10.6	17220 10.6	161910 100.0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                82/11/04.     17.52.21.     PAGE   45
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E52         E53

* * * * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * *
       BETA        BETA FISH BEHAVIOUR CODES                 BY  HR           EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  4 OF  4
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BETA	HR / COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
NULL	99	600 3.2	750 4.1	950 4.9	1500 8.3	900 5.0	900 5.3	1300 7.2	800 4.6	1250 7.3	8950 5.5
	COLUMN TOTAL	18510 11.4	18360 11.3	19310 11.9	18140 11.2	17910 11.1	17100 10.6	18140 11.2	17220 10.6	17220 10.6	161910 100.0

RAW CHI SQUARE = 35802.67393 WITH 384 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 46
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 3

BETA	COUNT COL PCT	HR 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
NF	1	0 0	0 0	0 0	210 1.2	0 0	0 0	0 0	0 0	0 0	210 .1
NP	3	20 .1	10 .1	10 .1	10 .1	0 0	10 .0	0 0	0 0	0 0	60 .0
CH	4	30 .2	40 .2	70 .4	140 .8	70 .4	40 .2	50 .3	0 0	80 .4	520 .3
BU	5	20 .1	100 .5	80 .4	40 .2	60 .3	60 .3	90 .5	20 .1	80 .4	550 .3
M4	6	0 0	0 0	0 0	40 .2	20 .1	0 0	0 0	0 0	0 0	60 .0
HH	7	800 4.1	1210 6.5	780 4.2	960 5.7	900 4.6	670 3.2	940 5.1	240 1.2	1110 5.1	7610 4.4
TH	8	870 4.5	970 5.2	690 3.7	590 3.5	850 4.3	310 1.5	600 3.3	210 1.1	750 3.4	5840 3.3
FD	9	0 0	0 0	0 0	50 .3	0 0	0 0	0 0	0 0	0 0	50 .0
ND	10	60 .3	140 .8	70 .4	0 0	20 .1	60 .3	0 0	0 0	0 0	350 .2
TB	11	80 .4	840 4.5	310 1.7	590 3.5	420 2.1	980 4.6	550 3.0	140 .7	420 1.9	4330 2.5
CI	12	20 .1	0 0	20 .1	80 .5	0 0	0 0	50 .3	0 0	40 .2	210 .1
M3	14	40 .2	0 0	0 0	120 .7	80 .4	0 0	30 .2	0 0	0 0	270 .2
M2	15	210 1.1	360 1.9	290 1.5	310 1.8	200 1.0	90 .4	240 1.3	0 0	270 1.2	1970 1.1
M1	16	10 .1	100 .5	50 .3	110 .6	70 .4	90 .4	100 .5	160 .8	120 .5	810 .5
AP	17	190 1.0	320 1.7	370 2.0	120 .7	180 .9	180 .8	170 .9	230 1.2	200 .9	1960 1.1
LD	18	470 2.4	570 3.1	570 3.0	1180 7.0	390 2.0	970 4.6	680 3.7	380 1.9	970 4.4	6180 3.5
	COLUMN TOTAL	19400 11.1	18500 10.6	18750 10.7	16930 9.7	19740 11.3	21190 12.1	18260 10.5	19990 11.4	21930 12.6	174690 100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 47
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 3

BETA	COUNT / COL PCT	HR 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
DE	19	10 .1	0 0	0 0	50 .3	30 .2	30 .1	0 0	0 0	10 .0	130 .1
HS	20	60 .3	0 0	0 0	30 .2	0 0	0 0	0 0	60 .3	0 0	150 .1
IG	21	30 .2	60 .3	0 0	60 .4	0 0	0 0	0 0	0 0	0 0	150 .1
SP	22	0 0	0 0	0 0	10 .1	0 0	0 0	0 0	0 0	0 0	10 .0
DG	23	20 .1	0 0	0 0	20 .1	0 0	0 0	0 0	0 0	0 0	40 .0
SS	24	0 0	20 .1	0 0	200 1.2	0 0	0 0	0 0	0 0	0 0	220 .1
CB	25	220 1.1	90 .5	280 1.5	720 4.3	60 .3	210 1.0	390 2.1	630 3.2	0 0	2600 1.5
HD	26	2630 13.6	1940 10.5	2570 13.7	1590 9.4	2240 11.3	2120 10.0	1590 8.7	2670 13.4	1960 8.9	19310 11.1
R4	27	0 0	0 0	140 .7	0 0	470 2.4	0 0	0 0	0 0	110 .5	720 .4
R3	28	5230 27.0	3480 18.8	6160 32.9	4730 27.9	5080 25.7	5730 27.0	5310 29.1	3510 17.6	4600 21.0	43830 25.1
TU	29	290 1.5	120 .6	210 1.1	220 1.3	230 1.2	130 .6	450 2.5	230 1.2	260 1.2	2140 1.2
ST	30	0 0	0 0	0 0	0 0	20 .1	10 .0	0 0	0 0	0 0	30 .0
EX	31	0 0	0 0	0 0	80 .5	0 0	0 0	80 .4	110 .5	30 .1	300 .2
CR	32	4820 24.8	2960 16.0	3170 16.9	2470 14.6	4510 22.8	2300 10.9	3500 19.2	4300 22.5	3010 13.7	31240 17.9
BA	33	20 .1	40 .2	60 .3	30 .2	40 .2	20 .1	130 .7	0 0	0 0	340 .2
CD	35	0 0	10 .1	0 0	0 0	0 0	10 .0	0 0	0 0	10 .0	30 .0
	COLUMN TOTAL	19400 11.1	18500 10.6	18750 10.7	16930 9.7	19740 11.3	21190 12.1	18260 10.5	19990 11.4	21930 12.6	174690 100.0

(CONTINUED)

BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 3 OF 3

BETA	HR COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	570 2.9	2790 15.1	1510 8.1	690 4.1	760 3.9	1950 9.2	1480 8.1	1140 5.7	1590 7.3	12480 7.1
R1	38	490 2.5	70 .4	30 .2	130 .8	250 1.3	20 .1	30 .2	330 1.7	130 .6	1480 .8
SA	39	0 0	0 0	0 0	0 0	0 0	0 0	20 .1	0 0	0 0	20 .0
BT	40	40 .2	20 .1	20 .1	0 0	0 0	0 0	0 0	20 .1	50 .2	150 .1
HA	42	0 0	10 .1	0 0	40 .2	0 0	20 .1	0 0	20 .1	10 .0	100 .1
RV	43	420 2.2	260 1.4	240 1.3	80 .5	400 2.0	340 1.6	310 1.7	260 1.3	600 2.7	2910 1.7
RO	44	200 1.0	270 1.5	80 .4	280 1.7	190 1.0	440 2.1	360 2.0	520 2.6	560 2.6	2900 1.7
BQ	45	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	30 .1	30 .0
RS	47	0 0	90 .5	0 0	0 0	0 0	0 0	10 .1	100 .5	480 2.2	680 .4
AV	48	0 0	0 0	60 .3	20 .1	50 .3	100 .5	150 .8	490 2.5	270 1.2	1140 .7
DA	49	30 .2	10 .1	10 .1	30 .2	0 0	0 0	50 .3	20 .1	10 .0	160 .1
FL	50	0 0	0 0	0 0	0 0	0 0	0 0	0 0	100 .5	70 .3	170 .1
NULL	99	1500 7.7	1600 8.6	900 4.8	900 5.3	2150 10.9	4300 20.3	900 4.9	3900 19.5	4100 18.7	20250 11.6
	COLUMN TOTAL	19400 11.1	18500 10.6	18750 10.7	16930 9.7	19740 11.3	21190 12.1	18600 10.5	19990 11.4	21930 12.6	174690 100.0

RAW CHI SQUARE = 38522.74725 WITH 352 DEGREES OF FREEDOM. SIGNIFICANCE = 0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)           82/11/04.    17.52.21.    PAGE   49
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (ALL BEHAVIOUR CLASS

CPU TIME REQUIRED..    23.9810 SECONDS

              TASK NAME       ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
              CROSSTABS       VARIABLES=ALPHA(1,19),HR(1,9)/TABLES=ALPHA BY HR
              OPTIONS         3,5,7
              STATISTICS      1

        00052500 CM NEEDED FOR CROSSTABS


        OPTION - 1
        IGNORE MISSING VALUE INDICATORS
        (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

        OPTION - 3
        DELETE ROW PERCENTAGES

        OPTION - 5
        DELETE TOTAL PERCENTAGES
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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)            82/11/04.    17.52.21.    PAGE  50
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E11         E13

* * * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * *
    ALPHA       ALPHA FISH BEHAVIOUR CODES                  BY   HR           EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  2
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ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
BI	2	0	20	0	0	10	10	0	10	0	50
		0	.9	0	0	.6	.6	0	.3	0	.2
NP	3	20	30	0	0	90	30	50	60	20	300
		1.2	1.3	0	0	5.0	1.8	1.7	2.0	.7	1.4
CH	4	0	230	40	10	170	100	20	20	0	590
		0	10.3	1.6	.4	9.4	5.9	.7	.7	0	2.8
BU	5	20	0	40	120	50	90	20	60	30	430
		1.2	0	1.6	4.6	2.8	5.3	.7	2.0	1.1	2.0
HH	7	330	200	590	380	120	240	930	860	500	4150
		19.9	8.9	23.1	14.6	6.7	14.2	32.1	29.0	18.7	19.7
TH	8	270	300	350	240	50	180	310	350	470	2520
		16.3	13.4	13.7	9.2	2.8	10.7	10.7	11.8	17.6	12.0
FD	9	0	0	0	0	0	0	0	0	20	20
		0	0	0	0	0	0	0	0	.7	.1
ND	10	0	60	40	60	0	20	60	110	30	380
		0	2.7	1.6	2.3	0	1.2	2.1	3.7	1.1	1.8
TB	11	0	60	40	0	0	90	350	250	0	790
		0	2.7	1.6	0	0	5.3	12.1	8.4	0	3.7
CI	12	50	130	30	0	0	70	20	230	60	590
		3.0	5.8	1.2	0	0	4.1	.7	7.7	2.2	2.8
HW	13	0	0	0	0	0	10	0	0	0	10
		0	0	0	0	0	.6	0	0	0	.0
M3	14	20	70	0	0	0	80	0	30	20	220
		1.2	3.1	0	0	0	4.7	0	1.0	.7	1.0
M2	15	110	330	190	170	130	40	330	120	80	1500
		6.6	14.7	7.5	6.5	7.2	2.4	11.4	4.0	3.0	7.1
M1	16	140	150	180	200	30	120	150	100	170	1240
		8.4	6.7	7.1	7.7	1.7	7.1	5.2	3.4	6.4	5.9
AP	17	210	510	430	690	850	490	250	130	430	3990
		12.7	22.8	16.9	26.5	47.2	29.0	8.6	4.4	16.1	18.9
LD	18	470	130	560	710	240	100	400	620	820	4050
		23.3	5.8	22.0	27.3	13.3	5.9	13.8	20.9	30.7	19.2
	COLUMN TOTAL	1660	2240	2550	2600	1800	1690	2900	2970	2670	21030
		7.9	10.6	12.1	12.3	8.5	8.0	13.8	14.1	12.7	100.0

(CONTINUED)

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                    82/11/04.    17.52.21.    PAGE  51
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
FILE   RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE   E11          E13

* * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * * *
     ALPHA      ALPHA FISH BEHAVIOUR CODES                    BY  HR        EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  2 OF  2
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ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
DE	19	20 1.2	20 .9	60 2.4	20 .8	60 3.3	20 1.2	10 .3	20 .7	20 .7	250 1.2
	COLUMN TOTAL	1660 7.9	2240 10.6	2550 12.1	2600 12.3	1800 8.5	1690 8.0	2900 13.8	2970 14.1	2670 12.7	21080 100.0

RAW CHI SQUARE = 8084.48708 WITH 128 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 163700

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                82/11/04.     17.52.21.     PAGE   52
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
FILE    RUFUS      (CREATION DATE =  82/11/04.)
SUBFILE    E29             E32

* * * * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * *
      ALPHA      ALPHA FISH BEHAVIOUR CODES                        BY   HR              EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  2
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ALPHA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
BI	2	0 0	0 0	0 0	0 0	30 1.0	0 0	10 .5	10 .4	10 .4	60 .3
NP	3	0 0	10 1.3	0 0	0 0	90 3.0	120 3.7	100 5.2	30 1.3	90 3.2	440 2.4
CH	4	0 0	20 2.6	10 1.0	10 .6	100 3.4	100 3.1	160 8.3	120 5.2	180 6.3	700 3.9
BU	5	0 0	0 0	30 3.0	150 9.4	190 6.4	120 3.7	140 7.3	40 1.7	110 3.9	780 4.3
HH	7	110 7.1	160 20.8	170 17.0	220 13.8	300 10.1	140 4.3	130 6.8	430 18.5	230 8.1	1890 10.4
TH	8	120 7.7	100 13.0	80 8.0	180 11.3	130 4.4	70 2.2	30 1.6	150 6.5	80 2.8	940 5.2
FD	9	0 0	0 0	0 0	0 0	30 1.0	20 .6	30 1.6	0 0	0 0	80 .4
ND	10	50 3.2	0 0	10 1.0	200 12.6	100 3.4	30 .9	0 0	0 0	60 2.1	450 2.5
TB	11	80 5.2	0 0	40 4.0	40 2.5	20 .7	80 2.5	0 0	80 3.4	0 0	340 1.9
CI	12	0 0	70 9.1	0 0	80 5.0	90 3.0	80 2.5	0 0	70 3.0	0 0	390 2.1
HW	13	0 0	20 2.6	0 0	0 0	20 .7	0 0	0 0	10 .4	0 0	50 .3
M3	14	0 0	0 0	0 0	0 0	30 1.0	30 .9	0 0	0 0	0 0	60 .3
M2	15	20 1.3	0 0	20 2.0	0 0	180 6.1	220 6.8	40 2.1	20 .9	130 4.6	630 3.5
M1	16	90 5.8	30 3.9	40 4.0	70 4.4	270 9.1	240 7.5	140 7.3	150 6.5	190 6.7	1220 6.7
AP	17	740 47.7	300 39.0	210 21.0	320 20.1	650 21.9	780 24.2	630 32.8	500 21.6	1020 35.9	5150 28.3
LD	18	210 13.5	40 5.2	300 30.0	210 13.2	710 23.9	1130 35.1	470 24.5	640 27.6	700 24.6	4410 24.3
	COLUMN TOTAL	1550 8.5	770 4.2	1000 5.5	1590 8.7	2970 16.3	3220 17.7	1920 10.5	2320 12.8	2840 15.6	18180 100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 53
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
PAGE 2 OF 2

ALPHA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
DE	19	130 8.4	20 2.6	90 9.0	110 6.9	30 1.0	60 1.9	40 2.1	70 3.0	40 1.4	590 3.2
	COLUMN TOTAL	1550 8.5	770 4.2	1000 5.5	1590 8.7	2970 16.3	3220 17.7	1920 10.6	2320 12.8	2840 15.6	18180 100.0

RAW CHI SQUARE = 5414.56431 WITH 128 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 176050

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.32.21. PAGE 54
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 2

ALPHA	COUNT COL PCT	HR 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
MF	1	0 0	0 0	0 0	0 0	30 1.6	30 1.3	0 0	0 0	30 2.8	90 .6
BI	2	0 0	0 0	0 0	0 0	0 0	20 .8	0 0	0 0	0 0	20 .1
CH	4	0 0	0 0	20 1.0	0 0	20 1.1	100 4.2	110 4.4	70 2.7	110 10.4	430 2.7
BU	5	0 0	30 2.2	0 0	0 0	20 1.1	20 .8	80 3.2	90 3.4	20 1.9	260 1.6
M4	6	0 0	0 0	0 0	0 0	20 1.1	10 .4	0 0	0 0	0 0	30 .2
HH	7	70 6.9	160 11.9	270 13.2	330 24.6	260 14.1	210 8.8	600 24.0	360 13.6	180 17.0	2440 15.1
TH	8	150 14.9	230 17.0	260 12.7	180 13.4	150 8.1	220 9.2	240 9.6	330 12.5	110 10.4	1870 11.6
FD	9	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .8	0 0	20 .1
ND	10	60 5.9	30 2.2	190 9.3	0 0	20 1.1	20 .8	50 2.0	40 1.5	0 0	410 2.5
TB	11	0 0	170 12.6	10 .5	20 1.5	90 4.9	0 0	0 0	0 0	40 3.8	330 2.0
CI	12	100 9.9	0 0	80 3.9	110 8.2	50 2.7	160 6.7	50 2.0	20 .8	30 2.8	600 3.7
HW	13	0 0	0 0	0 0	20 1.5	0 0	20 .8	0 0	0 0	20 1.9	60 .4
M3	14	0 0	40 3.0	0 0	0 0	100 5.4	70 2.9	0 0	30 1.1	20 1.9	260 1.6
M2	15	10 1.0	50 3.7	30 1.5	0 0	80 4.3	180 7.5	100 4.0	190 7.2	80 7.5	720 4.4
M1	16	60 5.9	90 6.7	20 1.0	90 6.7	110 5.9	240 10.0	380 15.2	320 12.1	130 12.3	1440 8.9
AP	17	320 31.7	160 11.9	700 34.3	20 1.5	240 13.0	270 11.3	250 10.0	380 14.4	120 11.3	2460 15.2
	COLUMN TOTAL	1010 5.2	1350 8.3	2040 12.6	1340 8.3	1850 11.4	2390 14.8	2500 15.5	2640 16.3	1060 6.6	16180 100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 55
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 2

ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
LD	18	210 20.8	350 25.9	420 20.6	570 42.5	640 34.6	820 34.3	620 24.8	760 28.8	170 16.0	4560 28.2
DE	19	30 3.0	40 3.0	40 2.0	0 0	20 1.1	0 0	20 .8	30 1.1	0 0	180 1.1
	COLUMN TOTAL	1010 6.2	1350 8.3	2040 12.6	1340 8.3	1850 11.4	2390 14.8	2500 15.5	2640 16.3	1060 6.6	16180 100.0

RAW CHI SQUARE = 5961.81427 WITH 136 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 179260

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 56
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E38 E36

* * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
BI	2	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .9	20 .2
NP	3	0 0	0 0	0 0	10 1.2	0 0	0 0	10 .6	20 1.3	10 .4	50 .5
CH	4	0 0	0 0	0 0	0 0	0 0	40 2.6	40 2.4	40 2.6	170 7.4	290 2.7
BU	5	0 0	0 0	20 2.8	20 2.5	20 1.6	40 2.6	20 1.2	20 1.3	20 .9	160 1.5
HH	7	110 20.4	60 27.3	220 30.6	300 37.0	270 21.4	120 7.8	140 8.5	160 10.3	420 18.3	1800 17.0
TH	8	40 7.4	0 0	160 22.2	40 4.9	60 4.8	110 7.1	190 11.5	160 10.3	100 4.4	860 8.1
FD	9	0 0	0 0	0 0	0 0	10 .8	20 1.3	0 0	0 0	0 0	30 .3
ND	10	0 0	0 0	0 0	0 0	10 .8	20 1.3	0 0	0 0	40 1.7	70 .7
TB	11	60 11.1	0 0	80 11.1	0 0	80 6.3	0 0	90 5.5	150 9.7	190 8.3	650 6.1
CI	12	0 0	0 0	0 0	50 6.2	20 1.6	100 6.5	50 3.0	20 1.3	230 10.0	470 4.4
HW	13	0 0	0 0	0 0	0 0	0 0	40 2.6	20 1.2	0 0	0 0	60 .6
M2	15	20 3.7	0 0	0 0	0 0	0 0	20 1.3	160 9.7	150 9.7	90 3.9	440 4.2
M1	16	0 0	10 4.5	20 2.8	20 2.5	70 5.6	110 7.1	60 3.6	130 8.4	80 3.5	500 4.7
AP	17	70 13.0	50 22.7	60 8.3	120 14.8	150 11.9	430 27.9	380 23.0	360 23.2	490 21.4	2110 19.9
LD	18	160 29.6	90 40.9	150 20.8	250 30.9	550 43.7	470 30.5	440 26.7	310 20.0	390 17.0	2810 26.6
DE	19	80 14.8	10 4.5	10 1.4	0 0	20 1.6	20 1.3	50 3.0	30 1.9	40 1.7	260 2.5
COLUMN TOTAL		540 5.1	220 2.1	720 6.8	810 7.7	1260 11.9	1540 14.6	1650 15.6	1550 14.7	2290 21.6	10580 100.0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)           82/11/04.    17.52.21.    PAGE   57
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
RAW CHI SQUARE =  3508.77887 WITH   120 DEGREES OF FREEDOM.  SIGNIFICANCE =      0

NUMBER OF MISSING OBSERVATIONS =  183570
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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 58
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
MF	1	0 0	0 0	0 0	40 1.1	0 0	30 1.3	0 0	0 0	0 0	70 .4
NP	3	20 .8	0 0	0 0	0 0	0 0	50 2.1	0 0	20 .9	0 0	90 .5
CH	4	0 0	20 1.0	20 .9	50 1.4	20 1.3	180 7.7	60 3.2	120 5.6	20 1.8	490 2.5
BU	5	110 4.5	20 1.0	80 3.6	140 3.9	0 0	0 0	0 0	20 .9	0 0	370 1.9
HH	7	730 29.9	660 33.2	500 22.5	530 14.6	220 14.3	460 19.7	410 22.0	350 16.4	290 25.9	4150 21.5
TH	8	240 9.8	100 5.0	230 10.4	320 8.8	280 18.2	220 9.4	320 17.2	500 23.5	280 25.0	2490 12.9
ND	10	0 0	50 2.5	60 2.7	50 1.4	20 1.3	70 3.0	40 2.2	60 2.8	40 3.6	390 2.0
TB	11	0 0	0 0	90 4.1	110 3.0	0 0	0 0	80 4.3	60 2.8	0 0	340 1.8
CI	12	0 0	0 0	0 0	80 2.2	0 0	20 .9	0 0	130 6.1	0 0	230 1.2
HW	13	0 0	40 2.0	0 0	0 0	0 0	20 .9	0 0	0 0	0 0	60 .3
M3	14	10 .4	0 0	150 6.8	210 5.8	60 3.9	60 2.6	70 3.8	70 3.3	0 0	630 3.3
M2	15	150 6.1	100 5.0	140 6.3	720 19.8	280 18.2	270 11.6	290 15.6	360 16.9	170 15.2	2480 12.9
M1	16	170 7.0	130 6.5	120 5.4	240 6.6	110 7.1	100 4.3	130 7.0	130 6.1	50 4.5	1180 6.1
AP	17	740 30.3	670 33.7	640 28.8	580 16.0	410 26.6	670 28.8	300 16.1	230 10.8	260 23.2	4500 23.4
LD	18	210 8.6	170 8.5	190 8.6	540 14.9	130 8.4	170 7.3	160 8.6	80 3.8	0 0	1650 8.6
DE	19	60 2.5	30 1.5	0 0	20 .6	10 .6	10 .4	0 0	0 0	10 .9	140 .7
	COLUMN TOTAL	2440 12.7	1990 10.3	2220 11.5	3630 18.8	1540 8.0	2330 12.1	1800 9.7	2130 11.1	1120 5.8	19260 100.0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)              82/11/04.    17.52.21.    PAGE   59
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
RAW CHI SQUARE =  5190.70186 WITH   120 DEGREES OF FREEDOM.  SIGNIFICANCE =       0

NUMBER OF MISSING OBSERVATIONS =  138870
```

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 60
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 2

ALPHA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
MF	1	0 0	0 0	20 1.0	0 0	0 0	0 0	0 0	0 0	0 0	20 .1
NP	3	0 0	0 0	10 .5	0 0	10 .5	10 .4	20 1.7	0 0	0 0	50 .3
CH	4	30 2.3	0 0	20 1.0	0 0	20 1.1	0 0	30 2.5	0 0	0 0	100 .7
BU	5	0 0	50 2.7	0 0	0 0	0 0	100 4.2	0 0	0 0	150 8.5	300 2.0
M4	6	0 0	0 0	0 0	0 0	30 1.6	0 0	0 0	0 0	0 0	30 .2
HH	7	250 19.1	420 22.6	180 9.0	230 16.7	350 18.6	400 16.9	140 11.9	230 17.4	320 18.1	2520 16.7
TH	8	170 13.0	210 11.3	230 11.6	280 20.3	330 17.6	400 16.9	120 10.2	20 1.5	310 17.5	2070 13.8
ND	10	0 0	60 3.2	40 2.0	0 0	50 2.7	0 0	0 0	0 0	20 1.1	170 1.1
TB	11	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	50 2.8	50 .3
CI	12	0 0	0 0	20 1.0	30 2.2	20 1.1	30 1.3	60 5.1	40 3.0	30 1.7	230 1.5
HW	13	0 0	20 1.1	0 0	20 1.4	0 0	0 0	0 0	0 0	0 0	40 .3
M3	14	0 0	0 0	30 1.5	0 0	30 1.6	0 0	0 0	0 0	80 4.5	140 .9
M2	15	60 4.6	110 5.9	40 2.0	80 5.8	70 3.7	80 3.4	20 1.7	60 4.5	170 9.6	690 4.6
M1	16	0 0	50 2.7	160 8.0	40 2.9	80 4.3	110 4.7	110 9.3	50 3.8	130 7.3	730 4.9
AP	17	690 52.7	670 36.0	770 38.7	300 21.7	590 31.4	710 30.1	550 46.6	570 43.2	430 24.3	5280 35.1
LD	18	110 8.4	250 13.4	470 23.6	400 29.0	280 14.9	520 22.0	110 9.3	290 22.0	80 4.5	2510 16.7
	COLUMN TOTAL	1310 8.7	1860 12.4	1990 13.2	1380 9.2	1880 12.5	2360 15.7	1180 7.8	1320 8.8	1770 11.8	15030 100.0

(CONTINUED)

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 61
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 2

	HR / COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
ALPHA DE	19	0 0	20 1.1	0 0	0 0	20 1.1	0 0	20 1.7	60 4.5	0 0	120 .8
	COLUMN TOTAL	1310 8.7	1860 12.4	1990 13.2	1380 9.2	1880 12.5	2360 15.7	1180 7.8	1320 8.8	1770 11.8	15050 100.0

RAW CHI SQUARE = 4454.32214 WITH 128 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 146860

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                82/11/04.    17.52.21.    PAGE  62
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE   E54          E55
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C R O S S T A B U L A T I O N   O F
ALPHA   ALPHA FISH BEHAVIOUR CODES   BY HR   EXP. TIME ELAPSED

PAGE 1 OF 2

ALPHA	COUNT COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
MF	1	0 0	0 0	0 0	210 8.7	0 0	0 0	0 0	0 0	0 0	210 .9
BI	2	0 0	0 0	0 0	0 0	0 0	0 0	20 .6	0 0	10 .3	30 .1
NP	3	20 1.3	10 .4	10 .4	30 1.2	0 0	20 .7	30 .9	30 1.0	60 1.8	210 .9
CH	4	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .6	20 .6	40 .2
BU	5	0 0	20 .9	40 1.7	20 .8	0 0	70 2.3	0 0	0 0	70 2.1	220 .9
M4	6	0 0	0 0	20 .8	0 0	0 0	0 0	0 0	40 1.3	0 0	60 .3
HH	7	350 22.7	950 42.0	650 27.4	820 33.9	910 39.2	1150 37.5	840 26.2	1180 37.6	1040 30.5	7890 33.2
TH	8	160 10.4	290 12.8	310 13.1	310 12.8	470 20.3	380 12.4	410 12.8	500 15.9	690 20.2	3520 14.8
FD	9	0 0	0 0	0 0	50 2.1	0 0	0 0	0 0	0 0	20 .6	70 .3
ND	10	10 .6	50 2.2	50 2.1	20 .8	50 2.2	160 5.2	70 2.2	70 2.2	100 2.9	580 2.4
TB	11	20 1.3	50 2.2	130 5.5	0 0	30 1.3	0 0	360 11.2	200 6.4	60 1.8	850 3.6
CI	12	20 1.3	0 0	20 .8	40 1.7	0 0	0 0	40 1.2	0 0	10 .3	130 .5
HW	13	0 0	0 0	40 1.7	0 0	0 0	0 0	0 0	0 0	0 0	40 .2
M3	14	60 3.9	0 0	40 1.7	110 4.5	0 0	50 1.6	20 .5	0 0	30 .9	310 1.3
M2	15	200 13.0	120 5.3	360 15.2	210 8.7	160 6.9	170 5.5	120 3.7	280 8.9	120 3.5	1740 7.3
M1	16	20 1.3	50 2.2	70 3.0	30 1.2	90 3.9	180 5.9	110 3.4	160 5.1	90 2.6	800 3.4
	COLUMN TOTAL	1540 6.5	2260 9.5	2370 10.0	2420 10.2	2320 9.8	3070 12.9	3200 13.5	3140 13.2	3410 14.4	23730 100.0

(CONTINUED)

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 63
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 2

ALPHA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
AP	17	400 26.0	400 17.7	190 8.0	310 12.8	390 16.8	310 10.1	260 8.1	350 11.1	310 9.1	2920 12.3
LD	18	280 18.2	320 14.2	440 18.6	260 10.7	220 9.5	580 18.9	920 28.8	310 9.9	780 22.9	4110 17.3
	COLUMN TOTAL	1540 6.5	2260 9.5	2370 10.0	2420 10.2	2320 9.8	3070 12.9	3200 13.5	3140 13.2	3410 14.4	23730 100.0

RAW CHI SQUARE = 6867.41851 WITH 136 DEGREES OF FREEDOM. SIGNIFICANCE = . 0

NUMBER OF MISSING OBSERVATIONS = 150960

```
CPU TIME REQUIRED..    18.5310 SECONDS

          TASK NAME      BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
          CROSSTABS      VARIABLES=BETA(1,19),HR(1,9)/TABLES=BETA BY HR
          OPTIONS        3,5,7
          STATISTICS     1

     00052500 CM NEEDED FOR CROSSTABS

     OPTION - 1
     IGNORE MISSING VALUE INDICATORS
     (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

     OPTION - 3
     DELETE ROW PERCENTAGES

     OPTION - 5
     DELETE TOTAL PERCENTAGES
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BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED

BETA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
NP	3	20 1.4	0 0	0 0	0 0	0 0	0 0	10 .5	0 0	0 0	30 .2
CH	4	0 0	0 0	0 0	10 .5	0 0	0 0	0 0	0 0	80 2.6	90 .5
BU	5	20 1.4	0 0	140 5.2	60 2.9	0 0	60 3.2	0 0	20 .8	60 2.0	360 2.0
M4	6	0 0	0 0	0 0	0 0	30 2.9	0 0	0 0	0 0	0 0	30 .2
HH	7	430 30.7	220 17.3	360 13.3	320 15.3	100 9.5	520 27.8	450 24.6	720 27.2	810 26.8	3930 22.0
TH	8	280 20.0	200 15.7	390 14.4	100 4.8	60 5.7	280 15.0	410 22.4	400 15.1	450 14.9	2570 14.4
ND	10	40 2.9	80 6.3	60 2.2	90 4.3	0 0	140 7.5	20 1.1	10 .4	40 1.3	480 2.7
TB	11	0 0	0 0	20 .7	0 0	0 0	0 0	0 0	30 1.1	390 12.9	440 2.5
CI	12	40 2.9	70 5.5	170 6.3	0 0	250 23.8	110 5.9	20 1.1	20 .8	60 2.0	740 4.1
HW	13	0 0	0 0	40 1.5	0 0	0 0	0 0	0 0	0 0	0 0	40 .2
M3	14	0 0	0 0	0 0	0 0	0 0	20 1.1	0 0	0 0	0 0	20 .1
M2	15	50 3.6	0 0	50 1.8	0 0	90 8.6	20 1.1	30 1.6	120 4.5	150 5.0	510 2.9
M1	16	30 2.1	60 4.7	120 4.4	40 1.9	80 7.6	110 5.9	130 7.1	70 2.6	60 2.0	700 3.9
AP	17	230 16.4	550 43.3	510 18.8	720 34.4	190 18.1	420 22.5	350 19.1	430 16.2	320 10.6	3720 20.8
LD	18	240 17.1	90 7.1	850 31.4	750 35.9	230 21.9	190 10.2	410 22.4	820 30.9	580 19.2	4160 23.3
DE	19	20 1.4	0 0	0 0	0 0	20 1.9	0 0	0 0	10 .4	20 .7	70 .4
	COLUMN TOTAL	1400 7.8	1270 7.1	2710 15.1	2090 11.7	1050 5.9	1870 10.5	1830 10.2	2650 14.8	3020 16.9	17890 100.0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)              82/11/04.    17.52.21.    PAGE   66
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
RAW CHI SQUARE =  7560.92854 WITH   120 DEGREES OF FREEDOM.  SIGNIFICANCE =       0

NUMBER OF MISSING OBSERVATIONS =  166890
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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 67
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
PAGE 1 OF 2

BETA	COUNT COL PCT	HR 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
NP	3	0 0	10 .4	30 1.3	0 0	10 .4	0 0	0 0	0 0	0 0	50 .2
CH	4	80 3.3	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	80 .4
BU	5	40 1.6	120 4.5	140 6.1	130 4.0	20 .9	170 5.2	60 2.5	100 4.7	40 1.9	820 3.6
M4	6	80 3.3	30 1.1	0 0	0 0	0 0	30 .9	0 0	0 0	0 0	140 .6
HH	7	190 7.8	310 11.6	230 10.0	460 14.2	250 11.0	160 4.9	310 12.7	150 7.1	130 6.3	2190 9.6
TH	8	110 4.5	360 13.5	90 3.9	400 12.4	140 6.2	70 2.2	200 8.2	150 7.1	70 3.4	1590 7.0
FD	9	0 0	20 .7	0 0	0 0	50 2.2	0 0	0 0	0 0	0 0	70 .3
ND	10	80 3.3	90 3.4	100 4.3	220 6.8	160 7.0	40 1.2	60 2.5	170 8.0	50 2.4	970 4.3
TB	11	40 1.6	0 0	0 0	0 0	20 .9	0 0	0 0	0 0	0 0	60 .3
CI	12	0 0	0 0	30 1.3	110 3.4	0 0	40 1.2	20 .8	90 4.2	0 0	290 1.3
HW	13	0 0	20 .7	30 1.3	0 0	0 0	0 0	0 0	40 1.9	0 0	90 .4
M3	14	160 6.6	40 1.5	40 1.7	20 .6	90 4.0	80 2.5	0 0	20 .9	0 0	450 2.0
M2	15	190 7.8	110 4.1	150 6.5	90 2.8	210 9.3	240 7.4	170 7.0	0 0	60 2.9	1220 5.4
M1	16	180 7.4	100 3.7	60 2.6	80 2.5	190 8.4	170 5.2	10 .4	100 4.7	120 5.8	1010 4.4
AP	17	790 32.4	780 29.2	970 42.2	910 28.2	580 25.6	650 20.1	750 30.7	600 28.3	670 32.5	6700 29.4
LD	18	430 17.6	640 24.0	400 17.4	750 23.2	520 22.9	1560 48.1	850 34.8	700 33.0	920 44.7	6770 29.7
	COLUMN TOTAL	2440 10.7	2670 11.7	2300 10.1	3230 14.2	2270 10.0	3240 14.2	2440 10.7	2120 9.3	2060 9.0	22770 100.0

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 68
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* * * * * * * * PAGE 2 OF 2

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
DE	19	70 2.9	40 1.5	30 1.3	60 1.9	30 1.3	30 .9	10 .4	0 0	0 0	270 1.2
	COLUMN TOTAL	2440 10.7	2670 11.7	2300 10.1	3230 14.2	2270 10.0	3240 14.2	2440 10.7	2120 9.3	2060 9.0	22770 100.0

RAW CHI SQUARE = 5953.75261 WITH 128 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 171460

BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34
E41

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 2

BETA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
MF	1	0	0	0	0	30	30	0	0	30	90
		0	0	0	0	1.0	2.5	0	0	2.9	.5
CH	4	30	20	90	80	0	0	0	20	0	240
		1.1	.7	4.1	3.4	0	0	0	1.0	0	1.3
BU	5	130	130	20	60	40	80	20	100	0	580
		4.7	4.8	.9	2.6	1.3	6.7	1.4	5.1	0	3.1
M4	6	0	0	30	0	0	0	0	0	0	30
		0	0	1.4	0	0	0	0	0	0	.2
HH	7	640	830	140	590	770	220	100	270	60	3620
		23.1	30.7	6.5	25.3	24.6	18.3	6.8	13.7	5.9	19.3
TH	8	630	450	370	440	390	150	0	60	160	2650
		22.7	16.7	17.1	18.9	12.5	12.5	0	3.0	15.7	14.1
FD	9	0	0	40	0	0	0	0	20	0	60
		0	0	1.8	0	0	0	0	1.0	0	.3
ND	10	150	70	70	70	90	0	0	20	30	500
		5.4	2.6	3.2	3.0	2.9	0	0	1.0	2.9	2.7
TB	11	120	40	0	0	0	20	0	0	0	180
		4.3	1.5	0	0	0	1.7	0	0	0	1.0
CI	12	0	0	50	0	0	0	50	60	30	190
		0	0	2.3	0	0	0	3.4	3.0	2.9	1.0
HW	13	0	0	0	0	90	40	0	0	0	130
		0	0	0	0	2.9	3.3	0	0	0	.7
M3	14	80	60	60	0	60	0	30	0	0	290
		2.9	2.2	2.8	0	1.9	0	2.1	0	0	1.5
M2	15	200	20	60	60	80	0	0	50	0	470
		7.2	.7	2.8	2.6	2.6	0	0	2.5	0	2.5
M1	16	60	60	90	20	40	20	120	150	40	600
		2.2	2.2	4.1	.9	1.3	1.7	8.2	7.6	3.9	3.2
AP	17	380	530	500	270	470	270	700	760	530	4410
		13.7	19.6	23.0	11.6	15.0	22.5	47.9	38.6	52.0	23.5
LD	18	340	460	630	740	1050	370	440	460	140	4630
		12.3	17.0	29.0	31.8	33.5	30.8	30.1	23.4	13.7	24.7
	COLUMN TOTAL	2770	2700	2170	2330	3130	1200	1460	1970	1020	18750
		14.8	14.4	11.6	12.4	16.7	6.4	7.8	10.5	5.4	100.0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)            82/11/04.    17.52.21.    PAGE   70
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE   E34          E41

* * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * *
    BETA       BETA FISH BEHAVIOUR CODES                    BY  HR          EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  2 OF  2
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HR / COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
BETA DE 19	10 .4	30 1.1	20 .9	0 0	20 .6	0 0	0 0	0 0	0 0	80 .4
COLUMN TOTAL	2770 14.8	2700 14.4	2170 11.6	2330 12.4	3130 16.7	1200 6.4	1460 7.8	1970 10.5	1020 5.4	18750 100.0

RAW CHI SQUARE = 6806.64962 WITH 128 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 176690

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                 82/11/04.    17.52.21.    PAGE   71
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE    E38        E36

* * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * *
     BETA       BETA FISH BEHAVIOUR CODES                  BY  HR          EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
BI	2	40 1.9	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	40 .2
NP	3	20 .9	0 0	10 .4	50 1.4	0 0	0 0	20 .9	50 2.7	0 0	150 .7
CH	4	0 0	0 0	0 0	20 .6	50 1.9	0 0	50 2.2	0 0	0 0	120 .6
BU	5	150 7.1	130 5.9	270 9.5	250 7.2	270 10.3	40 2.9	30 1.3	0 0	0 0	1140 5.6
HH	7	510 24.2	560 25.3	890 31.2	790 22.7	510 19.5	120 8.8	370 16.5	540 29.3	250 16.1	4540 22.4
TH	8	230 10.9	540 24.4	650 22.8	910 26.1	560 21.5	110 8.0	750 33.5	320 17.4	20 1.3	4090 20.2
FD	9	0 0	80 3.6	0 0	0 0	0 0	0 0	0 0	0 0	0 0	80 .4
ND	10	60 2.8	100 4.5	140 4.9	90 2.6	180 6.9	50 3.6	60 2.7	40 2.2	10 .6	730 3.6
TB	11	0 0	0 0	0 0	80 2.3	0 0	0 0	0 0	0 0	0 0	80 .4
CI	12	70 3.3	40 1.8	0 0	30 .9	20 .8	90 6.6	140 6.3	20 1.1	0 0	410 2.0
HW	13	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 1.3	20 .1
M2	15	150 7.1	90 4.1	60 2.1	130 3.7	30 1.1	0 0	0 0	50 2.7	20 1.3	530 2.6
M1	16	70 3.3	20 .9	70 2.5	10 .3	30 1.1	20 1.5	60 2.7	80 4.3	10 .6	370 1.8
AP	17	600 28.4	440 19.9	580 20.4	410 11.8	360 13.8	410 29.9	420 18.8	550 29.9	710 45.8	4480 22.1
LD	18	190 9.0	130 5.9	160 5.6	670 19.3	540 20.7	510 37.2	340 15.2	190 10.3	510 32.9	3240 16.0
DE	19	20 .9	80 3.6	20 .7	40 1.1	60 2.3	20 1.5	0 0	0 0	0 0	240 1.2
	COLUMN TOTAL	2110 10.4	2210 10.9	2850 14.1	3480 17.2	2610 12.9	1370 6.8	2240 11.1	1840 9.1	1550 7.7	20260 100.0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 72

BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)

RAW CHI SQUARE = 6365.44157 WITH 120 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 173890

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)              82/11/04.     17.52.21.     PAGE   73
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E50          E51

* * * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * * *
* * BETA      BETA FISH BEHAVIOUR CODES * * * * * * * * * * * BY  HR  * * * * * EXP. TIME ELAPSED * * * * * PAGE  1 OF  1
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BETA	COUNT COL PCT	HR 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
MF	1	0 0	0 0	0 0	40 1.2	0 0	30 2.1	0 0	0 0	0 0	70 .4
NP	3	0 0	20 .9	40 1.3	0 0	0 0	40 2.7	0 0	20 1.3	0 0	120 .7
CH	4	70 3.9	120 5.4	60 2.0	280 8.6	50 4.3	70 4.8	0 0	0 0	0 0	650 3.6
BU	5	50 2.8	60 2.7	140 4.6	170 5.2	20 1.7	40 2.7	80 3.7	20 1.3	40 3.5	620 3.5
HH	7	350 19.7	450 20.3	590 19.3	650 20.1	210 17.9	230 15.8	460 21.0	450 28.5	270 23.7	3660 20.5
TH	8	370 20.8	420 18.9	800 26.2	400 12.3	360 30.8	160 11.0	360 16.4	400 25.3	270 23.7	3540 19.9
ND	10	0 0	30 1.4	20 .7	0 0	0 0	0 0	20 .9	0 0	0 0	70 .4
TB	11	0 0	140 6.3	30 1.0	40 1.2	0 0	60 4.1	80 3.7	0 0	20 1.8	370 2.1
CI	12	0 0	0 0	0 0	80 2.5	0 0	0 0	0 0	70 4.4	80 7.0	230 1.3
HW	13	0 0	20 .9	50 1.6	20 .6	20 1.7	0 0	0 0	0 0	0 0	110 .6
M3	14	50 2.8	0 0	50 1.6	0 0	0 0	70 4.8	30 1.4	0 0	0 0	200 1.1
M2	15	330 18.5	80 3.6	330 10.8	240 7.4	60 5.1	190 13.0	20 .9	50 3.2	50 4.4	1350 7.6
M1	16	110 6.2	130 5.9	50 1.6	60 1.9	40 3.4	70 4.8	60 2.7	70 4.4	100 8.8	690 3.9
AP	17	110 6.2	370 16.7	340 11.1	560 17.3	320 27.4	110 7.5	890 40.6	250 15.8	20 1.8	2970 16.7
LD	18	320 18.0	370 16.7	550 18.0	680 21.0	90 7.7	390 26.7	190 8.7	250 15.8	290 25.4	3130 17.6
DE	19	20 1.1	10 .5	0 0	20 .6	0 0	0 0	0 0	0 0	0 0	50 .3
	COLUMN TOTAL	1780 10.0	2220 12.5	3050 17.1	3240 18.2	1170 6.6	1460 8.2	2190 12.3	1580 8.9	1140 6.4	17830 100.0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                82/11/04.    17.52.21.    PAGE   74
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
RAW CHI SQUARE =  5331.25920 WITH   120 DEGREES OF FREEDOM.  SIGNIFICANCE =      0

NUMBER OF MISSING OBSERVATIONS =  140300
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BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 2

BETA	COUNT / COL PCT (HR)	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
MF	1	0 0	0 0	20 .8	0 0	0 0	0 0	0 0	0 0	0 0	20 .1
BI	2	20 .9	0 0	0 0	0 0	0 0	0 0	20 1.5	0 0	0 0	40 .2
NP	3	20 .9	30 1.0	30 1.2	30 1.1	0 0	0 0	0 0	0 0	0 0	110 .5
CH	4	130 5.6	80 2.6	90 3.6	60 2.3	40 1.5	100 3.6	90 6.7	0 0	10 .5	600 2.8
BU	5	40 1.7	40 1.3	30 1.2	0 0	100 3.8	20 .7	40 3.0	40 2.1	80 4.1	390 1.8
M4	6	0 0	0 0	0 0	50 1.9	0 0	110 4.0	0 0	30 1.6	0 0	190 .9
HH	7	470 20.1	710 23.4	430 17.0	420 15.8	760 28.6	810 29.1	170 12.6	490 25.4	720 36.9	4980 23.5
TH	8	300 12.8	560 18.5	410 16.2	740 27.9	310 11.7	260 9.4	220 16.3	380 19.7	280 14.4	3460 16.3
ND	10	20 .9	40 1.3	40 1.6	20 .8	120 4.5	60 2.2	0 0	70 3.6	70 3.6	440 2.1
TB	11	0 0	0 0	0 0	0 0	30 1.1	0 0	0 0	0 0	0 0	30 .1
CI	12	0 0	0 0	0 0	0 0	40 1.5	0 0	20 1.5	250 13.0	110 5.6	420 2.0
HW	13	0 0	20 .7	50 2.0	0 0	0 0	0 0	0 0	10 .5	0 0	80 .4
M3	14	0 0	50 1.7	100 4.0	100 3.8	30 1.1	250 9.0	0 0	0 0	0 0	530 2.5
M2	15	180 7.7	420 13.9	250 9.9	130 4.9	140 5.3	210 7.6	80 5.9	150 7.8	20 1.0	1580 7.4
M1	16	240 10.3	80 2.6	70 2.8	150 5.7	150 5.6	180 6.5	40 3.0	70 3.6	30 1.5	1010 4.8
AP	17	890 38.0	590 19.5	470 18.6	640 24.2	440 16.5	410 14.7	490 36.3	350 18.1	520 26.7	4800 22.6
	COLUMN TOTAL	2340 11.0	3030 14.3	2530 11.9	2650 12.5	2660 12.5	2780 13.1	1350 6.4	1930 9.1	1950 9.2	21220 100.0

(CONTINUED)

BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 2

BETA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
LD	18	30 1.3	370 12.2	510 20.2	310 11.7	480 18.0	340 12.2	120 8.9	50 2.6	110 5.6	2320 10.9
DE	19	0 0	40 1.3	30 1.2	0 0	20 .8	30 1.1	60 4.4	40 2.1	0 0	220 1.0
	COLUMN TOTAL	2340 11.0	3030 14.3	2530 11.9	2650 12.5	2660 12.5	2780 13.1	1350 6.4	1930 9.1	1950 9.2	21240 100.0

RAW CHI SQUARE = 7225.58261 WITH 136 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 140690

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 77
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 2

BETA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
MF	1	0 0	0 0	0 0	210 4.6	0 0	0 0	0 0	0 0	0 0	210 .7
NP	3	20 .7	10 .2	10 .3	10 .2	0 0	10 .3	0 0	0 0	0 0	60 .2
CH	4	30 1.1	40 .9	70 2.1	140 3.0	70 2.1	40 1.1	50 1.4	0 0	80 2.0	520 1.7
BU	5	20 .7	100 2.1	80 2.4	40 .9	60 1.8	60 1.7	90 2.6	20 1.4	80 2.0	550 1.8
M4	6	0 0	0 0	0 0	40 .9	20 .6	0 0	0 0	0 0	0 0	60 .2
HH	7	800 28.3	1210 26.0	780 23.6	960 20.9	900 27.4	670 19.2	940 26.9	240 17.4	1110 27.4	7610 24.5
TH	8	870 30.7	970 20.8	690 20.8	590 12.8	850 25.8	310 8.9	600 17.1	210 15.2	750 18.5	5840 18.8
FD	9	0 0	0 0	0 0	50 1.1	0 0	0 0	0 0	0 0	0 0	50 .2
ND	10	60 2.1	140 3.0	70 2.1	0 0	20 .6	60 1.7	0 0	0 0	0 0	350 1.1
TB	11	80 2.8	840 18.0	310 9.4	590 12.8	420 12.8	980 28.1	550 15.7	140 10.1	420 10.4	4330 13.9
CI	12	20 .7	0 0	20 .6	80 1.7	0 0	0 0	50 1.4	0 0	40 1.0	210 .7
M3	14	40 1.4	0 0	0 0	120 2.6	80 2.4	0 0	30 .9	0 0	0 0	270 .9
M2	15	210 7.4	360 7.7	290 8.8	310 6.7	200 6.1	90 2.6	240 6.9	0 0	270 6.7	1970 6.3
M1	16	10 .4	100 2.1	50 1.5	110 2.4	70 2.1	90 2.6	100 2.9	160 11.6	120 3.0	810 2.6
AP	17	190 6.7	320 6.9	370 11.2	120 2.6	180 5.5	180 5.2	170 4.9	230 16.7	200 4.9	1960 6.3
LD	18	470 16.6	570 12.2	570 17.2	1180 25.7	390 11.9	970 27.8	680 19.4	380 27.5	970 24.0	6180 19.9
	COLUMN TOTAL	2830 9.1	4660 15.0	3310 10.6	4600 14.8	3290 10.6	3490 11.2	3500 11.3	1380 4.4	4050 13.0	31110 100.0

(CONTINUED)

BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 2 OF 2

BETA (COUNT / COL PCT)	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
DE 19	10 .4	0 0	0 0	50 1.1	30 .9	30 .9	0 0	0 0	10 .2	130 .4
COLUMN TOTAL	2830 9.1	4660 15.0	3310 10.6	4600 14.8	3290 10.6	3490 11.2	3500 11.3	1380 4.4	4050 13.0	31110 100.0

RAW CHI SQUARE = 6487.18186 WITH 128 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 143580

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)          82/11/04.    17.52.21.    PAGE   79
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (AGGRESSIVE)

CPU TIME REQUIRED..    18.4200 SECONDS

            TASK NAME       ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
            CROSSTABS       VARIABLES=ALPHA(20,25),HR(1,9)/TABLES=ALPHA BY HR
            OPTIONS         3,5,7
            STATISTICS      1

        00052300 CM NEEDED FOR CROSSTABS


        OPTION - 1
        IGNORE MISSING VALUE INDICATORS
        (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

        OPTION - 3
        DELETE ROW PERCENTAGES

        OPTION - 5
        DELETE TOTAL PERCENTAGES
```

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 80
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	40 14.8	50 6.5	0 0	0 0	120 23.5	200 33.9	30 8.6	30 5.6	0 0	470 10.8
IG	21	20 7.4	0 0	20 11.1	0 0	70 13.7	30 5.1	30 8.6	30 5.6	0 0	200 4.6
SP	22	0 0	0 0	0 0	20 5.4	0 0	10 1.7	0 0	0 0	0 0	30 .7
DG	23	0 0	20 2.6	0 0	0 0	30 5.9	60 10.2	0 0	20 3.7	0 0	130 3.0
SS	24	20 7.4	190 24.7	20 11.1	0 0	120 23.5	0 0	30 8.6	280 51.9	0 0	660 15.1
CB	25	190 70.4	510 66.2	140 77.8	350 94.6	170 33.3	290 49.2	260 74.3	180 33.3	780 100.0	2870 65.8
	COLUMN TOTAL	270 6.2	770 17.7	180 4.1	370 8.5	510 11.7	590 13.5	350 8.0	540 12.4	780 17.9	4360 100.0

RAW CHI SQUARE = 2312.53777 WITH 40 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 180420

ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

C R O S S T A B U L A T I O N O F
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED

ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	90 9.6	0 0	20 6.7	50 10.0	0 0	70 15.9	120 8.5	170 24.3	120 22.2	640 10.9
IG	21	200 21.3	100 21.3	100 33.3	20 4.0	170 30.9	30 6.8	200 14.1	20 2.9	40 7.4	880 15.0
SP	22	60 6.4	50 10.6	40 13.3	0 0	80 14.5	0 0	100 7.0	0 0	0 0	330 5.6
DG	23	120 12.8	0 0	20 6.7	0 0	40 7.3	20 4.5	50 3.5	60 8.6	30 5.6	340 5.8
SS	24	100 10.6	50 10.6	60 20.0	310 62.0	100 18.2	60 13.6	30 2.1	20 2.9	40 7.4	770 13.1
CB	25	370 39.4	270 57.4	60 20.0	120 24.0	160 29.1	260 59.1	920 64.8	430 61.4	310 57.4	2900 49.5
	COLUMN TOTAL	940 16.0	470 8.0	300 5.1	500 8.5	550 9.4	440 7.5	1420 24.2	700 11.9	540 9.2	5860 100.0

RAW CHI SQUARE = 2510.57521 WITH 40 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 188370

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                82/11/04.     17.52.21.     PAGE  82
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE    E34          E41

* * * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * * *
    ALPHA      ALPHA FISH BEHAVIOUR CODES                    BY  HR           EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE 1 OF 1
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ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	30 5.8	80 13.6	90 12.2	50 9.4	430 38.7	240 13.4	160 11.1	110 22.4	110 12.4	1300 16.0
IG	21	120 23.1	0 0	60 8.1	120 22.6	140 12.6	190 10.6	150 10.4	30 6.1	90 10.1	900 11.1
SP	22	50 9.6	0 0	40 5.4	40 7.5	80 7.2	110 6.1	60 4.2	0 0	0 0	380 4.7
DG	23	0 0	20 3.4	40 5.4	40 7.5	160 14.4	40 2.2	70 4.9	100 20.4	60 6.7	530 6.5
SS	24	30 5.8	0 0	10 1.4	280 52.8	20 1.8	100 5.6	100 6.9	50 10.2	230 25.8	820 10.1
CB	25	290 55.8	490 83.1	500 67.6	0 0	280 25.2	1110 62.0	900 62.5	200 40.8	400 44.9	4170 51.5
	COLUMN TOTAL	520 6.4	590 7.3	740 9.1	530 6.5	1110 13.7	1790 22.1	1440 17.8	490 6.0	890 11.0	8100 100.0

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RAW CHI SQUARE =  3275.33595 WITH    40 DEGREES OF FREEDOM.  SIGNIFICANCE =      0

NUMBER OF MISSING OBSERVATIONS =  187340
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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 83
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E38 E36

* * * * * C R O S S T A B U L A T I O N O F * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* * * * * PAGE 1 OF 1

ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	110 14.1	0 0	0 0	40 5.1	70 6.9	180 15.9	160 11.1	80 7.5	170 17.3	810 9.9
IG	21	160 20.5	190 48.7	250 44.6	150 19.0	170 16.7	120 10.6	180 12.5	80 7.5	60 6.1	1360 16.7
SP	22	60 7.7	60 15.4	140 25.0	80 10.1	120 11.8	50 4.4	80 5.6	20 1.9	10 1.0	620 7.6
DG	23	20 2.6	0 0	0 0	0 0	40 3.9	40 3.5	30 2.1	0 0	40 4.1	170 2.1
SS	24	100 12.8	110 28.2	110 19.6	150 19.0	410 40.2	110 9.7	310 21.5	260 24.5	370 37.8	1930 23.7
CB	25	330 42.3	30 7.7	60 10.7	370 46.8	210 20.6	630 55.8	680 47.2	620 58.5	330 33.7	3260 40.0
	COLUMN TOTAL	780 9.6	390 4.8	560 6.9	790 9.7	1020 12.5	1130 13.9	1440 17.7	1060 13.0	980 12.0	8150 100.0

RAW CHI SQUARE = 2289.89576 WITH 40 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 186000

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 84
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	ROW TOTAL
HS	20	470 34.8	210 26.9	170 14.3	0 0	140 14.4	270 42.2	50 21.7	40 9.1	1350 23.4
IG	21	60 4.4	20 2.6	80 6.7	0 0	70 7.2	20 3.1	30 13.0	20 4.5	300 5.2
DG	23	40 3.0	20 2.6	0 0	0 0	0 0	40 6.3	0 0	0 0	100 1.7
SS	24	100 7.4	100 12.8	140 11.8	10 5.9	50 5.2	110 17.2	0 0	210 47.7	720 12.5
CB	25	680 50.4	430 55.1	800 67.2	160 94.1	710 73.2	200 31.3	150 65.2	170 38.6	3300 57.2
	COLUMN TOTAL	1350 23.4	780 13.5	1190 20.6	170 2.9	970 16.8	640 11.1	230 4.0	440 7.6	5770 100.0

RAW CHI SQUARE = 1313.82464 WITH 28 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 152360

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                    82/11/04.     17.52.21.     PAGE   65
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE   E52           E53

* * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * *
     ALPHA       ALPHA FISH BEHAVIOUR CODES                    BY  HR           EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  1
```

ALPHA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
HS	20	260 22.0	280 37.3	230 27.1	60 60.0	150 40.5	50 11.9	130 30.2	0 0	30 10.7	1190 26.0
IG	21	90 7.6	0 0	30 3.5	0 0	0 0	0 0	70 16.3	30 15.0	30 10.7	250 5.5
SP	22	0 0	0 0	10 1.2	0 0	0 0	0 0	10 2.3	0 0	30 10.7	50 1.1
DG	23	60 5.1	130 17.3	120 14.1	40 40.0	0 0	0 0	0 0	0 0	0 0	350 7.6
SS	24	90 7.6	0 0	0 0	0 0	0 0	0 0	0 0	80 40.0	0 0	170 3.7
CB	25	680 57.6	340 45.3	460 54.1	0 0	220 59.5	370 88.1	220 51.2	90 45.0	190 67.9	2570 56.1
	COLUMN TOTAL	1180 25.8	750 16.4	850 18.6	100 2.2	370 8.1	420 9.2	430 9.4	200 4.4	280 6.1	4580 100.0

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RAW CHI SQUARE =  2209.31726 WITH    40 DEGREES OF FREEDOM.  SIGNIFICANCE =        0

NUMBER OF MISSING OBSERVATIONS =  157330
```

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 86
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	30 4.9	0 0	120 34.3	30 5.5	60 18.8	30 33.3	30 6.8	280 34.6	30 4.4	610 15.3
IG	21	100 16.4	30 20.0	0 0	60 10.9	0 0	0 0	0 0	0 0	0 0	190 4.7
SP	22	0 0	10 6.7	0 0	10 1.8	0 0	0 0	0 0	0 0	0 0	20 .5
DG	23	0 0	0 0	40 11.4	0 0	0 0	20 22.2	20 4.5	100 12.3	20 2.9	200 5.0
SS	24	30 4.9	0 0	0 0	20 3.6	0 0	0 0	0 0	0 0	0 0	50 1.2
CB	25	450 73.8	110 73.3	190 54.3	430 78.2	260 81.3	40 44.4	390 88.6	430 53.1	630 92.6	2930 73.2
	COLUMN TOTAL	610 15.3	150 3.7	350 8.8	550 13.7	320 8.0	90 2.3	440 11.0	810 20.2	680 17.0	4000 100.0

RAW CHI SQUARE = 1554.78004 WITH 40 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 170690

```
RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                    82/11/04.    17.52.21.    PAGE   87
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)

CPU TIME REQUIRED..    16.5300 SECONDS

                    TASK NAME       BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
                    CROSSTABS       VARIABLES=BETA(20,25),HR(1,9)/TABLES=BETA BY HR
                    OPTIONS         3,5,7
                    STATISTICS      1

          00052300 CM NEEDED FOR CROSSTABS

          OPTION - 1
          IGNORE MISSING VALUE INDICATORS
          (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

          OPTION - 3
          DELETE ROW PERCENTAGES

          OPTION - 5
          DELETE TOTAL PERCENTAGES
```

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 88
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP, TIME ELAPSED
* PAGE 1 OF 1

BETA	COUNT / COL PCT (HR)	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
HS	20	170 44.7	0 0	0 0	90 5.5	120 14.1	170 28.8	140 16.9	0 0	50 100.0	740 12.2
IG	21	50 13.2	0 0	0 0	0 0	50 5.9	30 5.1	90 10.8	20 4.0	0 0	240 3.9
SP	22	0 0	0 0	0 0	0 0	0 0	10 1.7	20 2.4	0 0	0 0	30 .5
DG	23	60 15.8	0 0	0 0	20 1.2	30 3.5	0 0	20 2.4	0 0	0 0	130 2.1
SS	24	60 15.8	310 36.5	0 0	30 1.8	100 11.8	0 0	30 3.6	130 26.0	0 0	660 10.9
CB	25	40 10.5	540 63.5	400 100.0	1490 91.4	550 64.7	380 64.4	530 63.9	350 70.0	0 0	4280 70.4
	COLUMN TOTAL	380 6.3	850 14.0	400 6.6	1630 26.8	850 14.0	590 9.7	830 13.7	500 8.2	50 .8	6080 100.0

RAW CHI SQUARE = 3180.14409 WITH 40 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 178700

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- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)               82/11/04.     17.52.21.      PAGE   89
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE    RUFUS      (CREATION DATE =  82/11/04.)
SUBFILE   E29           E32
* * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * * * *
      BETA      BETA FISH BEHAVIOUR CODES                  BY   HR       EXP. TIME ELAPSED  * * * *   PAGE  1 OF  1
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
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BETA	COUNT / COL PCT (HR)	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
HS	20	120 11.2	30 1.1	60 4.8	20 3.0	30 4.8	40 33.3	20 3.4	0 0	90 10.6	410 5.0
IG	21	70 6.5	170 6.5	50 4.0	0 0	40 6.3	0 0	20 3.4	0 0	20 2.4	370 4.5
SP	22	0 0	20 .8	10 .8	0 0	20 3.2	0 0	0 0	0 0	0 0	50 .6
DG	23	50 4.7	20 .8	20 1.6	20 3.0	0 0	20 16.7	0 0	0 0	30 3.5	160 1.9
SS	24	200 18.7	1230 47.1	450 35.7	270 40.9	20 3.2	10 8.3	40 6.8	0 0	30 3.5	2250 27.2
CB	25	630 58.9	1140 43.7	670 53.2	350 53.0	220 82.5	50 41.7	510 86.4	490 100.0	680 80.0	5040 60.9
	COLUMN TOTAL	1070 12.9	2610 31.5	1260 15.2	660 8.0	630 7.6	120 1.4	590 7.1	490 5.9	850 10.3	8280 100.0

RAW CHI SQUARE = 2365.59284 WITH 40 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 185950

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 90
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

BETA	COUNT / COL PCT	HR 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	140 24.6	30 7.7	60 8.2	30 14.3	400 24.8	110 30.6	80 10.0	60 20.0	120 16.0	1030 18.0
IG	21	60 10.5	60 15.4	0 0	0 0	0 0	40 11.1	90 11.2	0 0	30 4.0	280 4.9
SP	22	0 0	40 10.3	0 0	0 0	0 0	0 0	0 0	0 0	0 0	40 .7
DG	23	50 8.8	20 5.1	40 5.5	20 9.5	470 29.2	50 13.9	50 6.3	0 0	20 2.7	720 12.6
SS	24	10 1.8	20 5.1	0 0	0 0	30 1.9	0 0	90 11.2	20 6.7	200 26.7	370 6.5
CB	25	310 54.4	220 56.4	630 86.3	160 76.2	710 44.1	160 44.4	490 61.2	220 73.3	380 50.7	3280 57.3
	COLUMN TOTAL	570 10.0	390 6.8	730 12.8	210 3.7	1610 28.1	360 6.3	800 14.0	300 5.2	750 13.1	5720 100.0

RAW CHI SQUARE = 2477.97042 WITH 40 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 189720

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 91
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E38 E36

* * * * * C R O S S T A B U L A T I O N O F * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* * * * * PAGE 1 OF 1

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	0 0	20 3.3	20 1.8	60 7.5	100 16.7	70 20.0	60 13.0	150 11.8	40 6.3	520 7.8
IG	21	30 3.4	50 8.3	50 4.5	110 13.7	70 11.7	60 17.1	60 13.0	190 15.0	20 3.2	640 9.6
SP	22	0 0	0 0	10 .9	0 0	0 0	20 5.7	10 2.2	60 4.7	0 0	100 1.5
DG	23	0 0	0 0	20 1.8	40 5.0	70 11.7	40 11.4	20 4.3	40 3.1	0 0	230 3.4
SS	24	150 17.2	60 10.0	100 8.9	100 12.5	160 26.7	10 2.9	30 6.5	350 27.6	170 27.0	1130 16.9
CB	25	690 79.3	470 78.3	920 82.1	490 61.2	200 33.3	150 42.9	280 60.9	480 37.8	400 63.5	4080 60.9
	COLUMN TOTAL	870 13.0	600 9.0	1120 16.7	800 11.9	600 9.0	350 5.2	460 6.9	1270 19.0	630 9.4	6700 100.0

RAW CHI SQUARE = 1605.55511 WITH 40 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 187450

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 92
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

CROSSTABULATION OF BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED PAGE 1 OF 1

BETA		COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	COUNT	40	420	190	380	150	260	170	120	0	1730
		COL PCT	10.0	56.0	20.4	43.2	30.6	36.6	15.5	14.1	0	28.2
IG	21	COUNT	60	50	130	0	50	20	0	50	0	360
		COL PCT	15.0	6.7	14.0	0	10.2	2.8	0	5.9	0	5.9
SP	22	COUNT	10	0	0	0	0	0	0	0	0	10
		COL PCT	2.5	0	0	0	0	0	0	0	0	.2
DG	23	COUNT	20	40	60	40	20	60	40	60	0	340
		COL PCT	5.0	5.3	6.5	4.5	4.1	8.5	3.7	7.1	0	5.5
SS	24	COUNT	30	60	290	0	80	0	0	370	0	830
		COL PCT	7.5	8.0	31.2	0	16.3	0	0	43.5	0	13.5
CB	25	COUNT	240	180	260	460	190	370	880	250	30	2860
		COL PCT	60.0	24.0	28.0	52.3	38.8	52.1	80.7	29.4	100.0	46.7
COLUMN TOTAL			400	750	930	880	490	710	1090	850	30	6130
			6.5	12.2	15.2	14.4	8.0	11.6	17.8	13.9	.5	100.0

RAW CHI SQUARE = 2672.03507 WITH 40 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 152000

BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HS	20	240 11.9	120 15.4	320 29.4	20 2.1	250 61.0	30 9.7	170 13.1	170 26.2	260 14.9	1580 17.1
IG	21	80 4.0	0 0	110 10.1	20 2.1	0 0	0 0	30 2.3	30 4.6	30 1.7	300 3.2
SP	22	0 0	0 0	30 2.8	0 0	0 0	0 0	0 0	0 0	10 .6	40 .4
DG	23	130 6.4	20 2.6	170 15.6	0 0	70 17.1	0 0	0 0	20 3.1	20 1.1	430 4.6
SS	24	260 12.9	0 0	0 0	0 0	0 0	0 0	20 1.5	70 10.8	30 1.7	380 4.1
CB	25	1310 64.9	640 82.1	460 42.2	920 95.8	90 22.0	280 90.3	1080 83.1	360 55.4	1390 79.9	6530 70.5
	COLUMN TOTAL	2020 21.8	780 8.4	1090 11.8	960 10.4	410 4.4	310 3.3	1300 14.0	650 7.0	1740 18.8	9260 100.0

RAW CHI SQUARE = 2883.52297 WITH 40 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 152650

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)            82/11/04.     17.52.21.     PAGE   94
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (FEEDING)
FILE   RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE   E54         E55

* * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * *
    BETA     BETA FISH BEHAVIOUR CODES                      BY  HR          EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * PAGE  1 OF  1
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BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	ROW TOTAL
HS	20	60 18.2	0 0	0 0	30 2.9	0 0	0 0	0 0	60 8.7	150 4.7
IG	21	30 9.1	60 35.3	0 0	60 5.8	0 0	0 0	0 0	0 0	150 4.7
SP	22	0 0	0 0	0 0	10 1.0	0 0	0 0	0 0	0 0	10 .3
DG	23	20 6.1	0 0	0 0	20 1.9	0 0	0 0	0 0	0 0	40 1.3
SS	24	0 0	20 11.8	0 0	200 19.2	0 0	0 0	0 0	0 0	220 6.9
CB	25	220 66.7	90 52.9	280 100.0	720 69.2	60 100.0	210 100.0	390 100.0	630 91.3	2600 82.0
	COLUMN TOTAL	330 10.4	170 5.4	280 8.8	1040 32.8	60 1.9	210 6.6	390 12.3	690 21.8	3170 100.0

RAW CHI SQUARE = 1204.58868 WITH   35 DEGREES OF FREEDOM. SIGNIFICANCE =   0

NUMBER OF MISSING OBSERVATIONS = 171520

```
CPU TIME REQUIRED..     16.4960 SECONDS

          TASK NAME      ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
          CROSSTABS      VARIABLES=ALPHA(26,36),HR(1,9)/TABLES=ALPHA BY HR
          OPTIONS        3,5,7
          STATISTICS     1

      00052400 CM NEEDED FOR CROSSTABS


      OPTION - 1
      IGNORE MISSING VALUE INDICATORS
      (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

      OPTION - 3
      DELETE ROW PERCENTAGES

      OPTION - 5
      DELETE TOTAL PERCENTAGES
```

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 96
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * PAGE 1 OF 1

ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HO	26	3410 27.8	530 4.8	1210 9.6	990 9.7	1700 12.8	1000 9.1	1540 14.6	1530 15.2	1100 12.5	13010 13.0
R4	27	0 0	30 .3	2030 16.0	0 0	450 3.4	270 2.4	670 6.4	0 0	0 0	3450 3.5
R3	28	5010 40.8	4030 36.1	5210 41.2	4770 46.8	2580 19.5	3430 31.1	5250 49.8	4730 47.0	3810 43.2	38820 38.8
TU	29	160 1.3	570 5.1	360 2.8	320 3.1	320 2.4	250 2.3	220 2.1	70 .7	210 2.4	2480 2.5
ST	30	0 0	20 .2	40 .3	50 .5	30 .2	10 .1	20 .2	30 .3	0 0	200 .2
EX	31	40 .3	0 0	0 0	0 0	50 .4	20 .2	40 .4	0 0	170 1.9	320 .3
CR	32	3560 29.0	5910 53.0	3740 29.5	4020 39.5	8030 60.6	6020 54.6	2790 26.4	3690 36.7	3420 38.8	41180 41.2
BA	33	40 .3	40 .4	60 .5	40 .4	20 .2	20 .2	20 .2	10 .1	40 .5	290 .3
SC	34	0 0	0 0	0 0	0 0	70 .5	0 0	0 0	0 0	0 0	70 .1
CD	35	60 .5	20 .2	10 .1	0 0	0 0	10 .1	0 0	0 0	70 .8	170 .2
	COLUMN TOTAL	12280 12.3	11150 11.2	12660 12.7	10190 10.2	13250 13.3	11030 11.0	10550 10.5	10060 10.1	8820 8.8	99990 100.0

RAW CHI SQUARE = 19041.64781 WITH 72 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 84790

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 97
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
ALPHA										
HO 26	740 6.0	850 6.2	700 4.9	830 6.1	990 8.4	890 7.3	1090 9.1	1140 9.6	1210 9.1	8440 7.4
R4 27	1980 16.1	7570 55.4	6210 43.5	4420 32.6	1730 14.7	2860 23.6	3630 30.2	340 2.9	450 3.4	29190 25.4
R3 28	2350 19.1	3000 22.0	5190 36.3	5270 38.9	3700 31.4	3180 26.3	2510 20.9	5950 50.3	5270 39.7	36420 31.7
TU 29	530 4.3	330 2.4	210 1.5	480 3.5	420 3.6	430 3.6	460 3.8	420 3.6	540 4.1	3820 3.3
ST 30	230 1.9	160 1.2	140 1.0	220 1.6	160 1.4	180 1.5	110 .9	50 .4	30 .2	1280 1.1
EX 31	140 1.1	0 0	0 0	0 0	140 1.2	60 .5	70 .6	20 .2	40 .3	470 .4
CR 32	6300 51.2	1680 12.3	1790 12.5	2230 16.5	4640 39.3	4460 36.8	4010 33.4	3840 32.5	5730 43.1	34680 30.2
BA 33	30 .2	70 .5	40 .3	90 .7	20 .2	50 .4	130 1.1	60 .5	20 .2	510 .4
CD 35	0 0	0 0	0 0	10 .1	0 0	0 0	0 0	0 0	0 0	10 .0
COLUMN TOTAL	12300 10.7	13660 11.9	14280 12.4	13550 11.8	11800 10.3	12110 10.5	12010 10.5	11820 10.3	13290 11.6	114820 100.0

RAW CHI SQUARE = 24982.00551 WITH 64 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 79410

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 98
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
HO	26	1860 12.9	1000 9.1	2230 12.4	1670 18.0	1460 8.6	1380 12.2	2310 20.0	2580 21.5	1460 14.9	15950 13.9
R4	27	0 0	140 1.3	1700 9.4	160 1.7	30 .2	0 0	0 0	410 3.4	120 1.2	2560 2.2
R3	28	5580 38.7	4770 43.5	7450 41.4	6220 67.1	9300 54.6	3940 34.8	2780 24.1	2940 24.5	2610 26.7	45590 39.9
TU	29	230 1.6	490 4.5	600 3.3	240 2.6	280 1.6	640 5.6	140 1.2	530 4.4	450 4.6	3600 3.1
ST	30	340 2.4	270 2.5	440 2.4	110 1.2	190 1.1	60 .5	20 .2	20 .2	90 .9	1540 1.3
EX	31	100 .7	0 0	20 .1	0 0	90 .5	190 1.7	0 0	80 .7	30 .3	510 .4
CR	32	6210 43.1	4180 38.1	5450 30.3	830 9.0	5600 32.9	5070 44.7	6190 53.6	5120 42.7	4870 49.8	43520 38.1
BA	33	80 .6	60 .5	50 .3	40 .4	60 .4	20 .2	80 .7	270 2.3	60 .6	720 .6
SC	34	0 0	0 0	0 0	0 0	20 .1	20 .2	0 0	20 .2	50 .5	110 .1
CD	35	20 .1	60 .5	70 .4	0 0	10 .1	10 .1	30 .3	10 .1	30 .3	240 .2
	COLUMN TOTAL	14420 12.6	10970 9.6	18010 15.8	9270 8.1	17040 14.9	11330 9.9	11550 10.1	11980 10.5	9770 8.5	114340 100.0

RAW CHI SQUARE = 18614.28997 WITH 72 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 81100

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 99
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E38 E36

* * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* * * * * * * * * PAGE 1 OF 1

ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HO	26	620 3.7	680 4.6	850 6.9	920 7.0	790 6.5	400 4.5	680 9.0	2330 18.9	1560 13.4	8830 8.1
R4	27	6300 37.7	6200 42.2	4580 37.2	5950 45.0	2750 22.6	620 7.0	280 3.7	670 5.4	0 0	27350 25.0
R3	28	5270 31.6	5950 40.5	6020 48.9	4150 31.4	5520 45.3	2190 24.8	1300 17.2	3820 30.9	2680 23.0	36900 33.7
TU	29	480 2.9	130 .9	60 .5	250 1.9	260 2.1	290 3.3	570 7.5	380 3.1	370 3.2	2790 2.5
ST	30	600 3.6	290 2.0	320 2.6	160 1.2	100 .8	60 .7	70 .9	40 .3	40 .3	1680 1.5
EX	31	90 .5	0 0	0 0	0 0	20 .2	40 .5	20 .3	40 .3	0 0	210 .2
CR	32	3240 19.4	1310 8.9	450 3.7	1780 13.5	2690 22.1	5150 58.3	4570 60.4	5060 40.9	6950 59.7	31200 28.5
BA	33	40 .2	60 .4	40 .3	0 0	50 .4	40 .5	60 .8	20 .2	30 .3	340 .3
SC	34	30 .2	20 .1	0 0	0 0	0 0	0 0	0 0	0 0	0 0	50 .0
CD	35	20 .1	40 .3	0 0	20 .2	0 0	40 .5	10 .1	0 0	0 0	130 .1
YA	36	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .2	20 .0
	COLUMN TOTAL	16590 15.2	14680 13.4	12320 11.3	13230 12.1	12180 11.1	8830 8.1	7560 6.9	12360 11.3	11650 10.6	109500 100.0

RAW CHI SQUARE = 38273.10702 WITH 80 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 84650

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                 82/11/04.     17.52.21.      PAGE  100
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP  (NEUTRAL)
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E50          E51

* * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * * *
    ALPHA     ALPHA FISH BEHAVIOUR CODES                    BY  HR          EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  1
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ALPHA	COUNT / COL PCT	HR: 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
HO	26	1060 8.7	1830 14.9	2080 16.8	1620 14.9	870 7.8	1160 8.8	1250 9.7	3390 28.6	490 8.3	13750 13.4
R4	27	120 1.0	0 0	430 3.5	450 4.1	0 0	1040 7.9	390 3.0	30 .3	1960 33.1	4420 4.3
R3	28	830 6.8	1960 16.0	2840 22.9	3100 28.5	2700 24.1	1260 9.6	3820 29.8	3320 27.7	1250 21.1	21280 20.7
TU	29	260 2.1	240 2.0	170 1.4	190 1.7	180 1.6	370 2.8	220 1.7	120 1.0	100 1.7	1850 1.8
ST	30	80 .7	80 .7	20 .2	20 .2	40 .4	30 .2	20 .2	10 .1	0 0	300 .3
EX	31	30 .2	70 .6	50 .4	40 .4	0 0	60 .5	0 0	0 0	0 0	250 .2
CR	32	9780 80.4	8020 65.4	6610 53.4	5400 49.7	7410 66.0	9250 70.2	7110 55.4	4790 40.4	2120 35.8	60490 58.9
BA	33	0 0	60 .5	70 .6	40 .4	20 .2	10 .1	0 0	0 0	0 0	200 .2
SC	34	0 0	10 .1	0 0	0 0	0 0	0 0	20 .2	0 0	0 0	30 .0
CD	35	10 .1	0 0	40 .3	0 0	0 0	0 0	10 .1	10 .1	10 .2	80 .1
YA	36	0 0	0 0	70 .6	0 0	0 0	0 0	0 0	0 0	0 0	70 .1
	COLUMN TOTAL	12170 11.8	12270 11.9	12380 12.1	10860 10.6	11220 10.9	13180 12.8	12840 12.5	11870 11.6	5930 5.8	102720 100.0

RAW CHI SQUARE = 24583.38145 WITH 80 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 55410

ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES . BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HO	26	780	1460	1370	1530	2310	2340	2630	2770	980	16170
		7.0	13.8	12.1	20.1	20.5	26.5	25.3	26.1	10.3	17.7
R3	28	1280	860	490	180	270	520	680	1610	1950	7840
		11.4	8.1	4.3	2.4	2.4	5.9	6.5	15.2	20.6	8.6
TU	29	140	90	290	160	170	120	160	70	170	1370
		1.3	.9	2.6	2.1	1.5	1.4	1.5	.7	1.8	1.5
ST	30	60	80	20	30	40	10	10	30	40	320
		.5	.8	.2	.4	.4	.1	.1	.3	.4	.4
EX	31	50	20	20	20	20	0	0	10	0	140
		.4	.2	.2	.3	.2	0	0	.1	0	.2
CR	32	8360	7950	9100	5700	8410	5780	6880	5990	6280	64950
		79.2	75.2	80.1	74.8	74.6	65.5	66.3	56.5	66.3	71.1
BA	33	20	100	60	0	20	40	20	50	40	350
		.2	.9	.5	0	.2	.5	.2	.5	.4	.4
SC	34	0	0	0	0	0	20	0	70	0	90
		0	0	0	0	0	.2	0	.7	0	.1
CD	35	0	10	10	0	10	0	0	0	10	40
		0	.1	.1	0	.1	0	0	0	.1	.0
YA	36	0	0	0	0	20	0	0	0	0	20
		0	0	0	0	.2	0	0	0	0	.0
	COLUMN TOTAL	11190	10570	11360	7620	11270	8830	10380	10600	9470	91290
		12.3	11.6	12.4	8.3	12.3	9.7	11.4	11.6	10.4	100.0

RAW CHI SQUARE = 7890.07311 WITH 72 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 70620

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 102
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HO	26	1050 13.4	1730 21.5	1770 16.7	1490 15.1	2550 27.2	1960 18.8	1550 16.5	2470 23.3	1960 22.4	16530 19.5
R4	27	0 0	330 4.1	1300 12.3	2820 28.6	240 2.6	640 6.1	0 0	0 0	0 0	5330 6.3
R3	28	2960 37.7	3170 39.3	4300 40.6	1680 17.0	3090 33.0	4320 41.4	5630 59.8	3850 36.3	3520 40.2	32520 38.3
TU	29	150 1.9	270 3.3	190 1.8	230 2.3	150 1.6	170 1.6	120 1.3	120 1.1	130 1.5	1530 1.8
ST	30	80 1.0	60 .7	30 .3	60 .6	20 .2	30 .3	20 .2	0 0	0 0	300 .4
EX	31	80 1.0	0 0	0 0	0 0	100 1.1	0 0	0 0	150 1.4	130 1.5	460 .5
CR	32	3500 44.6	2430 30.1	2920 27.6	3540 35.9	3140 33.5	3300 31.6	1950 20.7	4010 37.8	3000 34.3	27790 32.7
BA	33	20 .3	40 .5	60 .6	30 .3	40 .4	20 .2	130 1.4	0 0	0 0	340 .4
CO	35	10 .1	30 .4	10 .1	20 .2	30 .3	0 0	20 .2	0 0	10 .1	130 .2
	COLUMN TOTAL	7850 9.2	8060 9.5	10580 12.5	9870 11.6	9360 11.0	10440 12.3	9420 11.1	10600 12.5	8750 10.3	84930 100.0

RAW CHI SQUARE = 16620.80914 WITH 64 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIJNS = 89760

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)          82/11/04.    17.52.21.     PAGE  103
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)

CPU TIME REQUIRED..   17.3170 SECONDS

                  TASK NAME       BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
                  CROSSTABS       VARIABLES=BETA(26,36),HR(1,9)/TABLES=BETA BY HR
                  OPTIONS         3,5,7
                  STATISTICS      1

          00052400 CM NEEDED FOR CROSSTABS

          OPTION - 1
          IGNORE MISSING VALUE INDICATORS
          (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

          OPTION - 3
          DELETE ROW PERCENTAGES

          OPTION - 5
          DELETE TOTAL PERCENTAGES
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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                 82/11/04.    17.52.21.    PAGE  104
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE   E11          E13

* * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * * * *
   BETA       BETA FISH BEHAVIOUR CODES                    BY  HR            EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  1
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BETA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
HO	26	3010 28.1	580 5.3	1070 11.2	750 7.4	710 7.1	970 11.9	2180 19.2	1630 15.1	2010 20.9	12910 14.1
R4	27	0 0	1210 11.0	1130 11.6	0 0	230 2.3	0 0	490 4.3	240 2.2	0 0	3300 3.6
R3	28	2950 27.5	3620 33.0	3730 39.0	1600 15.9	3650 36.4	1810 22.2	4210 37.2	2940 27.2	4120 42.8	28630 31.4
TU	29	270 2.5	320 2.9	350 3.7	570 5.7	150 1.5	110 1.3	240 2.1	240 2.2	380 3.9	2630 2.9
ST	30	30 .3	20 .2	10 .1	0 0	10 .1	20 .2	10 .1	0 0	20 .2	120 .1
EX	31	60 .6	0 0	0 0	0 0	90 .9	0 0	40 .4	50 .5	60 .6	300 .3
CR	32	4350 40.6	5150 46.9	3220 33.6	7110 70.6	5060 50.5	5210 63.8	4130 36.5	5690 52.6	3000 31.2	42920 47.0
BA	33	40 .4	40 .4	60 .6	40 .4	20 .2	30 .4	20 .2	10 .1	40 .4	300 .3
SC	34	0 0	0 0	0 0	0 0	80 .8	0 0	0 0	0 0	0 0	80 .1
CD	35	0 0	10 .1	0 0	0 0	0 0	20 .2	10 .1	10 .1	0 0	50 .1
YA	36	0 0	30 .3	0 0	0 0	20 .2	0 0	0 0	0 0	0 0	50 .1
	COLUMN TOTAL	10710 11.7	10980 12.0	9570 10.5	10070 11.0	10020 11.0	8170 8.9	11330 12.4	10810 11.8	9630 10.5	91290 100.0

RAW CHI SQUARE = 15054.95649 WITH   80 DEGREES OF FREEDOM. SIGNIFICANCE =   0

NUMBER OF MISSING OBSERVATIONS =   93490

BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * C R O S S T A B U L A T I O N O F * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HO	26	790 7.5	780 8.9	910 8.3	1040 10.2	1330 10.9	800 11.3	780 10.6	760 9.7	990 10.7	8180 9.7
R4	27	0 0	40 .5	0 0	320 3.1	0 0	0 0	170 2.3	40 .5	100 1.1	670 .8
R3	28	5220 49.3	3920 45.0	4670 42.8	2690 26.3	4360 35.6	3160 44.6	2300 31.3	2760 35.1	2010 21.7	31090 36.9
TU	29	360 3.4	340 3.9	570 5.2	720 7.0	540 4.4	190 2.7	400 5.4	370 4.7	530 5.7	4020 4.8
ST	30	10 .1	0 0	0 0	20 .2	80 .7	20 .3	10 .1	10 .1	10 .1	160 .2
EX	31	40 .4	30 .3	120 1.1	40 .4	60 .5	0 0	0 0	0 0	70 .8	360 .4
CR	32	4080 38.6	3510 40.3	4610 42.2	5310 51.9	5850 47.8	2860 40.4	3570 48.5	3870 49.2	5460 59.0	39120 46.4
BA	33	30 .3	100 1.1	40 .4	90 .9	20 .2	50 .7	130 1.8	60 .8	20 .2	540 .6
SC	34	30 .3	0 0	0 0	0 0	0 0	0 0	0 0	0 0	60 .6	90 .1
YA	36	20 .2	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .0
	COLUMN TOTAL	10580 12.6	8720 10.4	10920 13.0	10230 12.1	12240 14.5	7080 8.4	7360 8.7	7870 9.3	9250 11.0	84250 100.0

RAW CHI SQUARE = 5375.15665 WITH 72 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 109980

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 106
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HO	26	1870 13.2	1680 12.5	1660 9.7	1550 13.7	2220 16.7	2090 17.1	2070 18.2	1800 16.0	1220 11.3	16160 14.0
R4	27	140 1.0	480 3.6	1120 6.5	650 5.7	230 1.7	0 0	0 0	0 0	320 3.0	2940 2.6
R3	28	3350 23.6	3440 25.5	5580 32.5	3100 27.4	1600 12.1	5170 42.3	1460 12.8	2990 26.6	2000 18.5	28690 24.9
TU	29	380 2.7	160 1.2	720 4.2	390 3.4	340 2.6	280 2.3	320 2.8	400 3.6	300 2.8	3290 2.9
ST	30	10 .1	90 .7	70 .4	0 0	40 .3	0 0	10 .1	30 .3	10 .1	260 .2
EX	31	140 1.0	20 .1	120 .7	30 .3	230 1.7	0 0	0 0	150 1.3	70 .6	760 .7
CR	32	8190 57.8	7530 55.8	7820 45.5	5550 49.0	8520 64.2	4620 37.8	7430 65.2	5560 49.5	6810 63.1	62030 53.9
BA	33	80 .6	60 .4	50 .3	40 .4	60 .5	20 .2	80 .7	270 2.4	60 .6	720 .6
SC	34	20 .1	0 0	0 0	20 .2	0 0	0 0	10 .1	10 .1	0 0	60 .1
CD	35	0 0	30 .2	30 .2	0 0	30 .2	30 .2	10 .1	20 .2	0 0	150 .1
	COLUMN TOTAL	14180 12.3	13490 11.7	17170 14.9	11330 9.8	13270 11.5	12210 10.6	11390 9.9	11230 9.8	10790 9.4	115060 100.0

RAW CHI SQUARE = 10522.01055 WITH 72 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 80380

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC +%COL PCT)                 82/11/04.     17.52.21.     PAGE  107
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE    E38          E36

* * * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * * * *
   BETA       BETA FISH BEHAVIOUR CODES                    BY  HR              EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HO	26	3740 34.5	630 6.0	2350 26.8	1480 13.0	2690 20.3	2860 26.2	1730 19.2	2300 18.9	2610 21.8	20390 20.7
R4	27	0 0	0 0	0 0	630 5.6	110 .8	0 0	290 3.2	1240 10.2	130 1.1	2400 2.4
R3	28	1680 15.5	4900 46.8	2050 23.4	5200 45.8	2720 20.6	3360 30.7	2990 33.2	2540 20.9	2510 21.0	27950 28.3
TU	29	280 2.6	460 4.4	560 6.4	290 2.6	650 4.9	270 2.5	200 2.2	180 1.5	190 1.6	3080 3.1
ST	30	0 0	30 .3	10 .1	10 .1	10 .1	30 .3	10 .1	50 .4	0 0	150 .2
EX	31	20 .2	0 0	0 0	80 .7	70 .5	0 0	20 .2	0 0	20 .2	210 .2
CR	32	5060 46.7	4380 41.8	3760 42.9	3660 32.2	6930 52.4	4350 39.8	3710 41.2	5800 47.8	6470 54.1	44120 44.7
BA	33	40 .4	60 .6	40 .5	0 0	50 .4	60 .5	60 .7	20 .2	30 .3	360 .4
SC	34	0 0	20 .2	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .0
CD	35	20 .2	0 0	0 0	0 0	0 0	0 0	0 0	10 .1	0 0	30 .0
	COLUMN TOTAL	10840 11.0	10480 10.6	8770 8.9	11350 11.5	13230 13.4	10930 11.1	9010 9.1	12140 12.3	11960 12.1	98710 100.0

RAW CHI SQUARE = 14018.71993 WITH 72 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 95440

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 108
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* * * * * * C R O S S T A B U L A T I O N O F * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
PAGE 1 OF 1

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HO	26	880 5.9	1400 10.4	1400 11.0	1140 11.7	1580 13.8	780 5.7	1200 9.5	2240 22.2	700 15.1	11320 11.0
R4	27	3330 22.5	2770 20.6	4430 35.0	470 4.8	2370 20.6	370 2.7	510 4.0	680 6.8	1090 23.5	16020 15.5
R3	28	8240 55.7	4480 33.4	3190 25.2	3920 40.2	2370 20.6	8880 64.9	2910 23.1	3170 31.5	1890 40.7	39050 37.9
TU	29	110 .7	80 .6	110 .9	240 2.5	100 .9	60 .4	320 2.5	90 .9	0 0	1110 1.1
ST	30	0 0	20 .1	10 .1	20 .2	10 .1	20 .1	20 .2	10 .1	0 0	110 .1
EX	31	0 0	0 0	70 .6	0 0	20 .2	20 .1	80 .6	0 0	0 0	190 .2
CR	32	2210 14.9	4610 34.4	3390 26.8	3890 39.9	5010 43.6	3530 25.9	7480 59.4	3880 38.5	960 20.7	34980 33.9
BA	33	0 0	60 .4	70 .6	40 .4	20 .2	10 .1	0 0	0 0	0 0	200 .2
CD	35	20 .1	0 0	0 0	20 .2	0 0	0 0	80 .6	0 0	0 0	120 .1
	COLUMN TOTAL	14790 14.3	13420 13.0	12670 12.3	9740 9.4	11480 11.1	13690 13.3	12600 12.2	10070 9.8	4640 4.5	103100 100.0

RAW CHI SQUARE = 22893.50085 WITH 64 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 55030

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 109
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

BETA	COUNT / COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
HO	26	500 3.9	1190 9.5	1220 8.7	1020 8.9	1690 14.3	1480 12.4	1480 11.6	1070 10.0	750 7.2	10400 9.6
R4	27	0 0	0 0	120 .9	0 0	0 0	0 0	0 0	130 1.2	0 0	250 .2
R3	28	2580 20.4	2710 21.6	3540 25.3	3400 29.7	3100 26.3	6770 56.8	3410 26.7	3830 36.0	1520 14.5	30860 28.5
TU	29	140 1.1	90 .7	230 1.6	90 .8	80 .7	180 1.5	250 2.0	230 2.2	170 1.6	1460 1.3
ST	30	20 .2	0 0	10 .1	10 .1	0 0	20 .2	10 .1	0 0	20 .2	90 .1
EX	31	20 .2	60 .5	110 .8	130 1.1	20 .2	60 .5	90 .7	20 .2	0 0	510 .5
CR	32	9370 74.0	8400 66.9	8670 62.1	6770 59.1	6850 58.1	3300 27.7	7420 58.2	5270 49.5	7930 75.8	63980 59.1
BA	33	20 .2	100 .8	60 .4	0 0	20 .2	40 .3	20 .2	50 .5	50 .5	360 .3
SC	34	0 0	0 0	0 0	0 0	20 .2	40 .3	60 .5	20 .2	0 0	140 .1
CD	35	0 0	0 0	10 .1	10 .1	20 .2	0 0	20 .2	10 .1	20 .2	90 .1
YA	36	20 .2	0 0	0 0	20 .2	0 0	30 .3	0 0	20 .2	0 0	90 .1
	COLUMN TOTAL	12670 11.7	12550 11.6	13970 12.9	11450 10.6	11800 10.9	11920 11.0	12760 11.8	10650 9.8	10460 9.7	108230 100.0

RAW CHI SQUARE = 11098.09430 WITH 80 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 53680

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 110
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
HO	26	2630 20.2	1940 22.7	2570 20.9	1590 17.4	2240 17.8	2120 20.5	1590 14.4	2670 24.2	1960 19.6	19310 19.7
R4	27	0 0	0 0	140 1.1	0 0	470 3.7	0 0	0 0	0 0	110 1.1	720 .7
R3	28	5230 40.3	3480 40.7	6160 50.0	4730 51.9	5080 40.3	5730 55.5	5310 48.0	3510 31.9	4600 46.1	43830 44.8
TU	29	290 2.2	120 1.4	210 1.7	220 2.4	230 1.8	130 1.3	450 4.1	230 2.1	260 2.6	2140 2.2
ST	30	0 0	0 0	0 0	0 0	20 .2	10 .1	0 0	0 0	0 0	30 .0
EX	31	0 0	0 0	0 0	80 .9	0 0	0 0	80 .7	110 1.0	30 .3	300 .3
CR	32	4820 37.1	2960 34.6	3170 25.8	2470 27.1	4510 35.8	2300 22.3	3500 31.6	4500 40.8	3010 30.2	31240 31.9
BA	33	20 .2	40 .5	60 .5	30 .3	40 .3	20 .2	130 1.2	0 0	0 0	340 .3
CD	35	0 0	10 .1	0 0	0 0	0 0	10 .1	0 0	0 0	10 .1	30 .0
	COLUMN TOTAL	12990 13.3	8550 8.7	12310 12.6	9420 9.6	12590 12.9	10320 10.5	11060 11.3	11020 11.3	9980 10.2	97940 100.0

RAW CHI SQUARE = 5723.89912 WITH 64 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 76750

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)          02/11/04.    17.52.21.    PAGE  111
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (NEUTRAL)

CPU TIME REQUIRED..    17.3810 SECONDS

          TASK NAME       ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
          CROSSTABS       VARIABLES=ALPHA(37,50),HR(1,9)/TABLES=ALPHA BY HR
          OPTIONS         3,5,7
          STATISTICS      1

       00052400 CM NEEDED FOR CROSSTABS


       OPTION - 1
       IGNORE MISSING VALUE INDICATORS
       (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

       OPTION - 3
       DELETE ROW PERCENTAGES

       OPTION - 5
       DELETE TOTAL PERCENTAGES
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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 112
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* * * C R O S S T A B U L A T I O N O F * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
PAGE 1 OF 1

ALPHA	HR → COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	1300	860	540	1020	450	340	2130	2540	1330	10510
		61.3	47.3	45.8	25.4	31.0	15.4	65.5	63.0	32.8	43.6
R1	38	50	360	140	1950	280	1050	580	540	420	5370
		2.4	19.8	11.9	48.5	19.3	47.5	17.8	13.4	10.4	22.3
SA	39	0	20	0	0	10	0	0	0	0	30
		0	1.1	0	0	.7	0	0	0	0	.1
BT	40	30	0	20	40	60	60	0	0	0	210
		1.4	0	1.7	1.0	4.1	2.7	0	0	0	.9
HA	42	10	90	0	0	10	10	0	20	0	140
		.5	4.9	0	0	.7	.5	0	.5	0	.6
RV	43	450	340	190	540	440	500	290	290	610	3650
		21.2	18.7	16.1	13.4	30.3	22.6	8.9	7.2	15.1	15.1
RO	44	120	80	280	90	90	230	180	340	510	1920
		5.7	4.4	23.7	2.2	6.2	10.4	5.5	8.4	12.6	8.0
BQ	45	0	0	0	20	0	0	0	0	0	20
		0	0	0	.5	0	0	0	0	0	.1
QI	46	20	0	0	0	0	0	0	0	20	40
		.9	0	0	0	0	0	0	0	.5	.2
RS	47	100	40	0	250	0	0	0	200	770	1360
		4.7	2.2	0	6.2	0	0	0	5.0	19.0	5.6
AV	48	30	20	0	90	90	0	40	80	390	740
		1.4	1.1	0	2.2	6.2	0	1.2	2.0	9.6	3.1
DA	49	10	10	10	20	10	20	10	20	0	110
		.5	.5	.8	.5	.7	.9	.3	.5	0	.5
FL	50	0	0	0	0	10	0	20	0	0	30
		0	0	0	0	.7	0	.6	0	0	.1
	COLUMN TOTAL	2120	1820	1180	4020	1450	2210	3250	4030	4050	24130
		8.8	7.5	4.9	16.7	6.0	9.2	13.5	16.7	16.8	100.0

RAW CHI SQUARE = 10127.88923 WITH 96 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 160650

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 113
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
PAGE 1 OF 1

ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	870 41.6	200 20.2	40 4.5	570 49.6	1670 63.0	430 24.3	190 23.2	740 43.0	220 17.3	4930 37.0
R1	38	190 9.1	40 4.0	60 6.8	20 1.7	60 2.3	0 0	70 8.5	240 14.0	50 3.9	730 5.5
SA	39	0 0	0 0	0 0	0 0	0 0	0 0	10 1.2	0 0	10 .8	20 .1
BT	40	90 4.3	0 0	20 2.3	100 8.7	40 1.5	60 3.4	60 7.3	80 4.7	80 6.3	530 4.0
DD	41	10 .5	20 2.0	20 2.3	0 0	0 0	0 0	0 0	0 0	0 0	50 .4
HA	42	0 0	10 1.0	0 0	0 0	0 0	0 0	0 0	0 0	10 .8	20 .1
RV	43	290 13.9	460 46.5	580 65.9	240 20.9	570 21.5	1010 57.1	440 53.7	520 30.2	760 59.8	4870 36.5
RO	44	50 2.4	0 0	70 8.0	50 4.3	80 3.0	60 3.4	30 3.7	120 7.0	80 6.3	540 4.0
BQ	45	0 0	0 0	0 0	0 0	0 0	30 1.7	0 0	0 0	20 1.6	50 .4
AV	48	560 26.8	200 20.2	90 10.2	160 13.9	190 7.2	170 9.6	20 2.4	0 0	20 1.6	1410 10.6
DA	49	0 0	30 3.0	0 0	10 .9	40 1.5	10 .6	0 0	20 1.2	10 .8	120 .9
FL	50	30 1.4	30 3.0	0 0	0 0	0 0	0 0	0 0	0 0	10 .8	70 .5
	COLUMN TOTAL	2090 15.7	990 7.4	880 6.6	1150 8.6	2650 19.9	1770 13.3	820 6.1	1720 12.9	1270 9.5	13340 100.0

RAW CHI SQUARE = 5067.95628 WITH 88 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 160890

ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHA	COUNT COL PCT	HR 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
R2	37	1160 26.3	2270 40.5	1870 55.3	3800 61.0	1300 64.4	680 33.5	610 51.3	450 40.9	3940 93.6	16080 53.3
R1	38	2320 52.6	1850 33.0	210 6.2	730 11.7	300 14.9	710 35.0	240 20.2	60 5.5	20 .5	6440 21.3
SA	39	0 0	0 0	10 .3	0 0	0 0	0 0	0 0	0 0	0 0	10 .0
BT	40	30 .7	0 0	20 .6	0 0	0 0	50 2.5	40 3.4	20 1.8	0 0	160 .5
OO	41	0 0	10 .2	0 0	0 0	0 0	0 0	40 3.4	0 0	0 0	50 .2
HA	42	0 0	10 .2	0 0	0 0	0 0	10 .5	20 1.7	10 .9	40 1.0	90 .3
RV	43	140 3.2	540 9.6	540 16.0	720 11.6	190 9.4	250 12.3	140 11.8	290 26.4	110 2.6	2920 9.7
RO	44	90 2.0	50 .9	90 2.7	280 4.5	80 4.0	170 8.4	20 1.7	150 13.6	90 2.1	1020 3.4
BQ	45	0 0	0 0	30 .9	0 0	0 0	0 0	0 0	0 0	0 0	30 .1
QI	46	0 0	0 0	0 0	0 0	0 0	20 1.0	10 .8	0 0	0 0	30 .1
RS	47	0 0	300 5.3	70 2.1	460 7.4	0 0	80 3.9	0 0	0 0	0 0	910 3.0
AV	48	630 14.3	550 9.8	490 14.5	240 3.9	150 7.4	60 3.0	40 3.4	110 10.0	10 .2	2280 7.6
DA	49	0 0	10 .2	0 0	0 0	0 0	0 0	30 2.5	10 .9	0 0	50 .2
FL	50	40 .9	20 .4	50 1.5	0 0	0 0	0 0	0 0	0 0	0 0	110 .4
	COLUMN TOTAL	4410 14.6	5610 18.6	3380 11.2	6230 20.6	2020 6.7	2030 6.7	1190 3.9	1100 3.6	4210 13.9	30180 100.0

RAW CHI SQUARE = 12769.36139 WITH 104 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 165260

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 115
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E38 E36

* * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * PAGE 1 OF 1

ALPHA	COUNT COL PCT	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
R2	37	800 46.8	930 52.8	1570 63.1	700 35.5	4170 86.5	2320 82.9	4120 83.7	1800 75.9	1640 88.2	18050 73.1
R1	38	100 5.8	80 4.5	290 11.6	300 15.2	280 5.8	80 2.9	270 5.5	190 8.0	20 1.1	1610 6.5
SA	39	0 0	70 4.0	20 .8	20 1.0	30 .6	0 0	0 0	20 .8	0 0	160 .6
BT	40	0 0	0 0	0 0	20 1.0	0 0	0 0	20 .4	0 0	0 0	40 .2
DD	41	20 1.2	80 4.5	20 .8	60 3.0	20 .4	0 0	0 0	0 0	0 0	200 .8
HA	42	0 0	10 .6	0 0	0 0	0 0	0 0	10 .2	0 0	10 .5	30 .1
RV	43	430 25.1	290 16.5	260 10.4	90 4.6	70 1.5	290 10.4	290 5.9	230 9.7	130 7.0	2080 8.4
RO	44	160 9.4	20 1.1	160 6.4	210 10.7	100 2.1	60 2.1	60 1.2	0 0	30 1.6	800 3.2
BQ	45	0 0	50 2.8	150 6.0	70 3.6	20 .4	0 0	0 0	0 0	0 0	290 1.2
QI	46	0 0	30 1.7	0 0	0 0	0 0	10 .4	0 0	0 0	0 0	40 .2
RS	47	30 1.8	80 4.5	0 0	180 9.1	0 0	0 0	0 0	0 0	0 0	290 1.2
AV	48	150 8.8	90 5.1	20 .8	240 12.2	120 2.5	30 1.1	90 1.8	100 4.2	0 0	840 3.4
DA	49	0 0	30 1.7	0 0	40 2.0	10 .2	10 .4	20 .4	10 .4	30 1.6	150 .6
FL	50	20 1.2	0 0	0 0	40 2.0	0 0	0 0	40 .8	20 .8	0 0	120 .5
	COLUMN TOTAL	1710 6.9	1760 7.1	2490 10.1	1970 8.0	4820 19.5	2800 11.3	4920 19.9	2370 9.6	1860 7.5	24700 100.0

RAW CHI SQUARE = 8278.92161 WITH 104 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 169450

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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 116
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	1160	1190	890	380	400	470	1150	230	80	5950
		53.7	48.2	34.6	15.4	40.0	26.9	44.2	16.3	17.8	35.2
R1	38	160	210	250	90	20	140	410	190	0	1470
		7.4	8.5	9.7	3.6	2.0	8.0	15.8	13.5	0	8.7
SA	39	0	10	0	0	0	0	0	0	0	10
		0	.4	0	0	0	0	0	0	0	.1
BT	40	20	20	0	0	0	20	40	30	0	130
		.9	.8	0	0	0	1.1	1.5	2.1	0	.8
DD	41	0	0	20	20	0	0	0	0	0	40
		0	0	.8	.8	0	0	0	0	0	.2
HA	42	10	20	10	50	0	10	0	40	0	140
		.5	.8	.4	2.0	0	.6	0	2.8	0	.8
RV	43	330	270	380	630	260	550	380	550	120	3470
		15.3	10.9	14.8	25.5	26.0	31.4	14.6	39.0	26.7	20.6
RO	44	180	80	530	550	90	220	410	190	250	2500
		8.3	3.2	20.6	22.3	9.0	12.6	15.8	13.5	55.6	14.8
RS	47	0	0	0	0	30	40	170	140	0	380
		0	0	0	0	3.0	2.3	6.5	9.9	0	2.3
AV	48	300	620	400	530	200	220	40	30	0	2340
		13.9	25.1	15.6	21.5	20.0	12.6	1.5	2.1	0	13.9
DA	49	0	0	0	10	0	10	0	10	0	30
		0	0	0	.4	0	.6	0	.7	0	.2
FL	50	0	50	90	210	0	70	0	0	0	420
		0	2.0	3.5	8.5	0	4.0	0	0	0	2.5
	COLUMN TOTAL	2160	2470	2570	2470	1000	1750	2600	1410	450	16880
		12.8	14.6	15.2	14.6	5.9	10.4	15.4	8.4	2.7	100.0

RAW CHI SQUARE = 5548.23401 WITH 88 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 141250

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 117
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

C R O S S T A B U L A T I O N O F
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED PAGE 1 OF 1

ALPHA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	860 20.3	730 16.5	410 9.9	1100 14.6	280 8.0	460 10.0	90 1.9	810 18.8	980 22.0	5720 13.6
R1	38	2300 54.4	2410 54.4	2310 55.5	5130 68.0	1900 54.4	1810 39.4	3820 78.8	2110 49.1	2850 64.0	24640 58.6
SA	39	0 0	0 0	0 0	0 0	0 0	10 .2	0 0	0 0	0 0	10 .0
BT	40	20 .5	0 0	0 0	0 0	0 0	0 0	0 0	20 .5	0 0	40 .1
DD	41	0 0	20 .5	0 0	0 0	0 0	30 .7	20 .4	0 0	0 0	70 .2
HA	42	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	10 .2	10 .0
RV	43	110 2.6	210 4.7	420 10.1	80 1.1	230 6.6	290 6.3	190 3.9	280 6.5	100 2.2	1910 4.5
RO	44	160 3.8	430 9.7	430 10.3	520 6.9	470 13.5	690 15.0	260 5.4	430 10.0	150 3.4	3540 8.4
BQ	45	0 0	20 .5	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .0
RS	47	0 0	10 .2	120 2.9	290 3.8	150 4.3	540 11.8	110 2.3	230 5.3	250 5.6	1700 4.0
AV	48	680 16.1	520 11.7	370 8.9	320 4.2	450 12.9	660 14.4	300 6.2	380 8.8	90 2.0	3770 9.0
DA	49	0 0	0 0	20 .5	10 .1	0 0	40 .9	20 .4	40 .9	20 .4	150 .4
FL	50	100 2.4	80 1.8	80 1.9	90 1.2	10 .3	60 1.3	40 .8	0 0	0 0	460 1.1
	COLUMN TOTAL	4230 10.1	4430 10.5	4160 9.9	7540 17.9	3490 8.3	4590 10.9	4830 11.5	4300 10.2	4450 10.6	42040 100.0

RAW CHI SQUARE = 6464.59295 WITH 96 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 119870

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHA ALPHA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHA	COUNT / COL PCT (HR)	1 HR 1	2 HR 2	4 HR 3	8 HR 4	15 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
R2	37	4660 59.0	2360 36.7	2260 49.7	1000 31.3	1460 26.1	720 21.9	960 22.3	390 25.3	1190 23.8	15000 35.9
R1	38	1430 18.1	2070 32.2	550 12.1	270 8.5	1600 28.6	170 5.2	1210 28.1	400 26.0	940 18.8	8640 20.7
BT	40	0 0	60 .9	10 .2	0 0	0 0	20 .6	0 0	0 0	0 0	90 .2
DD	41	10 .1	0 0	0 0	0 0	10 .2	0 0	0 0	0 0	0 0	20 .0
HA	42	0 0	20 .3	10 .2	70 2.2	0 0	20 .6	0 0	10 .6	20 .4	150 .4
RV	43	400 5.1	490 7.6	220 4.8	390 12.2	440 7.9	700 21.3	420 9.8	120 7.8	590 11.8	3770 9.0
RO	44	580 7.3	630 9.8	380 8.4	410 12.9	770 13.8	670 20.4	750 17.4	470 30.5	810 16.2	5470 13.1
BQ	45	0 0	0 0	20 .4	0 0	0 0	0 0	0 0	0 0	0 0	20 .0
RS	47	70 .9	240 3.7	800 17.6	450 14.1	870 15.6	760 23.1	770 17.9	30 1.9	970 19.4	4960 11.9
AV	48	680 8.6	500 7.8	210 4.6	500 15.7	350 6.3	150 4.6	170 4.0	120 7.8	470 9.4	3150 7.5
DA	49	50 .6	20 .3	20 .4	20 .6	20 .4	40 1.2	20 .5	0 0	0 0	190 .5
FL	50	20 .3	40 .6	70 1.5	80 2.5	70 1.3	40 1.2	0 0	0 0	0 0	320 .8
	COLUMN TOTAL	7900 18.9	6430 15.4	4550 10.9	3190 7.6	5590 13.4	3290 7.9	4300 10.3	1540 3.7	4990 11.9	41780 100.0

RAW CHI SQUARE = 9472.24749 WITH 88 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 132910

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                82/11/04.     17.52.21.      PAGE  119
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)

CPU TIME REQUIRED..    17.6320 SECONDS

                    TASK NAME        BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
                    CROSSTABS        VARIABLES=BETA(37,50),HR(1,9)/TABLES=BETA BY HR
                    OPTIONS          3,5,7
                    STATISTICS       I

          00052400 CM NEEDED FOR CROSSTABS

          OPTION - 1
          IGNORE MISSING VALUE INDICATORS
          (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

          OPTION - 3
          DELETE ROW PERCENTAGES

          OPTION - 5
          DELETE TOTAL PERCENTAGES
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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 120
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED * * * PAGE 1 OF 1

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	1210 31.5	960 33.3	1710 44.0	2200 64.9	1670 32.6	2850 58.3	1290 42.2	1940 53.3	1510 41.7	15340 44.7
R1	38	390 25.8	390 13.5	270 6.9	70 2.1	1720 33.8	680 13.9	320 10.5	120 3.3	410 11.3	4970 14.5
SA	39	0 0	10 .3	0 0	10 .3	0 0	0 0	0 0	10 .3	0 0	30 .1
BT	40	30 .8	40 1.4	40 1.0	120 3.5	0 0	0 0	20 .7	90 2.5	0 0	340 1.0
DD	41	40 1.0	50 1.7	50 1.3	10 .3	40 .8	20 .4	0 0	0 0	40 1.1	250 .7
HA	42	10 .3	0 0	20 .5	0 0	0 0	10 .2	30 1.0	30 .8	0 0	100 .3
RV	43	110 2.9	430 14.9	440 11.3	320 9.4	120 2.4	120 2.5	390 12.7	420 11.5	470 13.0	2820 8.2
RO	44	140 3.6	130 4.5	400 10.3	130 3.8	270 5.3	150 3.1	270 8.8	350 9.6	310 8.6	2150 6.3
BQ	45	0 0	0 0	0 0	0 0	70 1.4	30 .6	0 0	30 .8	0 0	130 .4
RS	47	1070 27.9	110 3.8	150 3.9	40 1.2	180 3.5	190 3.9	60 2.0	120 3.3	650 18.0	2570 7.5
AV	48	90 2.3	530 18.4	720 18.5	430 12.7	470 9.2	500 10.2	510 16.7	420 11.5	110 3.0	3780 11.0
DA	49	40 1.0	10 .3	10 .3	20 .6	40 .8	50 1.0	30 1.0	40 1.1	10 .3	250 .7
FL	50	110 2.9	220 7.6	80 2.1	40 1.2	510 10.0	290 5.9	140 4.6	70 1.9	110 3.0	1570 4.6
	COLUMN TOTAL	3840 11.2	2880 8.4	3890 11.3	3390 9.9	5090 14.8	4890 14.3	3060 8.9	3640 10.6	3620 10.6	34300 100.0

RAW CHI SQUARE = 10908.45441 WITH 96 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 150480

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 121
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	2060 73.8	1150 60.8	1050 53.0	2090 78.3	1740 61.5	3870 54.5	3330 57.6	3900 64.1	3120 54.0	22310 60.5
R1	38	100 3.6	110 5.8	220 11.1	90 3.4	30 1.1	1850 26.1	1060 18.3	550 9.0	660 11.4	4670 12.7
SA	39	0 0	0 0	0 0	0 0	20 .7	0 0	0 0	0 0	10 .2	30 .1
BT	40	0 0	0 0	20 1.0	40 1.5	80 2.8	0 0	70 1.2	40 .7	120 2.1	370 1.0
DD	41	80 2.9	20 1.1	60 3.0	50 1.9	0 0	30 .4	40 .7	60 1.0	30 .5	370 1.0
HA	42	10 .4	10 .5	10 .5	0 0	10 .4	0 0	10 .2	20 .3	0 0	70 .2
RV	43	150 5.4	180 9.5	360 18.2	240 9.0	130 4.6	350 4.9	380 6.6	110 1.8	290 5.0	2190 5.9
RO	44	0 0	190 10.1	30 1.5	60 2.2	210 7.4	130 1.8	80 1.4	70 1.2	190 3.3	960 2.6
BQ	45	0 0	60 3.2	0 0	90 3.4	80 2.8	0 0	0 0	30 .5	50 .9	310 .8
RS	47	100 3.6	40 2.1	0 0	0 0	0 0	220 3.1	0 0	230 3.8	40 .7	630 1.7
AV	48	250 9.0	80 4.2	160 8.1	10 .4	390 13.8	260 3.7	320 5.5	720 11.8	660 11.4	2850 7.7
DA	49	40 1.4	0 0	60 3.0	0 0	50 1.8	10 .1	40 .7	40 .7	60 1.0	300 .8
FL	50	0 0	50 2.6	10 .5	0 0	90 3.2	330 5.4	450 7.8	310 5.1	550 9.5	1840 5.0
	COLUMN TOTAL	2790 7.6	1890 5.1	1980 5.4	2670 7.2	2830 7.7	7100 19.2	5780 15.7	6080 16.5	5780 15.7	36900 100.0

RAW CHI SQUARE = 7651.45855 WITH 96 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 157330

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                82/11/04.     17.52.21.     PAGE  122
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E34         E41
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* * * * * C R O S S T A B U L A T I O N O F * * * * *
BETA   BETA FISH BEHAVIOUR CODES   BY HR   EXP. TIME ELAPSED   PAGE 1 OF 1

BETA	COUNT / COL PCT (HR)	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	2110 74.3	1440 74.2	3380 82.4	2690 76.9	2920 72.8	2030 53.8	1090 36.0	820 30.3	1950 57.9	18430 63.0
R1	38	170 6.0	110 5.7	0 0	370 10.6	160 4.0	580 15.4	250 8.3	270 10.0	160 4.7	2070 7.1
BT	40	170 6.0	0 0	0 0	50 1.4	10 .2	30 .8	0 0	20 .7	10 .3	290 1.0
DD	41	0 0	0 0	0 0	0 0	0 0	0 0	20 .7	0 0	0 0	20 .1
HA	42	10 .4	0 0	40 1.0	20 .6	20 .5	0 0	30 1.0	30 1.1	30 .9	180 .6
RV	43	230 8.1	250 12.9	300 7.3	200 5.7	500 12.5	130 3.4	250 8.3	480 17.7	370 11.0	2710 9.3
RO	44	80 2.8	30 1.5	210 5.1	70 2.0	110 2.7	100 2.7	140 4.6	80 3.0	90 2.7	910 3.1
BQ	45	0 0	20 1.0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	20 .1
RS	47	0 0	0 0	0 0	0 0	0 0	290 7.7	590 19.5	40 1.5	140 4.2	1060 3.6
AV	48	30 1.1	40 2.1	170 4.1	90 2.6	260 6.5	380 10.1	580 19.1	840 31.0	510 15.1	2900 9.9
DA	49	40 1.4	50 2.6	0 0	10 .3	10 .2	10 .3	10 .3	0 0	10 .3	140 .5
FL	50	0 0	0 0	0 0	0 0	20 .5	220 5.8	70 2.3	130 4.8	100 3.0	540 1.8
	COLUMN TOTAL	2840 9.7	1940 6.6	4100 14.0	3500 12.0	4010 13.7	3770 12.9	3030 10.4	2710 9.3	3370 11.5	29270 100.0

RAW CHI SQUARE = 10446.40751 WITH 88 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 166170

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                82/11/04.    17.52.21.    PAGE 123
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE    E38          E36

* * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * *
    BETA        BETA FISH BEHAVIOUR CODES                BY  HR          EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE 1 OF 1
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BETA	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	4680	2780	2370	700	2100	920	2620	1190	1170	18530
		79.3	73.9	70.7	59.8	73.9	55.8	67.9	56.9	44.3	68.0
R1	38	240	760	660	70	60	40	90	50	50	2020
		4.1	20.2	19.7	6.0	2.1	2.4	2.3	2.4	1.9	7.4
SA	39	30	30	0	20	0	0	0	0	10	90
		.5	.8	0	1.7	0	0	0	0	.4	.3
BT	40	10	0	0	0	0	0	0	0	40	50
		.2	0	0	0	0	0	0	0	1.5	.2
DD	41	10	0	0	0	0	0	20	20	20	70
		.2	0	0	0	0	0	.5	1.0	.8	.3
HA	42	0	10	0	20	30	10	40	10	30	150
		0	.3	0	1.7	1.1	.6	1.0	.5	1.1	.6
RV	43	380	90	250	240	370	100	580	270	220	2500
		6.4	2.4	7.5	20.5	13.0	6.1	15.0	12.9	8.3	9.2
RO	44	120	60	50	60	50	130	100	0	100	670
		2.0	1.6	1.5	5.1	1.8	7.9	2.6	0	3.8	2.5
RS	47	210	0	0	0	0	0	0	30	120	360
		3.6	0	0	0	0	0	0	1.4	4.5	1.3
AV	48	160	30	20	20	220	430	290	370	690	2230
		2.7	.8	.6	1.7	7.7	26.1	7.5	17.7	26.1	8.2
DA	49	60	0	0	40	10	20	50	30	50	260
		1.0	0	0	3.4	.4	1.2	1.3	1.4	1.9	1.0
FL	50	0	0	0	0	0	0	70	120	140	330
		0	0	0	0	0	0	1.8	5.7	5.3	1.2
	COLUMN TOTAL	5900	3760	3350	1170	2840	1650	3860	2090	2640	27260
		21.6	13.8	12.3	4.3	10.4	6.1	14.2	7.7	9.7	100.0

RAW CHI SQUARE = 8679.32440 WITH 88 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 166890

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 124
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED * * * * PAGE 1 OF 1

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	520 45.2	680 60.7	720 42.1	920 28.1	380 23.9	1070 52.5	370 22.4	630 18.8	260 15.4	5550 31.6
R1	38	30 2.6	60 5.4	90 5.3	350 10.7	50 3.1	50 2.5	160 9.7	660 19.7	140 8.3	1590 9.0
SA	39	0 0	0 0	0 0	10 .3	0 0	10 .5	0 0	0 0	0 0	20 .1
BT	40	0 0	20 1.8	20 1.2	20 .6	0 0	0 0	100 6.1	30 .9	0 0	190 1.1
DD	41	0 0	0 0	20 1.2	20 .6	10 .6	10 .5	0 0	0 0	10 .6	70 .4
HA	42	20 1.7	10 .9	0 0	40 1.2	0 0	10 .5	0 0	10 .3	0 0	90 .5
RV	43	200 17.4	130 11.6	260 15.2	610 18.7	360 22.6	280 13.7	300 18.2	470 14.0	400 23.7	3010 17.1
RO	44	280 24.3	70 6.3	330 19.3	570 17.4	140 8.8	250 12.3	110 6.7	240 7.2	400 23.7	2390 13.6
BQ	45	0 0	0 0	40 2.3	40 1.2	50 3.1	0 0	0 0	0 0	0 0	130 .7
RS	47	0 0	0 0	80 4.7	520 15.9	530 33.3	0 0	120 7.3	970 29.0	110 6.5	2330 13.3
AV	48	90 7.8	150 13.4	120 7.0	130 4.0	60 3.8	170 8.3	380 23.0	180 5.4	320 18.9	1600 9.1
DA	49	10 .9	0 0	30 1.8	30 .9	10 .6	40 2.0	10 .6	30 .9	10 .6	170 1.0
FL	50	0 0	0 0	0 0	10 .3	0 0	150 7.4	100 6.1	130 3.9	40 2.4	430 2.4
	COLUMN TOTAL	1150 6.5	1120 6.4	1710 9.7	3270 18.6	1590 9.0	2040 11.6	1650 9.4	3350 19.1	1690 9.6	17570 100.0

RAW CHI SQUARE = 6633.96897 WITH 96 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 140560

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 125
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * C R O S S T A B U L A T I O N O F * * * * *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED
PAGE 1 OF 1

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	520 59.1	640 51.2	310 40.3	640 40.5	640 29.9	430 36.1	460 32.2	940 29.5	980 53.8	5560 39.0
R1	38	0 0	160 12.8	80 10.4	350 22.2	840 39.3	50 4.2	100 7.0	1400 43.9	260 14.3	3240 22.7
SA	39	0 0	0 0	0 0	20 1.3	0 0	0 0	0 0	0 0	0 0	20 .1
BT	40	0 0	0 0	20 2.6	0 0	0 0	0 0	0 0	0 0	0 0	20 .1
DD	41	0 0	0 0	0 0	0 0	20 .9	0 0	0 0	20 .6	0 0	40 .3
HA	42	0 0	0 0	20 2.6	30 1.9	10 .5	10 .8	0 0	0 0	10 .5	80 .6
RV	43	180 20.5	90 7.2	100 13.0	300 19.0	210 9.8	240 20.2	260 18.2	170 5.3	130 7.1	1680 11.8
RO	44	40 4.5	160 12.8	80 10.4	90 5.7	100 4.7	280 23.5	250 17.5	210 6.6	150 8.2	1360 9.5
BQ	45	0 0	50 4.0	20 2.6	0 0	30 1.4	100 8.4	0 0	20 .6	0 0	220 1.5
RS	47	0 0	0 0	0 0	0 0	0 0	0 0	0 0	270 8.5	0 0	270 1.9
AV	48	140 15.9	150 12.0	140 18.2	140 8.9	270 12.6	70 5.9	320 22.4	160 5.0	260 14.3	1650 11.6
DA	49	0 0	0 0	0 0	10 .6	0 0	0 0	0 0	0 0	10 .5	20 .1
FL	50	0 0	0 0	0 0	0 0	20 .9	10 .8	40 2.8	0 0	20 1.1	90 .6
	COLUMN TOTAL	880 6.2	1250 8.8	770 5.4	1580 11.1	2140 15.0	1190 8.4	1430 10.0	3190 22.4	1820 12.8	14250 100.0

RAW CHI SQUARE = 5054.03872 WITH 96 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 147660

BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETA BETA FISH BEHAVIOUR CODES BY HR EXP. TIME ELAPSED PAGE 1 OF 1

BETA	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
R2	37	570 32.6	2790 79.3	1510 77.4	690 54.3	760 46.1	1950 67.9	1480 61.4	1140 38.0	1590 41.8	12480 56.2
R1	38	490 28.0	70 2.0	30 1.5	130 10.2	250 15.2	20 .7	30 1.2	330 11.0	130 3.4	1480 6.7
SA	39	0 0	0 0	0 0	0 0	0 0	0 0	20 .8	0 0	0 0	20 .1
BT	40	40 2.3	20 .6	20 1.0	0 0	0 0	0 0	0 0	20 .7	50 1.3	150 .7
HA	42	0 0	10 .3	0 0	40 3.1	0 0	20 .7	0 0	20 .7	10 .3	100 .5
RV	43	420 24.0	260 7.4	240 12.3	80 6.3	400 24.2	340 11.8	310 12.9	260 8.7	600 15.8	2910 13.1
RO	44	200 11.4	270 7.7	80 4.1	280 22.0	190 11.5	440 15.3	360 14.9	520 17.3	560 14.7	2900 13.1
BQ	45	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	30 .8	30 .1
RS	47	0 0	90 2.6	0 0	0 0	0 0	0 0	10 .4	100 3.3	480 12.6	680 3.1
AV	48	0 0	0 0	60 3.1	20 1.6	50 3.0	100 3.5	150 6.2	490 16.3	270 7.1	1140 5.1
DA	49	30 1.7	10 .3	10 .5	30 2.4	0 0	0 0	50 2.1	20 .7	10 .3	160 .7
FL	50	0 0	0 0	0 0	0 0	0 0	0 0	0 0	100 3.3	70 1.8	170 .8
	COLUMN TOTAL	1750 7.9	3520 15.8	1950 8.8	1270 5.7	1650 7.4	2870 12.9	2410 10.8	3000 13.5	3800 17.1	22220 100.0

RAW CHI SQUARE = 7894.50683 WITH 88 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 152470

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)             82/11/04.    17.52.21.     PAGE  127
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (SUBMISSIVE)

CPU TIME REQUIRED..    17.4930 SECONDS

              TASK NAME        ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
              CROSSTABS        VARIABLES=ALPHAG(1,9),HR(1,9)/TABLES=ALPHAG BY HR
              OPTIONS          3,5,7
              STATISTICS       1

          00052400 CM NEEDED FOR CROSSTABS

          OPTION - 1
          IGNORE MISSING VALUE INDICATORS
          (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

          OPTION - 3
          DELETE ROW PERCENTAGES

          OPTION - 5
          DELETE TOTAL PERCENTAGES
```

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 128
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * *
ALPHAG ALPHA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHAG	COUNT / COL PCT	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	1660 7.9	2240 10.8	2550 11.6	2600 14.1	1800 9.8	1690 9.3	2900 13.5	2970 14.6	2670 11.1	21080 11.4
FEEDING	2	270 1.3	770 3.7	180 .8	370 2.0	510 2.8	590 3.2	350 1.6	540 2.7	780 3.2	4360 2.4
NEUTRAL	3	13630 64.5	12390 59.6	13340 60.6	13160 71.6	13990 76.2	12420 68.0	13260 61.6	13140 64.7	10570 44.0	115900 62.7
SUBMISSIVE	4	770 3.6	580 2.8	500 2.3	1050 5.7	710 3.9	820 4.5	540 2.5	950 4.7	2300 9.6	8220 4.4
NUL	9	4800 22.7	4800 23.1	5450 24.8	1200 6.5	1350 7.4	2750 15.1	4470 20.8	2700 13.3	7700 32.1	35220 19.1
	COLUMN TOTAL	21130 11.4	20780 11.2	22020 11.9	18380 9.9	18360 9.9	18270 9.9	21520 11.6	20300 11.0	24020 13.0	184780 100.0

RAW CHI SQUARE = 11991.71933 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 129
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * *
ALPHAG ALPHA FISH BEHAVIOUR CLASSES BY HR EXP, TIME ELAPSED
* PAGE 1 OF 1

ALPHAG	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	1550 7.0	770 3.9	1000 4.9	1590 6.2	2970 14.4	3220 14.7	1920 8.6	2320 10.6	2840 14.4	18180 9.4
FEEDING	2	940 4.2	470 2.4	300 1.5	500 2.0	550 2.7	440 2.0	1420 6.4	700 3.2	540 2.7	5860 3.0
NEUTRAL	3	13360 60.0	13900 70.2	14380 70.6	14140 55.5	13530 65.8	12540 57.4	12280 55.3	12800 58.3	13570 68.7	120500 62.0
SUBMISSIVE	4	1030 4.6	750 3.8	780 3.8	560 2.2	920 4.5	1340 6.1	550 2.5	740 3.4	990 5.0	7660 3.9
NUL	9	5400 24.2	3900 19.7	3900 19.2	8700 34.1	2600 12.6	4300 19.7	6030 27.2	5400 24.6	1800 9.1	42030 21.6
	COLUMN TOTAL	22280 11.5	19790 10.2	20360 10.5	25490 13.1	20570 10.6	21840 11.2	22200 11.4	21960 11.3	19740 10.2	194230 100.0

RAW CHI SQUARE = 11072.19159 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)          82/11/04.    17.52.21.    PAGE  130
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE   RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E34        E41

* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N   O F * * * * * * * * * * * * * * * * * * * *
   ALPHAG     ALPHA FISH BEHAVIOUR CLASSES                   BY  HR        EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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ALPHAG	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	1010 4.1	1350 5.9	2040 7.3	1340 6.6	1850 7.8	2390 11.8	2500 13.3	2640 13.4	1060 6.1	16180 8.3
FEEDING	2	520 2.1	590 2.6	740 2.7	530 2.6	1110 4.7	1790 8.8	1440 7.7	490 2.5	890 5.1	8100 4.1
NEUTRAL	3	17900 72.7	15090 66.2	20100 72.0	13800 67.7	18640 79.1	12720 62.7	12400 66.0	12490 63.5	13730 78.8	136870 70.0
SUBMISSIVE	4	930 3.8	1490 6.5	1290 4.6	1700 8.3	420 1.8	640 3.2	340 1.8	590 3.0	250 1.4	7650 3.9
NUL	9	4250 17.3	4280 18.8	3750 13.4	3000 14.7	1550 6.6	2760 13.6	2100 11.2	3450 17.5	1500 8.6	26640 13.6
	COLUMN TOTAL	24610 12.6	22800 11.7	27920 14.3	20370 10.4	23570 12.1	20300 10.4	18780 9.6	19660 10.1	17430 8.9	195440 100.0

RAW CHI SQUARE = 10216.94228 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 131
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E38 E36

* * * * * C R O S S T A B U L A T I O N O F * * * * *
ALPHAG ALPHA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED PAGE 1 OF 1

ALPHAG	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	540 2.3	220 1.1	720 2.9	810 3.9	1260 5.0	1540 8.2	1650 8.3	1550 7.3	2290 11.2	10580 5.4
FEEDING	2	780 3.3	390 1.9	560 2.3	790 3.8	1020 4.1	1130 6.0	1440 7.3	1060 5.0	980 4.8	8150 4.2
NEUTRAL	3	17590 74.5	15760 77.8	14200 58.1	14250 68.8	16660 66.7	11230 59.7	11950 60.4	14370 67.8	13310 65.3	129320 66.6
SUBMISSIVE	4	810 3.4	680 3.4	610 2.5	950 4.6	340 1.4	400 2.1	530 2.7	360 1.7	200 1.0	4880 2.5
NUL	9	3900 16.5	3200 15.8	8350 34.2	3900 18.8	5700 22.8	4500 23.9	4200 21.2	3870 18.2	3600 17.7	41220 21.2
	COLUMN TOTAL	23620 12.2	20250 10.4	24440 12.6	20700 10.7	24980 12.9	18800 9.7	19770 10.2	21210 10.9	20380 10.5	194150 100.0

RAW CHI SQUARE = 9467.23440 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 132
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * *
ALPHAG ALPHA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED
* * * * * * * * PAGE 1 OF 1

ALPHAG	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	2440 12.3	1990 11.0	2220 11.3	3630 18.0	1540 9.0	2330 12.1	1860 10.3	2130 12.9	1120 11.6	19260 12.2
FEEDING	2	1350 6.8	780 4.3	1190 6.1	170 .8	970 5.7	640 3.3	230 1.3	440 2.7	0 0	5770 3.6
NEUTRAL	3	13490 68.0	13680 75.4	13520 68.8	11330 56.3	11640 68.3	13790 71.6	14400 80.1	12290 74.7	6010 62.3	110150 69.7
SUBMISSIVE	4	840 4.2	1060 5.8	1430 7.3	2000 9.9	580 3.4	1140 5.9	1040 5.8	990 6.0	370 3.8	9450 6.0
NUL	9	1730 8.7	630 3.5	1280 6.5	3000 14.9	2310 13.6	1350 7.0	450 2.5	600 3.6	2150 22.3	13500 8.5
	COLUMN TOTAL	19850 12.6	18140 11.5	19640 12.4	20130 12.7	17040 10.8	19250 12.2	17980 11.4	16450 10.4	9650 6.1	158130 100.0

RAW CHI SQUARE = 10486.66763 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 133
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHAG ALPHA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

ALPHAG	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	1310 7.1	1860 10.1	1990 10.3	1380 7.6	1880 10.5	2360 13.8	1180 6.5	1320 7.7	1770 10.3	15050 9.3
FEEDING	2	1180 6.4	750 4.1	850 4.4	100 .6	370 2.1	420 2.5	430 2.4	200 1.2	280 1.6	4580 2.8
NEUTRAL	3	14350 77.5	13710 74.7	14080 72.9	13850 76.4	13450 75.1	11110 65.0	14290 78.8	13520 78.5	13300 77.2	121660 75.1
SUBMISSIVE	4	1070 5.8	1290 7.0	1440 7.5	1310 7.2	1310 7.3	2310 13.5	940 5.2	1380 8.0	620 3.6	11670 7.2
NUL	9	600 3.2	750 4.1	950 4.9	1500 8.3	900 5.0	900 5.3	1300 7.2	800 4.6	1250 7.3	8950 5.5
	COLUMN TOTAL	18510 11.4	18360 11.3	19310 11.9	18140 11.2	17910 11.1	17100 10.6	18140 11.2	17220 10.6	17220 10.6	161910 100.0

RAW CHI SQUARE = 5032.50674 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                    82/11/04.     17.52.21.      PAGE  134
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE   RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E54          E55

* * * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N   O F * * * * * * * * * * * * * * * * * * * * *
   ALPHAG     ALPHA FISH BEHAVIOUR CLASSES                  BY  HR          EXP. TIME ELAPSED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  1

              HR
        COUNT  I
      COL PCT  I1 HR     2 HR     4 HR     8 HR     16 HR    32 HR    64 HR    128 HR   256 HR    ROW
               I                                                                               TOTAL
ALPHAG  -------I---1----I---2----I---3----I---4----I---5----I---6----I---7----I---8----I---9----I
                1 I  1540  I  2260  I  2370  I  2420  I  2320  I  3070  I  3200  I  3140  I  3410  I  23730
 AGRESSIVE        I   7.9  I  12.2  I  12.6  I  14.3  I  11.8  I  14.5  I  17.5  I  15.7  I  15.5  I   13.6
               -I--------I--------I--------I--------I--------I--------I--------I--------I--------I
                2 I   610  I   150  I   350  I   550  I   320  I    90  I   440  I   810  I   680  I   4000
 FEEDING          I   3.1  I    .8  I   1.9  I   3.2  I   1.6  I    .4  I   2.4  I   4.1  I   3.1  I    2.3
               -I--------I--------I--------I--------I--------I--------I--------I--------I--------I
                3 I 13940  I 12490  I 13390  I 11140  I 12420  I 11330  I 11590  I 11390  I 10880  I 108570
 NEUTRAL          I  71.9  I  67.5  I  71.4  I  65.8  I  62.9  I  53.5  I  63.5  I  57.0  I  49.6  I   62.2
               -I--------I--------I--------I--------I--------I--------I--------I--------I--------I
                4 I  1810  I  2000  I  1740  I  1920  I  2530  I  2400  I  2130  I   750  I  2860  I  18140
 SUBMISSIVE       I   9.3  I  10.8  I   9.3  I  11.3  I  12.8  I  11.3  I  11.7  I   3.8  I  13.0  I   10.4
               -I--------I--------I--------I--------I--------I--------I--------I--------I--------I
                9 I  1500  I  1600  I   900  I   900  I  2150  I  4300  I   900  I  3900  I  4100  I  20250
 NUL              I   7.7  I   8.6  I   4.8  I   5.3  I  10.9  I  20.3  I   4.9  I  19.5  I  18.7  I   11.6
               -I--------I--------I--------I--------I--------I--------I--------I--------I--------I
        COLUMN     19400    18500    18750    16930    19740    21190    18260    19990    21930    174690
        TOTAL       11.1     10.6     10.7      9.7     11.3     12.1     10.5     11.4     12.6     100.0

RAW CHI SQUARE = 10547.33760 WITH    32 DEGREES OF FREEDOM.  SIGNIFICANCE =        0
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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                82/11/04.    17.52.21.    PAGE  135
ALPHA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)

CPU TIME REQUIRED..    16.9740 SECONDS

              TASK NAME        BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
              CROSSTABS        VARIABLES=BETAG(1,3),HR(1,9)/TABLES=BETAG BY HR
              OPTIONS          3,5,7
              STATISTICS       1

          00052400 CM NEEDED FOR CROSSTABS

          OPTION - 1
          IGNORE MISSING VALUE INDICATORS
          (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)

          OPTION - 3
          DELETE ROW PERCENTAGES

          OPTION - 5
          DELETE TOTAL PERCENTAGES
```

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 136
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETAG BETA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

BETAG (COUNT / COL PCT)	HR: 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
AGRESSIVE 1	1400 6.6	1270 6.1	2710 12.3	2090 11.4	1050 5.7	1870 10.2	1830 8.5	2650 13.1	3020 12.6	17890 9.7
FEEDING 2	380 1.8	850 4.1	400 1.8	1630 8.9	850 4.6	590 3.2	830 3.9	500 2.5	50 .2	6080 3.3
NEUTRAL 3	12910 61.1	12340 59.4	11550 52.5	12350 67.2	13410 73.0	11700 64.0	12940 60.1	12880 63.4	11550 48.1	111630 60.4
SUBMISSIVE 4	1640 7.8	1520 7.3	1910 8.7	1110 6.0	1700 9.3	1360 7.4	1450 6.7	1570 7.7	1700 7.1	13960 7.6
NUL 9	4800 22.7	4800 23.1	5450 24.8	1200 6.5	1350 7.4	2750 15.1	4470 20.8	2700 13.3	7700 32.1	35220 19.1
COLUMN TOTAL	21130 11.4	20780 11.2	22020 11.9	18380 9.9	18360 9.9	18270 9.9	21520 11.6	20300 11.0	24020 13.0	184780 100.0

RAW CHI SQUARE = 12324.94238 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 137
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

C R O S S T A B U L A T I O N O F
BETAG BETA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED
PAGE 1 OF 1

BETAG (COUNT / COL PCT)		1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	2440 11.0	2670 13.5	2300 11.3	3230 12.7	2270 11.0	3240 14.8	2443 11.0	2120 9.7	2060 10.4	22770 11.7
FEEDING	2	1070 4.8	2610 13.2	1260 6.2	660 2.6	630 3.1	120 .5	590 2.7	490 2.2	850 4.3	8280 4.3
NEUTRAL	3	12740 57.2	9980 50.4	12190 59.9	12410 48.7	14030 68.2	12800 58.6	11730 52.9	12320 56.1	13040 66.1	111260 57.3
SUBMISSIVE	4	630 2.8	630 3.2	710 3.5	490 1.9	1040 5.1	1380 6.3	1390 6.3	1630 7.4	1990 10.1	9890 5.1
NUL	9	5400 24.2	3900 19.7	3900 19.2	8700 34.1	2600 12.6	4300 19.7	6033 27.2	5400 24.6	1800 9.1	42030 21.6
COLUMN TOTAL		22280 11.5	19790 10.2	20360 10.5	25490 13.1	20570 10.6	21840 11.2	22200 11.4	21960 11.3	19740 10.2	194230 100.0

RAW CHI SQUARE = 13803.98355 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 138
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * *
BETAG BETA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED
* * * * * * * * PAGE 1 OF 1

BETAG	COUNT / COL PCT	HR 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	2770 11.3	2700 11.8	2170 7.8	2330 11.4	3130 13.3	1200 5.9	1460 7.8	1970 10.0	1020 5.9	18750 9.6
FEEDING	2	570 2.3	390 1.7	730 2.6	210 1.0	1610 6.8	360 1.8	800 4.3	300 1.5	750 4.3	5720 2.9
NEUTRAL	3	16460 66.9	15040 66.0	20550 73.6	14390 70.6	16350 69.4	14820 73.0	12730 67.8	12320 62.7	12900 74.0	133560 69.4
SUBMISSIVE	4	560 2.3	390 1.7	720 2.6	440 2.2	930 3.9	1160 5.7	1690 9.0	1620 8.2	1260 7.2	8770 4.5
NUL	9	4250 17.3	4280 18.8	3750 13.4	3000 14.7	1550 6.6	2760 13.6	2100 11.2	3450 17.5	1500 8.6	26640 13.6
	COLUMN TOTAL	24610 12.6	22800 11.7	27920 14.3	20370 10.4	23570 12.1	20300 10.4	18780 9.6	19660 10.1	17430 8.9	193440 100.0

RAW CHI SQUARE = 8915.98876 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E38 E36

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * *
BETAG BETA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

BETAG	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	2110 8.9	2210 10.9	2850 11.7	3480 16.8	2610 10.4	1370 7.3	2240 11.3	1840 8.7	1550 7.6	20260 10.4
FEEDING	2	870 3.7	600 3.0	1120 4.6	800 3.9	600 2.4	350 1.9	460 2.3	1270 6.0	630 3.1	6700 3.5
NEUTRAL	3	15790 66.9	14050 69.4	11800 48.3	12140 58.6	15390 61.6	11890 63.2	11720 59.3	13380 63.1	13190 64.7	119350 61.5
SUBMISSIVE	4	950 4.0	190 .9	320 1.3	380 1.8	680 2.7	690 3.7	1150 5.8	850 4.0	1410 6.9	6620 3.4
NUL	9	3900 16.5	3200 15.8	8350 34.2	3900 18.8	5700 22.8	4500 23.9	4200 21.2	3870 18.2	3600 17.7	41220 21.2
	COLUMN TOTAL	23620 12.2	20250 10.4	24440 12.6	20700 10.7	24980 12.9	18800 9.7	19770 10.2	21210 10.9	20380 10.5	194150 100.0

RAW CHI SQUARE = 8030.46685 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 140
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* * * * * C R O S S T A B U L A T I O N O F * * * * *
BETAG BETA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED PAGE 1 OF 1

BETAG (COUNT / COL PCT)	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
1 AGRESSIVE	1780 9.0	2220 12.2	3050 15.5	3240 16.1	1170 6.9	1460 7.6	2190 12.2	1580 9.6	1140 11.8	17830 11.3
2 FEEDING	400 2.0	750 4.1	930 4.7	880 4.4	490 2.9	710 3.7	1090 6.1	850 5.2	30 .3	6130 3.9
3 NEUTRAL	15340 77.3	14160 78.1	13480 68.6	11020 54.7	11910 69.9	14820 77.0	13130 73.0	11360 69.1	5040 52.2	110260 69.7
4 SUBMISSIVE	600 3.0	380 2.1	900 4.6	1990 9.9	1160 6.8	910 4.7	1120 6.2	2060 12.5	1290 13.4	10410 6.6
9 NUL	1730 8.7	630 3.5	1280 6.5	3000 14.9	2310 13.6	1350 7.0	450 2.5	600 3.6	2150 22.3	13500 8.5
COLUMN TOTAL	19850 12.6	18140 11.5	19640 12.4	20130 12.7	17040 10.8	19250 12.2	17980 11.4	16450 10.4	9650 6.1	158130 100.0

RAW CHI SQUARE = 12464.09664 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 141
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E52 E53

* * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
BETAG BETA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED
* PAGE 1 OF 1

BETAG	COUNT / COL PCT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	2340 12.6	3030 16.5	2230 13.1	2650 14.6	2660 14.9	2780 16.3	1350 7.4	1930 11.2	1950 11.3	21220 13.1
FEEDING	2	2020 10.9	780 4.2	1090 5.6	960 5.3	410 2.3	310 1.8	1300 7.2	650 3.8	1740 10.1	9260 5.7
NEUTRAL	3	13190 71.3	13350 72.7	14360 74.4	12460 68.7	13280 74.1	12400 72.5	13320 73.4	12990 75.4	11700 67.9	117050 72.3
SUBMISSIVE	4	360 1.9	450 2.5	380 2.0	570 3.1	660 3.7	710 4.2	870 4.8	850 4.9	580 3.4	5430 3.4
NUL	9	600 3.2	750 4.1	950 4.9	1500 8.3	900 5.0	900 5.3	1300 7.2	800 4.6	1250 7.3	8950 5.5
	COLUMN TOTAL	18510 11.4	18360 11.3	19310 11.9	18140 11.2	17910 11.1	17100 10.6	18140 11.2	17220 10.6	17220 10.6	161910 100.0

RAW CHI SQUARE = 4826.83034 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 142
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * *
BETAG BETA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED
PAGE 1 OF 1

BETAG (COUNT / COL PCT)	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
1 AGRESSIVE	2830 14.6	4660 25.2	3310 17.7	4600 27.2	3290 16.7	3490 16.5	3500 19.2	1380 6.9	4050 18.5	31110 17.8
2 FEEDING	330 1.7	170 .9	280 1.5	1040 6.1	60 .3	210 1.0	390 2.1	690 3.5	0 0	3170 1.8
3 NEUTRAL	14050 72.4	11410 61.7	13850 73.9	9940 58.7	13600 68.9	12230 58.0	12590 68.9	12490 62.5	11700 53.4	111920 64.1
4 SUBMISSIVE	690 3.6	660 3.6	410 2.2	450 2.7	640 3.2	900 4.2	880 4.8	1230 7.7	2080 9.5	8240 4.7
9 NUL	1500 7.7	1600 8.6	900 4.8	900 5.3	2150 10.9	4300 20.3	900 4.9	3900 19.5	4100 18.7	20250 11.6
COLUMN TOTAL	19400 11.1	18500 10.6	18750 10.7	16930 9.7	19740 11.3	21190 12.1	18260 10.5	19990 11.4	21930 12.6	174690 100.0

RAW CHI SQUARE = 14901.10328 WITH 32 DEGREES OF FREEDOM. SIGNIFICANCE = 0

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)              82/11/04.    17.52.21.     PAGE  143
BETA FISH BEHAVIOUR BY THE HOUR FOR EACH EXP (BY GROUP)

CPU TIME REQUIRED..    17.0370 SECONDS

                   TASK NAME        ALPHA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
                   BREAKDOWN        VARIABLES=ALPHAS(LJ,HI),ALPHAG(1,9),HR(1,9)/
                                    CROSSBREAK=ALPHAS BY ALPHAG BY HR
                   OPTIONS          5,6
                   STATISTICS       3

          00051000 CM NEEDED FOR BREAKDOWN

          OPTION - 5
          DO NOT REPORT COUNTS, WITH CROSSBREAK OUTPUT

          OPTION - 6
          DO NOT REPORT SUMS,   WITH CROSSBREAK OUTPUT
```

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 144
ALPHA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* C R O S S---B R E A K D O W N O F *

ALPHAG ALPHA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED

VARIABLE AVERAGED.. ALPHAS ALPHA FISH AGGRESSION SCALE

* PAGE 1 OF 1

ALPHAG (MEAN / STD DEV)	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE 1	25.114 8.072	26.071 9.319	25.529 8.225	23.512 3.028	23.967 10.277	25.527 9.371	27.724 7.848	28.007 7.835	25.067 8.046	25.844 8.610
FEEDING 2	10.889 1.574	10.494 .832	10.667 1.568	10.216 .906	11.745 1.720	11.542 1.620	10.771 1.553	11.037 1.218	10.000 0	10.791 1.368
NEUTRAL 3	2.120 3.468	.796 3.921	2.899 3.735	-.803 6.590	1.178 3.552	.302 5.285	.992 5.223	.254 4.988	.070 4.649	.950 4.805
SUBMISSIVE 4	-28.260 7.582	-26.207 7.792	-24.000 5.413	-30.790 8.258	-27.169 9.002	-24.780 6.812	-27.889 6.341	-29.432 8.060	-32.909 7.798	-29.150 8.237
TOTAL COLUMN	3.170 16330 10.810	3.826 15980 11.734	5.654 16570 10.783	1.281 17180 13.781	2.723 17010 10.699	2.262 15520 11.981	4.828 17050 12.970	3.066 17600 14.211	.375 16320 17.133	3.096 149560 12.942

RAW CHI SQUARE = 4779.63461 WITH 24 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 35220

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ALPHA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * * * * * * * * * * * * * * C R O S S---B R E A K D O W N O F *

ALPHAG ALPHA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED
VARIABLE AVERAGED.. ALPHAS ALPHA FISH AGGRESSION SCALE
* PAGE 1 OF 1

ALPHAG (MEAN / STD DEV)	HR	1 HR	2 HR	4 HR	8 HR	16 HR	32 HR	64 HR	128 HR	256 HR	ROW TOTAL
		1	2	3	4	5	6	7	8	9	
AGRESSIVE	1	21.284 6.387	24.870 8.658	24.000 7.828	25.497 8.294	24.805 9.294	22.612 8.281	24.885 10.481	24.991 8.938	23.496 9.424	24.051 8.935
FEEDING	2	11.968 1.987	11.596 2.143	12.733 2.019	11.120 1.126	12.435 2.124	11.045 1.538	11.331 1.950	11.071 1.458	11.222 1.631	11.551 1.896
NEUTRAL	3	1.638 4.132	5.428 3.444	5.074 3.185	4.069 3.620	1.742 4.146	3.049 3.580	3.522 3.786	1.973 3.756	2.220 2.735	3.222 3.866
SUBMISSIVE	4	-33.117 11.242	-32.053 7.847	-27.910 6.682	-27.321 12.218	-29.772 8.154	-28.388 6.949	-25.636 7.768	-24.919 7.575	-26.020 7.296	-28.584 8.875
TOTAL COLUMN		1.836 16880 11.841	4.784 15890 10.118	4.801 16460 9.438	5.356 16790 10.143	4.298 17970 12.909	4.439 17340 13.074	5.753 16170 10.476	4.380 16560 11.361	4.301 17940 11.684	4.430 152200 11.376

RAW CHI SQUARE = 5123.12619 WITH 24 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 42030

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 146
ALPHA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E34 E41

* * * * * * * * * * * * * * * * * * C R O S S---B R E A K D O W N O F * * * * * * * * * * * * * * * * * *

ALPHAG ALPHA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED
VARIABLE AVERAGED.. ALPHAS ALPHA FISH AGGRESSION SCALE PAGE 1 OF 1

ALPHAG	MEAN / STD DEV	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	22.663 6.879	25.296 7.342	23.809 7.655	25.313 7.477	24.292 7.795	23.895 8.275	25.992 8.767	24.462 8.251	27.358 9.711	24.731 8.181
FEEDING	2	11.769 2.183	10.475 1.064	11.108 1.730	12.396 1.676	12.387 1.640	11.279 1.831	11.188 1.768	11.490 1.501	11.270 1.600	11.457 1.793
NEUTRAL	3	-.586 6.248	-1.040 6.301	2.010 4.036	.080 5.746	1.758 3.651	.775 4.678	1.260 3.594	2.058 3.100	-.302 4.149	.695 4.913
SUBMISSIVE	4	-36.258 8.992	-35.121 7.174	-33.442 8.119	-32.094 7.213	-31.500 7.423	-27.141 9.395	-24.706 12.017	-28.085 8.146	-23.800 6.574	-32.061 8.832
TOTAL COLUMN		-.747 20360 11.371	-1.495 18520 13.729	2.237 24170 11.479	-.746 17370 13.788	3.552 22020 9.155	3.979 17540 11.453	5.295 16680 11.044	4.895 16210 11.421	1.816 15930 9.192	2.031 168800 11.724

RAW CHI SQUARE = 7714.65083 WITH 24 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 26640

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                    82/11/04.     17.52.21.     PAGE  147
ALPHA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E38            E36

* * * * * * * * * * * * * * * * * * *   C R O S S---B R E A K D O W N   O F   * * * * * * * * * * * * * * * * * * *
    ALPHAG     ALPHA FISH BEHAVIOUR CLASSES                  BY  HR          EXP. TIME ELAPSED
* * * * * * * * * *
VARIABLE AVERAGED..  ALPHAS    ALPHA FISH AGGRESSION SCALE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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ALPHAG	MEAN / STD DEV	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	24.444 7.029	22.955 7.454	28.639 7.554	26.370 8.491	24.024 7.454	22.532 7.500	23.382 7.618	23.923 7.993	25.764 8.843	24.561 8.114
FEEDING	2	11.936 2.029	13.333 1.955	13.429 1.900	11.696 2.035	11.990 1.808	11.354 1.790	11.438 1.802	10.925 1.504	11.327 1.428	11.715 1.914
NEUTRAL	3	3.865 4.141	4.371 4.124	3.537 5.032	4.222 4.693	1.142 5.372	.108 4.108	-1.380 4.555	1.358 4.158	.696 3.278	2.163 4.833
SUBMISSIVE	4	-29.667 7.552	-29.088 9.523	-25.525 4.661	-31.737 10.875	-30.000 9.584	-23.475 4.786	-30.245 9.194	-33.000 6.747	-28.400 6.905	-29.654 8.636
TOTAL COLUMN		3.371 19720 8.903	3.481 17050 8.384	3.902 16090 9.452	3.608 16800 11.316	2.662 19280 9.251	2.612 14300 10.047	1.447 15570 11.216	3.247 17340 9.652	4.391 16780 10.425	3.207 152930 9.862

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RAW CHI SQUARE =  5752.97776 WITH   24 DEGREES OF FREEDOM.  SIGNIFICANCE =      0

NUMBER OF MISSING OBSERVATIONS =    41220
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RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 148
ALPHA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E50 E51

* C R O S S---B R E A K D O W N O F *

ALPHAG ALPHA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED

VARIABLE AVERAGED.. ALPHAS ALPHA FISH AGGRESSION SCALE

PAGE 1 OF 1

ALPHAG (MEAN / STD DEV)	HR 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
1 AGRESSIVE	25.885	25.231	25.698	24.837	24.331	26.446	26.532	27.812	27.375	25.904
	8.855	8.527	8.267	9.090	7.836	9.629	8.113	8.289	8.260	8.529
2 FEEDING	11.400	11.115	10.882	10.059	10.845	11.719	11.304	10.977	0	11.121
	1.574	1.433	1.519	.236	1.563	1.431	1.879	1.217	0	1.531
3 NEUTRAL	.057	.521	1.197	1.852	1.104	1.110	.849	2.225	3.815	1.232
	3.084	3.496	3.817	3.199	2.481	3.307	4.107	3.307	3.510	3.523
4 SUBMISSIVE	-30.619	-35.264	-30.182	-31.175	-32.172	-30.456	-27.212	-27.737	-23.946	-30.329
	8.772	8.886	9.090	9.449	7.348	8.473	8.001	7.794	2.813	8.900
TOTAL COLUMN	2.958	1.635	2.343	2.948	2.864	2.777	2.046	4.035	5.964	2.850
	18120	17510	18360	17130	14730	17900	17530	15850	7500	144630
	12.491	13.167	13.402	10.427	10.804	13.168	11.891	12.824	11.694	13.109

RAW CHI SQUARE = 4639.73024 WITH 24 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 13500

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)            82/11/04.    17.52.21.     PAGE  149
ALPHA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE   RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE   E52          E53

* * * * * * * * * * * * * * * * * * *   C R O S S---B R E A K D O W N   O F   * * * * * * * * * * * * * * * * * *

   ALPHAG    ALPHA FISH BEHAVIOUR CLASSES                    BY  HR          EXP. TIME ELAPSED
* * * * * * * * * *
VARIABLE AVERAGED..  ALPHAS    ALPHA FISH AGGRESSION SCALE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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ALPHAG	MEAN / STD DEV	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	23.542 8.534	24.613 8.327	22.367 7.772	24.442 7.763	24.989 8.253	24.678 8.501	22.653 8.281	21.341 6.696	26.282 8.531	24.055 8.262
FEEDING	2	11.220 1.638	11.467 1.380	11.318 1.529	12.600 .492	11.216 1.475	10.357 .973	11.814 1.970	11.150 1.086	11.286 1.928	11.286 1.602
NEUTRAL	3	-2.116 6.055	-2.178 6.365	-1.957 6.110	-5.399 7.756	-1.283 5.973	-1.429 6.504	-2.907 7.576	-1.183 6.557	-2.677 6.931	-2.374 6.791
SUBMISSIVE	4	-36.617 8.876	-32.124 9.464	-31.743 8.540	-32.794 9.396	-31.824 8.681	-33.203 9.038	-32.574 9.207	-31.783 8.992	-33.468 8.484	-32.811 9.090
TOTAL COLUMN		-1.422 17910 13.042	-.961 17610 13.909	-1.042 18360 13.492	-4.972 16640 14.025	-.460 17010 13.872	-1.851 16200 17.259	-2.396 16840 12.590	-1.794 16420 12.915	-.384 15970 13.446	-1.687 152960 13.939

RAW CHI SQUARE = 4261.80816 WITH   24 DEGREES OF FREEDOM. SIGNIFICANCE =   0

NUMBER OF MISSING OBSERVATIONS =   8950

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)          82/11/04.    17.52.21.    PAGE 150
ALPHA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE   RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE   E54          E55

* * * * * * * * * * * * * * * * * * * *   C R O S S---B R E A K D O W N   O F   * * * * * * * * * * * * * * * * * * * *

    ALPHAG     ALPHA FISH BEHAVIOUR CLASSES                  BY   HR          EXP. TIME ELAPSED
* * * * * * * * *
VARIABLE AVERAGED..  ALPHAS    ALPHA FISH AGGRESSION SCALE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  1
```

MEAN / STD DEV	HR	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
ALPHAG											
AGRESSIVE	1	24.630 7.983	28.071 8.147	26.814 7.653	29.901 9.448	28.302 7.925	27.980 8.075	26.716 7.767	28.564 7.774	28.481 8.198	27.867 8.203
FEEDING	2	11.016 1.888	11.267 2.119	11.257 1.403	10.818 1.697	10.563 1.173	11.444 1.350	10.295 .842	11.284 1.400	10.191 .692	10.827 1.473
NEUTRAL	3	-2.301 5.938	-1.656 7.128	1.123 5.373	2.434 4.996	-.430 6.598	2.271 3.835	.560 6.110	1.749 4.125	.289 5.753	.362 5.887
SUBMISSIVE	4	-31.912 8.725	-30.450 9.580	-34.402 8.569	-33.229 9.112	-32.636 8.613	-31.146 8.459	-31.394 8.281	-26.587 7.540	-32.395 8.325	-31.924 8.778
TOTAL COLUMN		-2.524 17900 14.065	-.975 16900 16.572	1.270 17850 15.789	2.597 16030 17.592	-1.065 17590 17.608	2.245 16890 17.040	1.707 17360 17.234	0.141 16090 13.770	.815 17830 19.262	1.067 154440 16.877

```
RAW CHI SQUARE =  4092.21328 WITH    24 DEGREES OF FREEDOM.  SIGNIFICANCE =      0

NUMBER OF MISSING OBSERVATIONS =   20250
```

```
CPU TIME REQUIRED..     22.8820 SECONDS

          TASK NAME       BETA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
          BREAKDOWN       VARIABLES=BETAS(LO,HI),BETAG(1,9),HR(1,9)/
                          CROSSBREAK=BETAS BY BETAG BY HR
          OPTIONS         5,6
          STATISTICS      3

      00051000 CM NEEDED FOR BREAKDOWN

      OPTION - 5
      DO NOT REPORT COUNTS, WITH CROSSBREAK OUTPUT

      OPTION - 6
      DO NOT REPORT SUMS,   WITH CROSSBREAK OUTPUT
```

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 152
BETA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13

* C R O S S---B R E A K D O W N O F *

BETAG BETA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED
VARIABLE AVERAGED.. BETAS BETA FISH AGGRESSION SCALE * * * * * * * * * * PAGE 1 OF 1

BETAG (MEAN / STD DEV)	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE 1	27.700 8.272	24.079 7.996	24.539 7.971	22.651 7.661	22.067 5.816	25.947 8.185	26.153 8.258	25.638 8.061	27.778 7.870	25.514 8.114
FEEDING 2	12.474 1.411	10.365 .482	10.000 0	10.209 .722	10.906 1.477	11.186 1.653	11.229 1.600	10.460 1.025	13.000 0	10.734 1.348
NEUTRAL 3	.424 5.491	1.304 4.550	1.382 4.766	-.203 3.422	-1.138 6.244	-1.283 4.986	1.531 4.340	.703 3.906	1.075 4.682	.412 4.893
SUBMISSIVE 4	-36.622 8.813	-34.388 10.220	-32.293 10.051	-31.018 11.883	-37.094 9.739	-37.699 8.681	-33.331 9.575	-30.535 10.617	-33.159 8.702	-34.055 10.085
TOTAL COLUMN	-.677 16330 15.535	.201 15980 14.020	1.495 16570 16.065	1.574 17180 12.520	-2.697 17010 14.480	-.539 15320 15.649	1.681 17050 14.232	1.948 17500 14.590	2.487 16320 16.951	.617 149560 15.029

RAW CHI SQUARE = 4605.63339 WITH 24 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 35220

RUFUS FISH DATA - WEIGHTED CROSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 153
BETA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E29 E32

* * * * * * * * * * * * * * * * * * * C R O S S---B R E A K D O W N O F * * * * * * * * * * * * * * * * * * *

BETAG BETA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED

VARIABLE AVERAGED.. BETAS BETA FISH AGGRESSION SCALE

* PAGE 1 OF 1

BETAG (MEAN / STD DEV) \ HR	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
AGRESSIVE 1	22.762 7.444	24.094 8.074	22.730 8.035	24.353 7.971	22.930 7.048	21.293 6.333	22.533 7.330	22.741 7.285	20.515 5.866	22.718 7.410
FEEDING 2	10.944 1.459	10.877 1.260	10.762 1.178	10.561 .700	10.619 1.475	11.417 1.326	10.339 1.052	10.000 0	10.541 1.194	10.707 1.229
NEUTRAL 3	.943 3.887	1.232 3.732	1.265 3.741	.538 3.894	1.031 3.424	-2.646 6.486	-1.734 5.791	-1.256 5.048	-1.011 4.928	-.198 4.867
SUBMISSIVE 4	-33.413 10.884	-28.921 9.037	-29.718 10.189	-24.265 7.967	-31.740 11.751	-30.464 9.181	-35.086 11.798	-37.466 10.080	-35.643 11.683	-33.961 11.229
TOTAL COLUMN	3.448 16880 11.700	5.463 15890 12.019	3.655 16460 11.443	4.819 16790 11.686	2.237 17970 12.165	-.788 17540 15.443	-.499 16170 15.256	-1.415 16560 15.565	-1.833 17940 15.123	1.630 152200 13.769

RAW CHI SQUARE = 7744.03693 WITH 24 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 42030

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- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                    82/11/04.     17.52.21.     PAGE  154
BETA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE   E34          E41

* * * * * * * * * * * * * * * * * * *   C R O S S---B R E A K D O W N   O F   * * * * * * * * * * * * * * * * * * *
    BETAG      BETA FISH BEHAVIOUR CLASSES                          BY  HR         EXP. TIME ELAPSED
* * * * * * * * * * * *
VARIABLE AVERAGED..  BETAS     BETA FISH AGGRESSION SCALE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
```

MEAN / STD DEV	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
BETAG										
1 AGRESSIVE	28.325 7.903	27.796 8.404	24.318 8.098	27.365 8.523	25.671 8.126	25.783 9.091	19.589 5.154	22.472 7.938	22.480 8.306	25.447 8.453
2 FEEDING	11.436 1.759	11.564 2.000	10.356 .913	10.619 1.136	11.348 1.263	11.750 1.740	11.100 1.694	10.567 1.195	11.000 1.347	11.129 1.500
3 NEUTRAL	.600 3.668	1.052 3.556	1.035 3.881	.338 4.657	.026 3.837	.743 4.741	.530 3.656	1.052 3.757	.267 3.850	.637 3.991
4 SUBMISSIVE	-21.571 12.341	-30.513 6.283	-28.431 8.033	-26.682 10.725	-30.871 7.975	-37.681 8.611	-36.485 7.890	-35.605 8.511	-35.143 8.578	-33.322 9.762
TOTAL COLUMN	4.056 20360 11.534	4.508 18520 11.710	2.529 24170 9.776	3.403 17370 11.790	3.194 22020 12.500	.141 17540 13.134	-1.045 16680 13.873	.170 16210 14.719	-.606 15930 12.560	1.984 168800 12.488

RAW CHI SQUARE = 6309.55399 WITH   24 DEGREES OF FREEDOM. SIGNIFICANCE =   0

NUMBER OF MISSING OBSERVATIONS =   26640

```
RUFUS FISH DATA   -   WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)          82/11/04.     17.52.21.     PAGE  155
BETA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE    RUFUS      (CREATION DATE =  82/11/04.)
SUBFILE     E38          E36

* * * * * * * * * * * * * * * * * * *   C R O S S---B R E A K D O W N   O F   * * * * * * * * * * * * * * * * * * * *

     BETAG      BETA FISH BEHAVIOUR CLASSES                    BY   HR           EXP. TIME ELAPSED
* * * * * * * * * *
VARIABLE AVERAGED..   BETAS      BETA FISH AGGRESSION SCALE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE   1 OF   1
```

BETAG (MEAN / STD DEV)		HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	26.673 9.231	28.683 8.050	29.642 8.307	28.914 8.308	28.529 8.560	22.234 7.016	27.795 8.348	26.668 8.824	21.000 6.571	27.323 8.650
FEEDING	2	10.345 .957	10.617 1.451	10.438 1.179	11.137 1.774	11.583 1.627	11.943 1.929	11.283 1.840	11.630 1.818	10.619 1.120	11.007 1.018
NEUTRAL	3	-.362 4.677	-.306 5.135	-.217 5.288	2.368 3.365	.887 3.613	1.874 3.286	.545 4.359	1.797 3.774	1.277 3.350	.833 4.279
SUBMISSIVE	4	-32.537 8.105	-27.316 7.164	-27.875 4.028	-28.368 6.977	-31.265 7.806	-35.145 8.399	-31.591 6.701	-36.506 8.347	-35.993 9.893	-33.145 8.889
TOTAL COLUMN		1.453 19720 12.636	3.535 17050 11.716	5.264 16090 13.571	7.589 16800 12.941	3.828 19280 12.545	2.285 14300 11.195	2.409 15570 14.597	3.279 17340 12.859	.318 16780 13.270	3.317 152930 13.002

RAW CHI SQUARE = 4464.69306 WITH   24 DEGREES OF FREEDOM. SIGNIFICANCE =   0

NUMBER OF MISSING OBSERVATIONS =   41220

```
RUFUS FISH DATA   -   WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)                 82/11/04.     17.52.21.     PAGE  156
BETA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E50          E51

* * * * * * * * * * * * * * * * * * * *   C R O S S---B R E A K D O W N   O F   * * * * * * * * * * * * * * * * * * * *
  BETAG       BETA FISH BEHAVIOUR CLASSES                               BY  HR           EXP. TIME ELAPSED
* * * * * * * * * *
VARIABLE AVERAGED..  BETAS      BETA FISH AGGRESSION SCALE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  1
```

BETAG	MEAN / STD DEV	HR 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
1 AGRESSIVE	MEAN	27.017	27.595	28.033	27.534	27.427	26.836	25.288	27.753	27.368	27.244
	STD DEV	8.356	8.804	8.413	9.582	8.831	9.236	8.589	8.279	7.853	8.787
2 FEEDING	MEAN	11.325	12.200	11.753	11.386	11.673	11.408	10.541	11.294	10.000	11.393
	STD DEV	1.892	1.471	1.684	1.466	1.685	1.535	1.122	1.336	0	1.566
3 NEUTRAL	MEAN	3.958	2.982	3.697	1.349	2.819	2.379	1.365	1.398	3.198	2.597
	STD DEV	3.160	3.730	4.155	4.430	3.670	3.208	3.236	5.140	4.604	3.995
4 SUBMISSIVE	MEAN	-26.850	-30.395	-28.022	-29.774	-33.257	-31.989	-32.786	-35.015	-30.915	-31.562
	STD DEV	7.261	10.122	8.632	8.623	7.487	9.698	11.464	8.357	8.426	9.194
TOTAL COLUMN		5.366	5.773	6.593	3.202	2.227	2.985	2.742	-.177	1.032	3.550
		18120	17510	18360	17130	14730	17900	17530	15850	7500	144630
		10.001	10.965	13.070	16.814	13.210	11.491	13.224	16.712	17.897	13.752

```
RAW CHI SQUARE =  6654.58050 WITH    24 DEGREES OF FREEDOM.  SIGNIFICANCE =       0

NUMBER OF MISSING OBSERVATIONS =    13500
```

```
RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)            82/11/04.     17.52.21.     PAGE  157
BETA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E52          E53

* * * * * * * * * * * * * * * * * *   C R O S S---B R E A K D O W N   O F   * * * * * * * * * * * * * * * * * * * *

    BETAG      BETA FISH BEHAVIOUR CLASSES                      BY  HR         EXP. TIME ELAPSED
* * * * * * * * * *
VARIABLE AVERAGED..  BETAS     BETA FISH AGGRESSION SCALE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  1
```

MEAN / STD DEV	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
BETAG										
1 AGRESSIVE	25.598	26.733	26.063	26.608	26.872	27.079	25.533	27.140	28.072	26.659
	9.567	8.549	8.704	8.484	8.398	8.126	9.551	7.770	8.459	8.623
2 FEEDING	10.812	10.513	11.807	10.167	12.171	10.290	10.523	11.165	10.598	10.825
	1.337	1.107	1.722	.825	1.209	.888	1.223	1.529	1.255	1.400
3 NEUTRAL	.757	.807	1.313	.780	.350	2.549	1.325	-.333	.035	.649
	2.250	3.053	2.660	3.767	4.778	2.754	2.874	5.862	3.443	3.735
4 SUBMISSIVE	-32.389	-29.867	-29.316	-29.649	-32.030	-26.521	-31.885	-32.262	-32.862	-30.820
	7.113	8.173	10.497	7.842	9.077	6.178	8.508	8.720	8.974	8.611
TOTAL COLUMN	4.470	4.914	4.712	4.392	3.526	5.633	2.260	1.698	3.415	3.909
	17910	17610	18360	16640	17010	16200	16840	16420	15970	152960
	10.827	12.162	10.828	12.418	13.268	12.276	11.283	13.453	12.512	12.183

RAW CHI SQUARE = 4055.12998 WITH   24 DEGREES OF FREEDOM.   SIGNIFICANCE =   0

NUMBER OF MISSING OBSERVATIONS =   8950

RUFUS FISH DATA - WEIGHTED CRUSSTABS (TOTAL SEC + COL PCT) 82/11/04. 17.52.21. PAGE 158
BETA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E54 E55

* C R O S S---B R E A K D O W N O F *

BETAG BETA FISH BEHAVIOUR CLASSES BY HR EXP. TIME ELAPSED

VARIABLE AVERAGED.. BETAS BETA FISH AGGRESSION SCALE

PAGE 1 OF 1

BETAG (MEAN / STD DEV)		1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
AGRESSIVE	1	29.272 7.484	28.861 7.110	27.934 7.942	28.187 8.596	29.541 7.112	25.745 7.099	26.211 7.458	24.833 7.757	27.958 7.777	28.165 7.695
FEEDING	2	11.121 1.704	11.882 2.330	10.000 0	10.644 1.308	10.000 0	10.000 0	10.000 0	10.261 .846	0 0	10.486 1.242
NEUTRAL	3	1.719 4.145	.537 4.374	2.142 3.517	2.162 3.548	2.026 3.810	1.777 3.847	1.668 3.512	1.313 4.186	1.571 4.026	1.667 3.923
SUBMISSIVE	4	-25.536 6.604	-26.455 7.412	-27.951 7.905	-24.356 7.250	-27.234 4.831	-26.156 6.222	-28.693 7.476	-31.758 9.783	-30.841 9.097	-28.697 8.409
TOTAL COLUMN		5.198 17900 12.738	7.407 16900 15.258	6.357 17850 12.251	9.436 16030 14.016	6.135 17590 13.327	5.530 16890 13.426	5.668 17360 14.048	.569 16090 13.499	3.784 17830 17.603	5.566 154440 14.280

RAW CHI SQUARE = 8385.14787 WITH 24 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 20250

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RUFUS FISH DATA  -  WEIGHTED CROSSTABS  (TOTAL SEC + COL PCT)          82/11/04.    17.52.21.     PAGE  159
BETA FISH AGGRESSION BY THE HOUR FOR EACH EXP (BY GROUP)

CPU TIME REQUIRED..    23.1280 SECONDS

                  FINISH

TOTAL CPU TIME USED..    302.1430 SECONDS


RUN COMPLETED

NUMBER OF CONTROL CARDS READ  75
NUMBER OF ERRORS DETECTED     0


20.11.12.UCLP, AA, 050,      8.256KLNS. AGEJ.
```

APPENDIX D

TRANSITION MATRIX FOR BEHAVIOR CATEGORIES

Transition Matrix
for behaviour group
by Expn
" Efoct (trust. untreat
" Etreat (chemical used)
" Econc (0, 1, 2, 4 mg of chem)

```
OPERATING SYSTEM * NOS 2.0-562/552 AK   82/10/10. PRINTED * 82/11/03. 20.01.07.
AM2I          JSN  *  AFGS     FAMILY        * KRONUS     JOB ORIGIN     * BATCH.
CREATING JSN  *  AFGU     USER NUMBER   * DDB2027    SERVICE CLASS  * BATCH.

BBBBBBBBBBBB    PPPPPPPPPPP     LL
BBBBBBBBBBBBB   PPPPPPPPPPPP    LL
BB         BB   PP         PP   LL
BB         BB   PP         PP   LL
BB         BB   PP         PP   LL
BB         BB   PP         PP   LL
BB         BB   PPPPPPPPPPPP    LL
BBBBBBBBBBBBB   PPPPPPPPPPP     LL
BBBBBBBBBBBB    PP              LL
BB         BB   PP              LL
BB         BB   PP              LL
BB         BB   PP              LL
BB         BB   PP              LL
BB         BB   PP              LL          LL
BBBBBBBBBBBBB   PP              LLLLLLLLLLLLL
BBBBBBBBBBBB    PP              LLLLLLLLLLLLL
```

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******************* NEWS AS OF 82/11/01. 15.37 *******************
*                                                                *
*      ***** DALHOUSIE UNIVERSITY COMPUTER USERS' GROUP *****     *
*                                                                *
*  DUCUG IS HOLDING A GENERAL MEETING ON TUESDAY, NOVEMBER 9, AT *
*  2:30 P.M. IN ROOM 312 OF THE SCHOOL OF BUSINESS BUILDING      *
*  (ART COLLEGE) TO DISCUSS THE STATUS OF DALHOUSIE'S COMPUTING  *
*  RESOURCES WITH SENIOR ADMINISTRATION OFFICIALS. EVERYONE WHO  *
*  USES OR IS AFFECTED BY COMPUTING AT DAL IS INVITED TO ATTEND. *
*  FOR FURTHER INFORMATION, RUN "BGN,DUCUG/LIB".                 *
*                                                                *
*                      +++++++++++++++++++                       *
*                      + REMEMBRANCE DAY +                       *
*                      +++++++++++++++++++                       *
*                                                                *
* ON REMEMBRANCE DAY, NOVEMBER 11, THE COMPUTER CENTRE OPERATIONS *
* AREA, INCLUDING TERMINAL ROOMS B504 AND B507, WILL BE OPEN FROM *
* 9 AM TO 5 PM. UNATTENDED IAF/RBF WILL BE AVAILABLE OUTSIDE OF  *
* THESE HOURS. THE MAIN COMPUTER CENTRE OFFICES WILL BE CLOSED.  *
*                                                                *
******************************************************************
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COMPUTER CENTRE                                                          02/11/05.     19.54.37.     PAGE    1
DALHOUSIE UNIVERSITY

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- APRIL 1981


          ECOLOGY        OFF
          RUN NAME       RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC.
          GET FILE       RUFUS


               FILE RUFUS    HAS  15 VARIABLES

               THE SUBFILES ARE..

                            N OF
               NAME        CASES

               E11          1609
               E13          1939
               E29          2022
               E32          2078
               E34          1859
               E41          2034
               E38          1672
               E36          1938
               E50          1624
               E51          1612
               E52          1830
               E53          1666
               E54          1779
               E55          1851

               TOTAL       25513


          COMPUTE        EXPN=3*ETRLAT+ECONC
          IF             (EXPN GT 0) EXPN=EXPN-3
          VAR LABEL      EXPN, EXPERIMENTAL GROUP/
          VALUE LABELS   EXPN (0) UNTREATED (1) SEVIN 1MG (2) SEVIN 2MG (3) SEVIN 4MG
                              (4) MALATHION 1MG (5) MALATHION 2MG (6) MALATHION 4MG/

          COMPUTE        EFACT=0
          IF             (ETRLAT NE 0) EFACT=1
          VAR LABELS     EFACT, CONTROL-EXPERIMENTAL/
          VALUE LABELS   EFACT (0) CONTROL (1) EXPERIMENTAL/
```

```
          COMPUTE          HRL=LAG(HR)
          DO REPEAT        VAR=ALPHAG,BETAG/VARL=ALPHAGL,BETAGL
          COMPUTE          VARL=LAG(VAR)
          IF               (HR NE HRL) VARL=-1
          ASSIGN MISSING   VARL(-1)
          END REPEAT

          VALUE LABELS     ALPHAGL,BETAGL
                                 (1) AGRESSIVE (2) FEEDING (3) NEUTRAL (4) SUBMISSIVE (9) NUL

          TASK NAME        ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
          CROSSTABS        VARIABLES=ALPHAG(1,9),ALPHAGL(1,9),
                                     EXPN(0,6),EFACT(0,1),ETREAT(0,2),ECONC(0,3)/
                           TABLES=ALPHAGL BY ALPHAG BY EXPN/ALPHAGL BY ALPHAG BY EFACT/
                                 ALPHAGL BY ALPHAG BY ETREAT/ALPHAGL BY ALPHAG BY ECONC/
          OPTIONS          3,4,7
          STATISTICS       3
      00057000 CM NEEDED FOR CROSSTABS

      OPTION - 3
      DELETE ROW PERCENTAGES

      OPTION - 4
      DELETE COLUMN PERCENTAGES

      OPTION - 7
      INCLUDE MISSING VALUES IN TABLES BUT NOT STATISTICS
```

```
RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC            82/11/05.     14.54.37.     PAGE    3
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE    E11        E13        E29        E32        E34        E41        E38        E36        E50        E51
           E52        E53        E54        E55

* * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * *
     ALPHAGL                                           BY  ALPHAG     ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
     EXPN        EXPERIMENTAL GROUP                    VALUE..     0   UNTREATED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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ALPHAGL (COUNT / TOT PCT)		ALPHAG: AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	359 10.2	9 .3	446 12.6	66 1.9	2 .1	882 25.0
FEEDING	2	10 .3	25 .7	45 1.3	3 .1	1 .0	84 2.4
NEUTRAL	3	445 12.6	45 1.3	1602 45.4	149 4.2	31 .9	2272 64.4
SUBMISSIVE	4	66 1.9	5 .1	146 4.1	41 1.2	0 0	258 7.3
NUL	9	2 .1	0 0	31 .9	1 .0	0 0	34 1.0
COLUMN TOTAL		882 25.0	84 2.4	2270 64.3	260 7.4	34 1.0	3530 100.0

CONTINGENCY COEFFICIENT = .34831

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC                 82/11/05.     19.54.37.     PAGE    4
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE     E11         E13        E29        E32        E34        E41        E38        E36        E50        E51
            E52         E53        E54        E55

* * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * * * *
        ALPHAGL                                                              BY   ALPHAG     ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
        EXPN         EXPERIMENTAL GROUP                                      VALUE..     1   SEVIN 1MG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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ALPHAGL	COUNT / TOT PCT	AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	330 8.1	8 .2	415 10.2	56 1.4	2 .0	811 19.9
FEEDING	2	13 .3	101 2.5	68 1.7	10 .2	1 .0	193 4.7
NEUTRAL	3	409 10.0	72 1.8	2059 50.4	179 4.4	42 1.0	2761 67.6
SUBMISSIVE	4	55 1.3	10 .2	180 4.4	25 .6	1 .0	271 6.6
NUL	9	3 .1	2 .0	40 1.0	1 .0	0 .0	46 1.1
COLUMN TOTAL		810 19.8	193 4.7	2762 67.7	271 6.6	46 1.1	4082 100.0

CONTINGENCY COEFFICIENT = .49306

```
RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC            82/11/05.     19.54.37.     PAGE    5
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E11         E13         E29         E32         E34         E41         E38         E36         E50         E51
           E52         E53         E54         E55

* * * * * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * * * * * *
     ALPHAGL                                                        BY  ALPHAG     ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
     EXPN        EXPERIMENTAL GROUP                                VALUE..     2   SEVIN 2MG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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ALPHAGL	COUNT / TOT PCT	ALPHAG AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	227 5.9	9 .2	345 8.9	59 1.5	3 .1	643 16.6
FEEDING	2	12 .3	114 2.9	92 2.4	8 .2	0 0	226 5.8
NEUTRAL	3	359 9.3	101 2.6	2083 53.8	157 4.1	23 .6	2723 70.3
SUBMISSIVE	4	44 1.1	6 .2	168 4.3	31 .8	4 .1	253 6.5
NUL	9	0 0	0 0	28 .7	2 .1	0 0	30 .8
	COLUMN TOTAL	642 16.6	230 5.9	2716 70.1	257 6.6	30 .8	3875 100.0

CONTINGENCY COEFFICIENT =   .45770

```
RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC              82/11/05.    19.54.37.    PAGE    6
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E11      E13      E29      E32      E34      E41      E38      E36      E50      E51
           E52      E53      E54      E55

* * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * *
   ALPHAGL                                              BY  ALPHAG      ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
   EXPN        EXPERIMENTAL GROUP                       VALUE..    3   SEVIN 4MG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  1
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ALPHAGL (COUNT / TOT PCT)	ALPHAG: AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE 1	153 4.3	4 .1	266 7.4	23 .6	1 .0	447 12.4
FEEDING 2	12 .3	145 4.0	83 2.3	6 .2	2 .1	248 6.9
NEUTRAL 3	252 7.0	94 2.6	2160 60.1	130 3.6	41 1.1	2677 74.5
SUBMISSIVE 4	26 .7	9 .3	125 3.5	16 .4	0 0	176 4.9
NUL 9	4 .1	1 .0	38 1.1	1 .0	0 0	44 1.2
COLUMN TOTAL	447 12.4	253 7.0	2672 74.4	176 4.9	44 1.2	3592 100.0

CONTINGENCY COEFFICIENT = .51712

RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC   82/11/05.   19.54.37.   PAGE 7
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHAGL BY ALPHAG ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
EXPN EXPERIMENTAL GROUP VALUE.. 4. MALATHION 1MG
* PAGE 1 OF 1

ALPHAGL	COUNT / TOT PCT	ALPHAG AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	362 11.2	6 .2	309 9.6	108 3.4	3 .1	788 24.5
FEEDING	2	18 .6	45 1.4	53 1.6	10 .3	0 0	127 3.9
NEUTRAL	3	339 10.5	75 2.3	1345 41.8	166 5.2	14 .4	1939 60.2
SUBMISSIVE	4	68 2.1	4 .1	210 6.5	64 2.0	1 .0	347 10.8
NUL	9	0 .0	1 .0	17 .5	0 .0	0 .0	18 .6
COLUMN TOTAL		787 24.4	132 4.1	1934 60.1	348 10.8	18 .6	3219 100.0

CONTINGENCY COEFFICIENT = .41870

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC          82/11/05.     19.54.37.     PAGE    6
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E11        E13        E29        E32        E34        E41        E38        E36        E50        E51
           E52        E53        E54        E55

* * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * * *
      ALPHAGL                                                          BY  ALPHAG     ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
      EXPN        EXPERIMENTAL GROUP                                   VALUE..    3.  MALATHION 2MG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  1
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ALPHAGL		ALPHAG: AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
	COUNT / TOT PCT						
AGRESSIVE	1	238 6.8	9 .3	331 9.5	101 2.9	1 .0	630 19.0
FEEDING	2	16 .5	31 .9	50 1.4	5 .1	0 0	102 2.9
NEUTRAL	3	359 10.3	56 1.6	1566 45.0	233 6.7	17 .5	2231 64.1
SUBMISSIVE	4	66 1.9	6 .2	262 7.5	109 3.1	2 .1	445 12.8
NUL	9	2 .1	1 .0	17 .5	0 0	0 0	20 .6
	COLUMN TOTAL	681 19.6	103 3.0	2226 64.0	448 12.9	20 .6	3478 100.0

CONTINGENCY COEFFICIENT =   .35151

RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC 82/11/05. 19.54.37. PAGE 9
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E36 E38 E50 E51
E52 E53 E54 E55

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F *
ALPHAGL BY ALPHAG ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
EXPN EXPERIMENTAL GROUP VALUE.. 6 MALATHION 4MG
* PAGE 1 OF 1

ALPHAGL	COUNT / TOT PCT	ALPHAG AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	370 10.2	6 .2	416 11.5	127 3.5	0 0	919 25.4
FEEDING	2	13 .4	15 .4	35 1.0	7 .2	2 .1	72 2.0
NEUTRAL	3	409 11.3	41 1.1	1319 36.5	265 7.3	18 .5	2052 56.8
SUBMISSIVE	4	125 3.5	9 .2	259 7.2	150 4.2	3 .1	546 15.1
NUL	9	2 .1	1 .0	19 .5	1 .0	0 0	23 .6
	COLUMN TOTAL	919 25.4	72 2.0	2048 56.7	550 15.2	23 .6	3612 100.0

CONTINGENCY COEFFICIENT = .30817

NUMBER OF MISSING OBSERVATIONS = 125

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC          82/11/05.     19.54.37.     PAGE   10
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS     (CREATION DATE =   82/11/04.)
SUBFILE    E11        E13        E29        E32        E34        E41        E38        E30        E50        E51
           E52        E53        E54        E55

* * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * *
     ALPHAGL                                                  BY  ALPHAG     ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
     EFACT       CONTROL-EXPERIMENTAL                         VALUE..    0   CONTROL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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ALPHAGL (COUNT / TOT PCT) \ ALPHAG	AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE 1	359 10.2	9 .3	446 12.6	66 1.9	2 .1	882 25.0
FEEDING 2	10 .3	25 .7	45 1.3	3 .1	1 .0	84 2.4
NEUTRAL 3	445 12.6	45 1.3	1602 45.4	149 4.2	31 .9	2272 64.4
SUBMISSIVE 4	66 1.9	5 .1	146 4.1	41 1.2	0 0	258 7.3
NUL 9	2 .1	0 0	31 .9	1 .0	0 0	34 1.0
COLUMN TOTAL	882 25.0	84 2.4	2270 64.3	260 7.4	34 1.0	3530 100.0

CONTINGENCY COEFFICIENT = .34831

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC           82/11/05.    19.54.37.     PAGE   11
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE   RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE   E11        E13       E29        E32        E34        E41        E38        E36        E50        E51
          E52        E53       E54        E55

* * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * *
     ALPHAGL                                                 BY  ALPHAG    ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
     EFACT    CONTROL-EXPERIMENTAL                           VALUE..    1   EXPERIMENTAL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * PAGE  1 OF  1
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ALPHAGL	COUNT / TOT PCT	AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	1680 7.7	42 .2	2082 9.5	474 2.2	10 .0	4288 19.6
FEEDING	2	84 .4	452 2.1	381 1.7	46 .2	5 .0	968 4.4
NEUTRAL	3	2127 9.7	439 2.0	10532 48.2	1130 5.2	155 .7	14383 65.8
SUBMISSIVE	4	384 1.8	44 .2	1204 5.5	395 1.8	11 .1	2038 9.3
NUL	9	11 .1	6 .0	159 .7	5 .0	0 .0	181 .8
	COLUMN TOTAL	4286 19.6	983 4.5	14358 65.7	2050 9.4	181 .8	21858 100.0

CONTINGENCY COEFFICIENT = .46111

NUMBER OF MISSING OBSERVATIONS = 125

RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC 82/11/05. 19.54.37. PAGE 12
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * *
ALPHAGL BY ALPHAG ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
ETREAT EXPERIMENT TREATMENT CHEMICAL VALUE.. 0 UNTREATED
* * * * * * * * PAGE 1 OF 1

ALPHAGL (COUNT / TOT PCT)	ALPHAG: AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE 1	359 10.2	9 .3	446 12.6	66 1.9	2 .1	882 25.0
FEEDING 2	10 .3	25 .7	45 1.3	3 .1	1 .0	84 2.4
NEUTRAL 3	445 12.6	45 1.3	1602 45.4	149 4.2	31 .9	2272 64.4
SUBMISSIVE 4	66 1.9	5 .1	146 4.1	41 1.2	0 0	258 7.3
NUL 9	2 .1	0 0	31 .9	1 .0	0 0	34 1.0
COLUMN TOTAL	882 25.0	84 2.4	2270 64.3	260 7.4	34 1.0	3530 100.0

CONTINGENCY COEFFICIENT = .34831

RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC 82/11/03. 19.54.37. PAGE 13
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * *
ALPHAGL BY ALPHAG ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
ETREAT EXPERIMENT TREATMENT CHEMICAL VALUE.. 1. SEVIN
* * * * * * * * * * * * * * * * * * * PAGE 1 OF 1

ALPHAGL (COUNT / TOT PCT)		ALPHAG: AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	710 6.1	21 .2	1026 8.9	138 1.2	6 .1	1901 16.5
FEEDING	2	37 .3	360 3.1	243 2.1	24 .2	3 .0	667 5.8
NEUTRAL	3	1020 8.8	267 2.3	6302 54.6	466 4.0	106 .9	8161 70.7
SUBMISSIVE	4	125 1.1	25 .2	473 4.1	72 .6	5 .0	700 6.1
NUL	9	7 .1	3 .0	106 .9	4 .0	0 0	120 1.0
COLUMN TOTAL		1899 16.4	676 5.9	8150 70.6	704 6.1	120 1.0	11549 100.0

CONTINGENCY COEFFICIENT = .49502

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC            82/11/05.    19.54.37.    PAGE   14
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE    E11      E13      E29      E32      E34      E41      E38      E36      E50      E51
           E52      E53      E54      E55

* * * * * * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * * * * *
     ALPHAGL                                                  BY  ALPHAG     ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
     ETREAT      EXPERIMENT TREATMENT CHEMICAL                VALUE..     2   MALATHION
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  1
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ALPHAGL	COUNT / TOT PCT	ALPHAG AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	970 9.4	21 .2	1056 10.2	336 3.3	4 .0	2387 23.2
FEEDING	2	47 .5	92 .9	138 1.3	22 .2	2 .0	301 2.9
NEUTRAL	3	1107 10.7	172 1.7	4230 41.0	664 6.4	49 .5	6222 60.4
SUBMISSIVE	4	259 2.5	19 .2	731 7.1	323 3.1	6 .1	1338 13.0
NUL	9	4 .0	3 .0	53 .5	1 .0	0 .0	61 .6
	COLUMN TOTAL	2387 23.2	307 3.0	6208 60.2	1346 13.1	61 .6	10309 100.0

CONTINGENCY COEFFICIENT = .36666

NUMBER OF MISSING OBSERVATIONS = 125

RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC   02/11/05.   19.54.37.   PAGE 15
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE RUFUS (CREATION DATE = 02/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E36 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * *
ALPHAGL BY ALPHAG ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
ECONC EXPERIMENT TREATMENT CONCENTRATION VALUE.. 0 CONTROL
* PAGE 1 OF 1

ALPHAGL (COUNT / TOT PCT)		ALPHAG AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	359 10.2	9 .3	446 12.6	66 1.9	2 .1	882 25.0
FEEDING	2	10 .3	25 .7	45 1.3	3 .1	1 .0	84 2.4
NEUTRAL	3	445 12.6	45 1.3	1602 45.4	149 4.2	31 .9	2272 64.4
SUBMISSIVE	4	66 1.9	5 .1	146 4.1	41 1.2	0 0	258 7.3
NUL	9	2 .1	0 0	31 .9	1 .0	0 0	34 1.0
COLUMN TOTAL		382 25.0	84 2.4	2270 64.3	260 7.4	34 1.0	3530 100.0

CONTINGENCY COEFFICIENT = .34831

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC                82/11/05.     19.54.37.     PAGE    16
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE   E11         E13         E29         E32         E34         E41         E36         E36         E50         E51
          E52         E53         E54         E55

* * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * * * *
      ALPHAGL                                                     BY  ALPHAG     ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
      ECONC     EXPERIMENT TREATMENT CONCENTRATION          VALUE..     1    1 MG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  1
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ALPHAGL	COUNT / TOT PCT	AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	692 9.5	14 .2	724 9.9	164 2.2	5 .1	1599 21.9
FEEDING	2	31 .4	147 2.0	121 1.7	20 .3	1 .0	320 4.4
NEUTRAL	3	748 10.2	147 2.0	3404 46.6	345 4.7	56 .8	4700 64.4
SUBMISSIVE	4	123 1.7	14 .2	390 5.3	89 1.2	2 .0	618 8.5
NUL	9	3 .0	3 .0	57 .8	1 .0	0 .0	64 .9
	COLUMN TOTAL	1597 21.9	325 4.5	4696 64.3	619 8.5	64 .9	7301 100.0

CONTINGENCY COEFFICIENT =   .45276

ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

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ALPHAGL BY ALPHAG ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
ECONC EXPERIMENT TREATMENT CONCENTRATION VALUE.. 2 2 MG
* PAGE 1 OF 1

ALPHAGL	COUNT / TOT PCT	ALPHAG: AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	465 6.3	18 .2	676 9.2	160 2.2	4 .1	1323 18.0
FEEDING	2	28 .4	145 2.0	142 1.9	13 .2	0 0	328 4.5
NEUTRAL	3	718 9.8	157 2.1	3649 49.6	390 5.3	40 .5	4954 67.4
SUBMISSIVE	4	110 1.5	12 .2	430 5.8	140 1.9	6 .1	698 9.5
NUL	9	2 .0	1 .0	45 .6	2 .0	0 0	50 .7
	COLUMN TOTAL	1323 18.0	333 4.5	4942 67.2	705 9.6	50 .7	7353 100.0

CONTINGENCY COEFFICIENT = .43501

RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC 82/11/05. 19.54.37. PAGE 18
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
ALPHAGL BY ALPHAG ALPHA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
ECONC EXPERIMENT TREATMENT CONCENTRATION VALUE.. 3. 4 MG
* PAGE 1 OF 1

ALPHAGL (COUNT / TOT PCT)	ALPHAG: AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE 1	523 7.3	10 .1	682 9.5	150 2.1	1 .0	1366 19.0
FEEDING 2	25 .3	160 2.2	118 1.6	13 .2	4 .1	320 4.4
NEUTRAL 3	661 9.2	135 1.9	3479 48.3	395 5.5	59 .8	4729 65.6
SUBMISSIVE 4	151 2.1	18 .2	384 5.3	166 2.3	3 .0	722 10.0
NUL 9	6 .1	2 .0	57 .8	2 .0	0 0	67 .9
COLUMN TOTAL	1366 19.0	325 4.5	4720 65.5	726 10.1	67 .9	7204 100.0

CONTINGENCY COEFFICIENT = .48620

NUMBER OF MISSING OBSERVATIONS = 125

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC              82/11/05.     19.54.37.      PAGE   19
ALPHAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.

CPU TIME REQUIRED..    138.1950 SECONDS

          TASK NAME        BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
          CROSSTABS        VARIABLES=BETAG(1,9),BETAGL(1,9),
                                     EXPN(0,6),EFACT(0,1),ETREAT(0,2),ECONC(0,3)/
                           TABLES=BETAGL BY BETAG BY EXPN/BETAGL BY BETAG BY EFACT/
                                  BETAGL BY BETAG BY ETREAT/BETAGL BY BETAG BY ECONC/
          OPTIONS          3,4,7
          STATISTICS       3

     00054700 CM NEEDED FOR CROSSTABS

     OPTION - 3
     DELETE ROW PERCENTAGES

     OPTION - 4
     DELETE COLUMN PERCENTAGES

     OPTION - 7
     INCLUDE MISSING VALUES IN TABLES BUT NOT STATISTICS
```

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC          82/11/05.    19.54.37.     PAGE   20
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE    E11        E13        E29        E32        E34        E41        E38        E36        E50        E51
           E52        E53        E54        E55

* * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * * * *
    BETAGL                                                   BY  BETAG      BETA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
    EXPN        EXPERIMENTAL GROUP                          VALUE..    0   UNTREATED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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BETAGL		BETAG: AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
COUNT / TOT PCT							
AGRESSIVE	1	257 7.3	8 .2	317 9.0	98 2.8	1 .0	681 19.3
FEEDING	2	17 .5	36 1.0	51 1.4	12 .3	3 .1	119 3.4
NEUTRAL	3	312 8.8	62 1.8	1484 42.0	295 8.4	29 .8	2182 61.8
SUBMISSIVE	4	93 2.6	13 .4	295 8.4	112 3.2	1 .0	514 14.6
NUL	9	3 .1	0 0	30 .8	1 .0	0 0	34 1.0
COLUMN TOTAL		682 19.3	119 3.4	2177 61.7	518 14.7	34 1.0	3530 100.0

CONTINGENCY COEFFICIENT =   .35573

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC              82/11/05.     19.54.37.      PAGE    21
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS      (CREATION DATE =  82/11/04.)
SUBFILE    E11          E13          E29          E32          E34          E41          E36          E38          E50          E51
           E52          E53          E54          E55

* * * * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F * * * * * * * * * * * * * * * * * * * * *
     BETAGL                                                        BY  BETAG       BETA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
     EXPN       EXPERIMENTAL GROUP                                 VALUE..      1   SEVIN 1MG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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BETAGL	COUNT / TOT PCT	AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	359 8.8	13 .3	407 10.0	99 2.4	5 .1	883 21.6
FEEDING	2	38 .9	70 1.7	63 1.5	6 .1	3 .1	180 4.4
NEUTRAL	3	405 9.9	86 2.1	1787 43.8	234 5.7	35 .9	2547 62.4
SUBMISSIVE	4	73 1.8	6 .1	261 6.4	83 2.0	3 .1	426 10.4
NUL	9	6 .1	4 .1	32 .8	4 .1	0 0	46 1.1
	COLUMN TOTAL	381 21.6	179 4.4	2550 62.5	426 10.4	46 1.1	4082 100.0

CONTINGENCY COEFFICIENT =   .41534

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC                82/11/05.     19.54.37.     PAGE   22
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE   E11        E13        E29        E32        E34        E41        E38        E36        E50        E51
          E52        E53        E54        E55

* * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * *
    BETAGL
CONTROLLING FOR..                                          BY  BETAG    BETA FISH BEHAVIOUR CLASSES
    EXPN       EXPERIMENTAL GROUP                          VALUE..    2.  SEVIN 2MG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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BETAGL	COUNT / TOT PCT	AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	279 7.2	7 .2	358 9.2	82 2.1	1 .0	727 18.8
FEEDING	2	17 .4	62 1.6	71 1.8	5 .1	0 0	155 4.0
NEUTRAL	3	384 9.9	82 2.1	1992 51.4	171 4.4	23 .6	2652 68.4
SUBMISSIVE	4	46 1.2	5 .1	202 5.2	52 1.3	6 .2	311 8.0
NUL	9	2 .1	1 .0	25 .6	2 .1	0 0	30 .8
COLUMN TOTAL		728 18.8	157 4.1	2648 68.3	312 8.1	30 .8	3875 100.0

CONTINGENCY COEFFICIENT =   .42185

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC            82/11/05.    19.54.37.     PAGE   23
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E11        E13        E29        E32        E34        E41        E38        E30        E50        E51
           E52        E53        E54        E55

* * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F * * * * * * * * * * * * * * * * * * *
    BETAGL                                                            BY  BETAG        BETA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
    EXPN        EXPERIMENTAL GROUP                                  VALUE..     3   SEVIN 4MG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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BETAGL	COUNT / TOT PCT	BETAG AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	404 11.2	5 .1	311 8.7	72 2.0	1 .0	793 22.1
FEEDING	2	15 .4	64 1.8	76 2.1	5 .1	1 .0	161 4.5
NEUTRAL	3	317 8.8	89 2.5	1734 48.3	146 4.1	42 1.2	2328 64.8
SUBMISSIVE	4	52 1.4	5 .1	169 4.7	40 1.1	0 0	266 7.4
NUL	9	5 .1	1 .0	34 .9	4 .1	0 0	44 1.2
	COLUMN TOTAL	793 22.1	164 4.6	2324 64.7	267 7.4	44 1.2	3592 100.0

CONTINGENCY COEFFICIENT =   .47278

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC          02/11/05.     19.54.37.     PAGE   24
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE   RUFUS     (CREATION DATE =  02/11/04.)
SUBFILE    E11          E13          E29          E32          E34          E41          E38          E36          E50          E51
           E52          E53          E54          E55

* * * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * * * * *
      BETAGL                                                        BY BETAG     BETA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
     EXPN      EXPERIMENTAL GROUP                                  VALUE..    4   MALATHION 1MG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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BETAGL	BETAG: COUNT / TOT PCT	AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	291 9.0	13 .4	283 8.8	105 3.3	1 .0	693 21.5
FEEDING	2	21 .7	52 1.6	66 2.1	6 .2	1 .0	146 4.5
NEUTRAL	3	312 9.7	78 2.4	1484 46.1	145 4.5	13 .4	2032 63.1
SUBMISSIVE	4	66 2.1	7 .2	178 5.5	76 2.4	3 .1	330 10.3
NUL	9	2 .1	0 0	15 .5	1 .0	0 0	18 .6
COLUMN TOTAL		692 21.5	150 4.7	2026 62.9	333 10.3	18 .6	3219 100.0

CONTINGENCY COEFFICIENT =   .42050

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC          82/11/05.     19.54.37.     PAGE   25
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE   RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE   E11      E13      E29      E32      E34      E41      E38      E36      E30      E31
          E52      E53      E54      E55

* * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * *
    BETAGL                                              BY  BETAG      BETA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
    EXPN      EXPERIMENTAL GROUP                        VALUE..    5   MALATHION 2MG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *  PAGE  1 OF  1
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BETAGL	COUNT / TOT PCT	AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	427 12.3	14 .4	397 11.4	79 2.3	0 0	917 26.4
FEEDING	2	27 .8	60 1.7	78 2.2	10 .3	1 .0	176 5.1
NEUTRAL	3	408 11.7	93 2.7	1470 42.3	129 3.7	19 .5	2119 60.9
SUBMISSIVE	4	57 1.6	9 .3	152 4.4	28 .8	0 0	246 7.1
NUL	9	0 0	0 0	20 .6	0 0	0 0	20 .6
COLUMN TOTAL		919 26.4	176 5.1	2117 60.9	246 7.1	20 .6	3478 100.0

CONTINGENCY COEFFICIENT = .33048

RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC   82/11/05.   19.54.37.   PAGE 26
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* C R O S S T A B U L A T I O N O F *
BETAGL BY BETAG BETA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
EXPN EXPERIMENTAL GROUP VALUE.. 6. MALATHION 4MG
* PAGE 1 OF 1

BETAGL (COUNT / TOT PCT)		BETAG: AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	542 15.0	3 .1	479 13.3	93 2.5	4 .1	1121 31.0
FEEDING	2	15 .4	9 .2	28 .6	1 .0	0 0	53 1.5
NEUTRAL	3	462 12.8	38 1.1	1393 38.6	178 4.9	19 .5	2090 57.9
SUBMISSIVE	4	98 2.7	3 .1	169 4.7	55 1.5	0 0	325 9.0
NUL	9	6 .2	0 0	16 .4	1 .0	0 0	23 .6
COLUMN TOTAL		1123 31.1	53 1.5	2085 57.7	328 9.1	23 .6	3612 100.0

CONTINGENCY COEFFICIENT = .30533

NUMBER OF MISSING OBSERVATIONS = 125

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC          82/11/05.     19.54.37.     PAGE   27
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE   RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE   E11        E13        E29        E32        E34        E41        E38        E36        E50        E51
          E52        E53        E54        E55

* * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * *
   BETAGL
CONTROLLING FOR..                                                   BY  BETAG     BETA FISH BEHAVIOUR CLASSES
   EFACT       CONTROL-EXPERIMENTAL                                 VALUE..     0   CONTROL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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BETAGL (rows) / BETAG (columns) — COUNT / TOT PCT		AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	257 7.3	6 .2	317 9.0	98 2.8	1 .0	681 19.3
FEEDING	2	17 .5	36 1.0	51 1.4	12 .3	3 .1	119 3.4
NEUTRAL	3	312 8.8	62 1.8	1484 42.0	295 8.4	29 .8	2182 61.8
SUBMISSIVE	4	93 2.6	13 .4	295 8.4	112 3.2	1 .0	514 14.6
NUL	9	3 .1	0 0	30 .8	1 .0	0 0	34 1.0
COLUMN TOTAL		682 19.3	119 3.4	2177 61.7	518 14.7	34 1.0	3530 100.0

CONTINGENCY COEFFICIENT = .35573

RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC 82/11/05. 19.54.37. PAGE 26
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
BETAGL BY BETAG BETA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
EFACT CONTROL-EXPERIMENTAL VALUE.. 1 EXPERIMENTAL
* PAGE 1 OF 1

BETAGL	COUNT / TOT PCT	BETAG AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	2302 10.5	55 .3	2235 10.2	530 2.4	12 .1	5134 23.5
FEEDING	2	133 .6	317 1.5	382 1.7	33 .2	6 .0	871 4.0
NEUTRAL	3	2288 10.5	466 2.1	9860 45.1	1003 4.6	151 .7	13768 63.0
SUBMISSIVE	4	392 1.8	35 .2	1131 5.2	334 1.5	12 .1	1904 8.7
NUL	9	21 .1	6 .0	142 .6	12 .1	0 .0	181 .8
	COLUMN TOTAL	5136 23.5	879 4.0	13750 62.9	1912 8.7	181 .8	21858 100.0

CONTINGENCY COEFFICIENT = .41489

NUMBER OF MISSING OBSERVATIONS = 125

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC          82/11/05.     19.54.37.     PAGE   29
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E11        E13        E29        E32        E34        E41        E38        E36        E50        E51
           E52        E53        E54        E55

* * * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F   * * * * * * * * * * * * * * * * * *
     BETAGL                                              BY  BETAG      BETA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
     ETREAT    EXPERIMENT TREATMENT CHEMICAL              VALUE..     0   UNTREATED
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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BETAGL	COUNT / TOT PCT	AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	257 7.3	8 .2	317 9.0	98 2.8	1 .0	681 19.3
FEEDING	2	17 .5	36 1.0	51 1.4	12 .3	3 .1	119 3.4
NEUTRAL	3	312 8.8	62 1.8	1484 42.0	295 8.4	29 .8	2182 61.8
SUBMISSIVE	4	93 2.6	13 .4	295 8.4	112 3.2	1 .0	514 14.6
NUL	9	3 .1	0 .0	30 .8	1 .0	0 .0	34 1.0
	COLUMN TOTAL	682 19.3	119 3.4	2177 61.7	518 14.7	34 1.0	3530 100.0

CONTINGENCY COEFFICIENT =   .35573

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC          82/11/05.     19.54.37.     PAGE   30
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE    E11        E13        E29        E32        E34        E41        E38        E36        E50        E51
           E52        E53        E54        E55

* * * * * * * * * * * * * * * * * * *  C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * * *
     BETAGL                                                          BY  BETAG      BETA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
     ETREAT     EXPERIMENT TREATMENT CHEMICAL                        VALUE..     1   SEVIN
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
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BETAGL (COUNT / TOT PCT)	BETAG: AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE 1	1042 9.0	25 .2	1076 9.3	253 2.2	7 .1	2403 20.8
FEEDING 2	70 .6	196 1.7	210 1.8	16 .1	4 .0	496 4.3
NEUTRAL 3	1106 9.6	257 2.2	5513 47.7	551 4.8	100 .9	7527 65.2
SUBMISSIVE 4	171 1.5	16 .1	632 5.5	175 1.5	9 .1	1003 8.7
NUL 9	13 .1	6 .1	91 .8	10 .1	0 .0	120 1.0
COLUMN TOTAL	2402 20.8	500 4.3	7522 65.1	1005 8.7	120 1.0	11549 100.0

CONTINGENCY COEFFICIENT =   .43397

BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E30 E50 E51
E52 E53 E54 E55

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
BETAGL BETA FISH BEHAVIOUR CLASSES
BY BETAG
CONTROLLING FOR..
ETREAT EXPERIMENT TREATMENT CHEMICAL VALUE.. 2 MALATHION
* PAGE 1 OF 1

BETAGL	COUNT / TOT PCT	BETAG AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	1260 12.2	30 .3	1159 11.2	277 2.7	5 .0	2731 26.5
FEEDING	2	63 .6	121 1.2	172 1.7	17 .2	2 .0	375 3.6
NEUTRAL	3	1182 11.5	209 2.0	4347 42.2	452 4.4	51 .5	6241 60.5
SUBMISSIVE	4	221 2.1	19 .2	499 4.8	159 1.5	3 .0	901 8.7
NUL	9	8 .1	0 0	51 .5	2 .0	0 0	61 .6
	COLUMN TOTAL	2734 26.5	379 3.7	6228 60.4	907 8.8	61 .6	10309 100.0

CONTINGENCY COEFFICIENT = .38804

NUMBER OF MISSING OBSERVATIONS = 125

BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E52 E13 E53 E29 E54 E32 E55 E34 E41 E38 E36 E50 E51

* * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * *
BETAGL BY BETAG BETA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
ECONC EXPERIMENT TREATMENT CONCENTRATION VALUE.. 0 CONTROL
* * * * * * * * * * * * * * * * * PAGE 1 OF 1

BETAGL (COUNT / TOT PCT)	BETAG: AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
1 AGRESSIVE	257 7.3	8 .2	317 9.0	98 2.8	1 .0	681 19.3
2 FEEDING	17 .5	36 1.0	51 1.4	12 .3	3 .1	119 3.4
3 NEUTRAL	312 3.8	62 1.8	1484 42.0	295 8.4	29 .8	2182 61.8
4 SUBMISSIVE	93 2.6	13 .4	295 8.4	112 3.2	1 .0	514 14.6
9 NUL	3 .1	0 0	30 .8	1 .0	0 0	34 1.0
COLUMN TOTAL	682 19.3	119 3.4	2177 61.7	518 14.7	34 1.0	3530 100.0

CONTINGENCY COEFFICIENT = .35573

```
RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC                02/11/03.     19.54.37.     PAGE   33
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS    (CREATION DATE = 82/11/04.)
SUBFILE   E11        E13        E29        E32        E34        E41        E38        E36        E50        E51
          E52        E53        E54        E55

* * * * * * * * * * * * * * * * *   C R O S S T A B U L A T I O N   O F  * * * * * * * * * * * * * * * * *
      BETAGL                                                  BY   BETAG    BETA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
      ECONC     EXPERIMENT TREATMENT CONCENTRATION                 VALUE..   1   1 MG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
```

BETAGL	COUNT / TOT PCT	BETAG AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	650 8.9	26 .4	690 9.5	204 2.8	6 .1	1576 21.6
FEEDING	2	59 .8	122 1.7	129 1.8	12 .2	4 .1	326 4.5
NEUTRAL	3	717 9.8	164 2.2	3271 44.8	379 5.2	48 .7	4579 62.7
SUBMISSIVE	4	139 1.9	13 .2	439 6.0	159 2.2	6 .1	756 10.4
NUL	9	8 .1	4 .1	47 .6	5 .1	0 0	64 .9
	COLUMN TOTAL	1573 21.5	329 4.5	4576 62.7	759 10.4	64 .9	7301 100.0

CONTINGENCY COEFFICIENT = .41404

BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * * *
BETAGL BY BETAG BETA FISH BEHAVIOUR CLASSES
CONTROLLING FOR..
ECONC EXPERIMENT TREATMENT CONCENTRATION VALUE.. 2 2 MG
* PAGE 1 OF 1

BETAGL	COUNT / TOT PCT	BETAG: AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	706 / 9.6	21 / .3	755 / 10.3	161 / 2.2	1 / .0	1644 / 22.4
FEEDING	2	44 / .6	122 / 1.7	149 / 2.0	15 / .2	1 / .0	331 / 4.5
NEUTRAL	3	792 / 10.8	175 / 2.4	3462 / 47.1	300 / 4.1	42 / .6	4771 / 64.9
SUBMISSIVE	4	103 / 1.4	14 / .2	354 / 4.8	80 / 1.1	6 / .1	557 / 7.6
NUL	9	2 / .0	1 / .0	45 / .6	2 / .0	0 / 0	50 / .7
COLUMN TOTAL		1647 / 22.4	333 / 4.5	4765 / 64.8	558 / 7.6	50 / .7	7353 / 100.0

CONTINGENCY COEFFICIENT = .40641

```
RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC          82/11/05.     19.54.37.     PAGE   35
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE    E11         E13         E29         E32         E34         E41         E38         E36         E50         E51
           E52         E53         E54         E55
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* * * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N   O F * * * * * * * * * * * * * * * * * * *

BETAGL BY BETAG BETA FISH BEHAVIOUR CLASSES

CONTROLLING FOR..

ECONC EXPERIMENT TREATMENT CONCENTRATION VALUE.. 3 4 MG

* PAGE 1 OF 1

BETAGL	COUNT / TOT PCT	BETAG AGRESSIVE 1	FEEDING 2	NEUTRAL 3	SUBMISSIVE 4	NUL 9	ROW TOTAL
AGRESSIVE	1	946 13.1	8 .1	790 11.0	165 2.3	5 .1	1914 26.6
FEEDING	2	30 .4	73 1.0	104 1.4	6 .1	1 .0	214 3.0
NEUTRAL	3	779 10.8	127 1.8	3127 43.4	324 4.5	61 .8	4418 61.3
SUBMISSIVE	4	150 2.1	8 .1	338 4.7	95 1.3	0 0	591 8.2
NUL	9	11 .2	1 .0	50 .7	5 .1	0 .0	67 .9
	COLUMN TOTAL	1916 26.6	217 3.0	4409 61.2	595 8.3	67 .9	7204 100.0

CONTINGENCY COEFFICIENT = .41984

NUMBER OF MISSING OBSERVATIONS = 125

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RUFUS FISH DATA - TRANSITION MATRIX FOR BEHV. GROUPS BY EXPN,ETC          82/11/05.    19.54.37.    PAGE   36
BETAG FISH - NO. TIMES IN EXP. ROW BEHAV. FOLLOWED BY COL BEHAV.
CPU TIME REQUIRED..     53.5390 SECONDS

                        FINISH
TOTAL CPU TIME USED..    192.3310 SECONDS


RUN COMPLETED

NUMBER OF CONTROL CARDS READ   42
NUMBER OF ERRORS DETECTED       0
```

APPENDIX E

RF-2A; CROSS BREAKDOWN OF AGGRESSION INDEX BY HOUR, BY EXPERIMENT NUMBER, EXPERIMENT GROUP EACH FISH

RF2A copy 2

```
OPERATING SYSTEM =  NOS 2.0-562/552 AK   82/10/10. PRINTED = 82/11/04. 18.10.46.

AMZI         JSN =  AGFD        FAMILY        = KRUNDS        JOB ORIGIN     = BATCH.
CREATING JSN =  AGFA        USER NUMBER = DUB2027       SERVICE CLASS = BATCH.

BBBBBBBBBBB    PPPPPPPPPPP    LL
BBBBBBBBBBBB   PPPPPPPPPPPP   LL
BB        BB   PP        PP   LL
BB        BB   PP        PP   LL
BB        BB   PP        PP   LL
BB        BB   PP        PP   LL
BB        BB   PPPPPPPPPPPP   LL
BBBBBBBBBBBB   PPPPPPPPPPP    LL
BBBBBBBBBBB    PP             LL
BB        BB   PP             LL
BB        BB   PP             LL
BB        BB   PP             LL
BB        BB   PP             LL
BB        BB   PP             LL          LL
BBBBBBBBBBBB   PP             LLLLLLLLLLLL
BBBBBBBBBBB    PP             LLLLLLLLLLLL
```

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******************** NEWS AS OF 82/11/01. 15.37 ********************
*                                                                    *
*       ***** DALHOUSIE UNIVERSITY COMPUTER USERS' GROUP *****       *
*                                                                    *
*   DUCUG IS HOLDING A GENERAL MEETING ON TUESDAY, NOVEMBER 9, AT    *
*   2:30 P.M. IN ROOM 312 OF THE SCHOOL OF BUSINESS BUILDING         *
*   (ART COLLEGE) TO DISCUSS THE STATUS OF DALHOUSIE'S COMPUTING     *
*   RESOURCES WITH SENIOR ADMINISTRATION OFFICIALS.  EVERYONE WHO    *
*   USES OR IS AFFECTED BY COMPUTING AT DAL IS INVITED TO ATTEND.    *
*   FOR FURTHER INFORMATION, RUN "BGN,DUCUG/LIB".                    *
*                                                                    *
*                      +++++++++++++++++++                           *
*                      + REMEMBRANCE DAY +                           *
*                      +++++++++++++++++++                           *
*                                                                    *
* ON REMEMBRANCE DAY, NOVEMBER 11, THE COMPUTER CENTRE OPERATIONS    *
* AREA, INCLUDING TERMINAL ROOMS B504 AND B507, WILL BE OPEN FROM    *
* 9 AM TO 5 PM.  UNATTENDED IAF/RBF WILL BE AVAILABLE OUTSIDE OF     *
* THESE HOURS.  THE MAIN COMPUTER CENTRE OFFICES WILL BE CLOSED.     *
*                                                                    *
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COMPUTER CENTRE                                              82/11/04.    16.06.53.    PAGE    1
DALHOUSIE UNIVERSITY
S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES
VERSION 8.0 -- APRIL 1981

      RUN NAME        RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA
      GET FILE        RUFUS

                FILE RUFUS    HAS  15 VARIABLES
                THE SUBFILES ARE..

                NAME         N OF
                             CASES
                E11          1609
                E13          1939
                E29          2022
                E32          2078
                E34          1859
                E41          2034
                E38          1672
                E36          1938
                E50          1624
                E51          1612
                E52          1830
                E53          1666
                E54          1779
                E55          1851

                TOTAL        25513

      COMPUTE         EFACT=0
      IF              (ETREAT NE 0) EFACT=1
      VAR LABELS      EFACT, CONTROL-EXPERIMENTAL/
      VALUE LABELS    EFACT (0) CONTROL (1) EXPERIMENTAL/
      COMPUTE         WT=SEC*10
      WEIGHT          WT
      RUN SUBFILES    ALL

      TASK NAME       ALPHA FISH AGGRESSION BY THE HOOK BY EXP
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RUFUS FISH DATA  -  AGGRESSION SCALE - CRUSSBREAK & ANOVA              82/11/04.    16.06.53.     PAGE    2
ALPHA FISH AGGRESSION BY THE HOUR BY EXP
               BREAKDOWN          VARIABLES=ALPHAS(LJ,HI),HR(1,9),EXPNO(11,52),
                                            ETREAT(0,2),ECONC(0,3),EFACT(0,1)/
                                  CROSSBREAK=ALPHAS BY EXPNO BY HR/ALPHAS BY ETREAT BY HR/
                                            ALPHAS BY ECONC BY HR/ALPHAS BY EFACT BY HR/

               OPTIONS            5,6
               STATISTICS         3

          00055300 CM NEEDED FOR BREAKDOWN


          OPTION - 5
          DO NOT REPORT COUNTS,  WITH CROSSBREAK OUTPUT

          OPTION - 6
          DO NOT REPORT SUMS,    WITH CROSSBREAK OUTPUT
```

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 16.06.53. PAGE 3
ALPHA FISH AGGRESSION BY THE HOUR BY EXP
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * * * * * * * * * * * C R O S S - - B R E A K D O W N O F *

EXPNO BY HR EXP. TIME ELAPSED
VARIABLE AVERAGED.. ALPHAS ALPHA FISH AGGRESSION SCALE
* PAGE 1 OF 1

EXPNO	MEAN STD DEV	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
UNTREATED	11	2.895 10.780	5.542 14.973	5.964 11.694	-2.225 15.199	1.064 9.162	1.436 11.158	7.453 14.430	3.864 17.338	-2.169 20.542	2.533 14.771
UNTREATED	13	3.510 10.837	2.545 8.325	5.398 9.960	4.294 11.618	4.308 11.755	3.148 12.747	2.451 10.955	3.467 10.140	3.510 10.837	3.641 10.855
SEVIN 1MG	29	2.786 11.794	5.456 10.533	7.457 8.124	7.182 11.240	7.908 11.767	6.090 12.951	6.442 9.859	5.398 9.960	4.294 11.618	5.868 11.125
SEVIN 1MG	32	1.146 11.829	3.835 9.421	3.000 9.834	3.144 8.095	1.073 13.022	2.643 12.971	5.068 11.018	3.148 12.747	4.308 11.755	2.966 11.442
SEVIN 2MG	34	1.946 7.809	2.684 10.854	3.465 10.953	1.903 9.761	4.691 8.606	4.277 8.882	6.390 11.376	5.001 10.863	.586 7.662	3.438 9.870
SEVIN 4MG	36	2.405 11.242	2.175 9.221	2.335 12.887	4.305 11.139	.863 9.105	1.890 11.142	-1.113 11.980	2.451 10.955	3.467 10.140	2.080 10.934
SEVIN 4MG	38	4.471 4.832	4.923 7.074	5.050 5.483	2.677 11.483	4.948 8.926	3.122 9.161	4.926 8.983	4.095 7.947	5.405 10.638	4.419 8.442
SEVIN 2MG	41	-3.542 13.597	-5.639 14.969	-.098 12.080	-2.759 15.900	2.130 9.380	3.534 14.451	4.404 10.683	4.809 11.847	3.189 10.474	.471 13.312
MALATHION 1MG	50	3.706 11.528	.877 14.098	1.679 11.906	-.847 17.812	.980 9.791	-.374 12.274	1.281 10.753	2.895 10.780	0 0	1.290 12.082
MALATHION 1MG	51	2.168 13.388	2.384 12.131	2.983 14.673	0.966 13.721	5.183 11.523	0.192 13.253	2.816 12.889	5.542 14.973	5.964 11.694	4.358 13.336
MALATHION 2MG	52	1.704 13.205	2.040 14.075	.767 11.774	-3.867 14.680	-1.779 15.342	-2.696 23.616	-.790 11.669	-4.732 15.412	-2.225 15.199	-1.193 14.947
MALATHION 2MG	53	-4.587 12.078	-4.244 12.953	-2.804 14.707	-6.203 13.136	.889 12.039	-1.067 13.364	-4.006 13.256	.983 9.168	1.436 11.158	-2.185 12.823
MALATHION 4MG	54	-4.684 13.641	.600 14.598	3.945 13.494	9.200 16.331	2.651 15.547	7.776 15.170	5.559 14.701	7.453 14.436	3.864 17.338	3.923 15.582
MALATHION 4MG	55	-.398 14.152	-2.484 18.138	-1.462 17.412	-3.676 16.413	-4.958 18.763	-2.987 18.208	-2.162 16.666	4.811 12.927	-2.169 20.542	-1.758 17.617
TOTAL COLUMN		.928 127220 12.073	1.373 119460 13.035	2.629 127860 12.395	1.433 117940 14.402	2.135 125610 12.403	2.397 115890 13.955	2.056 117200 12.987	3.498 116070 12.604	2.208 108270 14.059	2.129 1075520 13.117

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- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA                82/11/04.    18.06.53.     PAGE    4
ALPHA FISH AGGRESSION BY THE HOUR BY EXP
RAW CHI SQUARE = 21787.55995 WITH   104 DEGREES OF FREEDOM.  SIGNIFICANCE =       0

NUMBER OF MISSING OBSERVATIONS =  187810
```

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RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA              82/11/04.    18.06.53.     PAGE    5
ALPHA FISH AGGRESSION BY THE HOUR BY EXP
FILE   RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE   E11        E13        E29        E32        E34        E41        E38        E36        E50        E51
          E52        E53        E54        E55

* * * * * * * * * * * * * * * * * *   C R O S S - - B R E A K D O W N   O F   * * * * * * * * * * * * * * * * * *
   ETREAT    EXPERIMENT TREATMENT CHEMICAL                 BY  HR        EXP. TIME ELAPSED
VARIABLE AVERAGED..  ALPHAS    ALPHA FISH AGGRESSION SCALE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
```

ETREAT	MEAN / STD DEV	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
UNTREATED	0	3.170 10.810	3.826 11.734	5.654 10.783	1.281 13.781	2.723 10.699	2.262 11.981	4.828 12.970	3.066 14.211	.375 17.133	3.096 12.942
SEVIN	1	1.462 10.875	2.092 11.412	3.453 10.419	2.700 12.147	3.480 10.484	3.746 11.709	4.210 11.081	4.154 10.843	3.549 10.598	3.181 11.091
MALATHION	2	-.316 13.423	-.092 14.648	.853 14.326	.189 16.479	.317 14.049	1.130 16.210	.486 14.255	2.757 13.601	1.286 16.126	.706 14.883
TOTAL COLUMN		.928 127220 12.073	1.373 119460 13.035	2.629 127860 12.395	1.433 117940 14.402	2.135 125610 12.403	2.397 115890 13.955	2.656 117200 12.987	3.498 116070 12.604	2.208 108270 14.059	2.129 1075520 13.117

RAW CHI SQUARE = 2288.61370 WITH   16 DEGREES OF FREEDOM. SIGNIFICANCE =   0

NUMBER OF MISSING OBSERVATIONS = 187810

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 18.06.53. PAGE 6
ALPHA FISH AGGRESSION BY THE HOUR BY EXP
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* C R O S S - - B R E A K D O W N O F *

ECONC EXPERIMENT TREATMENT CONCENTRATION BY HR EXP. TIME ELAPSED

VARIABLE AVERAGED.. ALPHAS ALPHA FISH AGGRESSION SCALE
* PAGE 1 OF 1

ECONC (MEAN / STD DEV)	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
CONTROL 0	3.170 10.810	3.826 11.734	5.654 10.783	1.281 13.781	2.723 10.699	2.262 11.981	4.828 12.970	3.666 14.211	.375 17.133	3.096 12.942
1 MG 1	2.446 12.193	3.133 11.919	3.505 11.761	4.140 13.735	3.635 12.027	3.600 13.148	3.825 11.387	4.212 12.099	4.791 11.711	3.660 12.276
2 MG 2	-1.063 12.186	-1.235 13.819	.821 12.494	-2.814 14.064	1.834 11.623	1.180 14.822	1.431 12.455	1.529 12.646	.714 11.572	.264 12.959
4 MG 3	.566 12.014	1.263 13.303	2.518 13.236	3.115 14.727	.884 14.005	2.413 14.656	1.584 14.699	4.640 11.903	2.549 15.717	2.132 13.887
TOTAL COLUMN	.928 127220 12.073	1.373 119460 13.035	2.629 127860 12.395	1.433 117940 14.402	2.135 125610 12.403	2.397 115890 13.955	2.658 117200 12.987	3.498 116070 12.604	2.208 108270 14.059	2.129 1075520 13.117

RAW CHI SQUARE = 3481.41485 WITH 24 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 187810

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 16.06.53. PAGE 7
ALPHA FISH AGGRESSION BY THE HOUR BY EXP
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * * * * * * * * * * C R O S S---B R E A K D O W N O F * * * * * * * * * * * * * * * * * *

EFACT CONTROL-EXPERIMENTAL BY HR EXP. TIME ELAPSED

VARIABLE AVERAGED.. ALPHAS ALPHA FISH AGGRESSION SCALE * * * * * * * * * * PAGE 1 OF 1

EFACT (MEAN / STD DEV)	HR	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
CONTROL	0	3.170 10.810	3.826 11.734	5.654 10.783	1.281 13.781	2.723 10.699	2.262 11.981	4.828 12.970	3.666 14.211	.375 17.133	3.096 12.942
EXPERIMENTAL	1	.597 12.213	.994 13.184	2.178 12.556	1.459 14.506	2.043 12.646	2.417 14.235	2.287 12.953	3.468 12.295	2.533 13.414	1.973 13.138
TOTAL COLUMN		.928 127220 12.073	1.373 119460 13.035	2.629 127860 12.395	1.433 117940 14.402	2.132 125610 12.403	2.337 115890 13.955	2.926 117200 12.987	3.498 116070 12.604	2.208 108270 14.059	2.129 1075520 13.117

RAW CHI SQUARE = 644.58288 WITH 8 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 187810

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RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA                    82/11/04.    18.06.53.    PAGE    6
ALPHA FISH AGGRESSION BY THE HOUR BY EXP

CPU TIME REQUIRED..   110.0630 SECONDS

              TASK NAME       BETA FISH AGGRESSION BY THE HOUR BY EXP
              BREAKDOWN       VARIABLES=BETAS(LO,HI),EXPNO(11,55),HR(1,9),
                                        ETREAT(0,2),ECONC(0,3),EFACT(0,1)/
                              CROSSBREAK=BETAS BY EXPNO BY HR/BETAS BY ETREAT BY HR/
                                        BETAS BY ECONC BY HR/BETAS BY EFACT BY HR/
              OPTIONS         5,6
              STATISTICS      3

          00053300 CM NEEDED FOR BREAKDOWN


          OPTION - 5
          DO NOT REPORT COUNTS, WITH CROSSBREAK OUTPUT

          OPTION - 6
          DO NOT REPORT SUMS,   WITH CROSSBREAK OUTPUT
```

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 16.06.53. PAGE 9
BETA FISH AGGRESSION BY THE HOUR BY EXP
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* C R O S S - - B R E A K D O W N O F *

EXPNO BY HR EXP. TIME ELAPSED

VARIABLE AVERAGED.. BETAS BETA FISH AGGRESSION SCALE

* PAGE 1 OF 1

EXPNO	MEAN STD DEV	HR 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
UNTREATED	11	-1.155 16.960	1.116 16.290	1.032 17.897	2.941 10.378	-1.119 12.643	3.883 14.297	-.099 14.010	2.974 15.986	4.576 19.021	1.588 15.663
UNTREATED	13	-.088 13.550	-.482 12.006	1.879 14.364	.399 13.997	-4.205 15.895	-2.403 16.024	3.292 14.241	.917 12.957	-.088 13.550	-.322 14.326
SEVIN 1MG	29	1.719 12.043	5.653 9.348	2.517 8.551	5.504 11.925	2.542 12.635	2.726 15.752	3.455 13.839	1.879 14.364	.399 13.997	2.970 12.899
SEVIN 1MG	32	4.906 11.199	5.194 14.996	4.426 12.988	3.988 11.336	1.969 11.731	-4.013 14.142	-4.429 15.581	-5.403 16.024	-4.205 15.895	.265 14.474
SEVIN 2MG	34	3.175 10.723	2.555 10.560	3.066 9.257	2.771 8.458	4.964 14.681	-.155 12.726	-2.642 14.898	.414 14.835	.643 10.629	1.955 12.119
SEVIN 4MG	36	1.147 14.853	2.966 10.260	4.853 15.475	5.947 13.454	2.389 11.672	2.966 11.849	2.919 17.815	3.292 14.241	.917 12.957	3.095 13.899
SEVIN 4MG	38	1.802 9.490	4.163 13.111	5.504 11.978	8.448 12.170	5.636 13.352	1.603 10.685	1.717 8.395	3.265 11.199	-.340 13.576	3.555 11.956
SEVIN 2MG	41	4.991 12.251	6.443 12.451	1.507 10.619	3.883 13.774	.984 8.570	.582 13.708	.253 12.836	-.026 14.623	-2.000 14.284	2.016 12.885
MALATHION 1MG	50	5.565 5.894	5.070 10.389	5.593 12.282	5.175 15.842	3.260 11.612	3.842 11.418	4.412 11.191	-1.155 16.960	0 0	3.975 12.525
MALATHION 1MG	51	5.156 12.997	6.467 11.464	7.556 13.719	1.113 17.545	.955 14.848	2.036 11.499	1.063 14.806	1.116 16.290	1.032 17.897	3.139 14.831
MALATHION 2MG	52	3.431 10.692	5.036 13.060	5.230 11.864	2.508 13.823	5.620 14.240	6.826 13.842	4.158 11.155	4.659 13.744	2.941 10.378	4.820 12.653
MALATHION 2MG	53	5.522 10.862	4.781 11.142	4.209 9.686	3.128 10.463	1.385 11.818	4.525 10.503	.358 11.090	-1.102 12.546	3.883 14.297	2.989 11.617
MALATHION 4MG	54	6.471 12.859	5.944 14.106	7.175 11.819	10.364 15.942	6.382 12.463	3.934 12.540	3.925 13.366	-.099 14.010	2.974 15.986	5.228 13.984
MALATHION 4MG	55	3.945 12.483	8.809 16.163	5.521 12.623	8.555 11.635	5.877 14.172	7.078 14.043	7.418 14.492	1.247 12.927	4.576 19.021	5.900 14.559
TOTAL COLUMN		3.371 127220 12.358	4.575 119460 12.769	4.316 127860 12.530	4.865 117940 13.503	2.700 125610 13.277	2.161 115890 13.618	1.921 117200 13.973	.902 116070 14.591	1.229 108270 15.238	2.932 1075320 13.598

BETA FISH AGGRESSION BY THE HOUR BY EXP

RAW CHI SQUARE = 21787.55995 WITH 104 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 187810

```
RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA          82/11/04.    18.06.53.    PAGE  11
BETA FISH AGGRESSION BY THE HOUR BY EXP
FILE   RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE   E11       E13       E29       E32       E34       E41       E38       E36       E50       E51
          E52       E53       E54       E55

* * * * * * * * * * * * * * * * *   C R O S S---B R E A K D O W N   O F   * * * * * * * * * * * * * * * * * *
    ETREAT     EXPERIMENT TREATMENT CHEMICAL             BY   HR       EXP. TIME ELAPSED
* * * * * * * * * * *
VARIABLE AVERAGED..  BETAS     BETA FISH AGGRESSION SCALE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *   PAGE  1 OF  1
```

ETREAT (MEAN / STD DEV)	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
UNTREATED 0	-.677 15.535	.201 14.020	1.495 16.065	1.574 12.520	-2.697 14.480	-.539 15.849	1.681 14.232	1.348 14.390	2.487 16.951	.617 15.029
SEVIN 1	2.978 12.029	4.480 11.833	3.631 11.499	5.250 12.272	3.110 12.430	.432 13.558	.248 14.656	.722 14.533	-.735 13.775	2.301 13.095
MALATHION 2	5.013 11.249	6.013 12.938	5.883 12.113	2.606 14.805	4.069 13.371	4.676 12.470	3.567 13.007	.708 14.636	3.141 15.921	4.363 13.460
TOTAL COLUMN	3.371 127220 12.358	4.575 119460 12.766	4.316 127860 12.530	4.865 117940 13.503	2.700 125610 13.277	2.161 115890 13.618	1.921 117200 13.973	.902 116070 14.591	1.229 108270 15.238	2.932 1075520 13.598

RAW CHI SQUARE = 2288.61370 WITH   16 DEGREES OF FREEDOM. SIGNIFICANCE =   0

NUMBER OF MISSING OBSERVATIONS = 187810

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA   82/11/04.   16.06.53.   PAGE 12
BETA FISH AGGRESSION BY THE HOUR BY EXP
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* C R O S S---B R E A K D O W N O F *

ECONC EXPERIMENT TREATMENT CONCENTRATION BY HR EXP. TIME ELAPSED

VARIABLE AVERAGED.. BETAS BETA FISH AGGRESSION SCALE

PAGE 1 OF 1

ECONC (MEAN / STD DEV)	HR: 1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
CONTROL 0	-.677 15.535	.201 14.020	1.495 16.065	1.574 12.520	-2.697 14.480	-.599 15.849	1.681 14.232	1.948 14.590	2.487 16.951	.617 15.029
1 MG 1	4.441 10.896	5.625 11.479	5.204 12.415	4.002 14.526	2.232 12.646	1.117 13.722	1.187 14.327	-.809 16.147	-.989 16.044	2.565 13.794
2 MG 2	4.255 11.210	4.706 11.944	3.471 10.300	3.887 12.111	3.339 12.842	2.778 13.022	.615 12.746	.939 14.117	1.407 12.696	2.899 12.381
4 MG 3	3.235 12.822	5.462 13.732	5.839 12.905	6.491 13.508	4.929 12.975	4.053 12.558	4.127 14.402	1.975 13.240	2.103 15.748	4.447 13.705
TOTAL COLUMN	3.371 127220 12.358	4.575 119460 12.766	4.316 127860 12.530	4.865 117940 13.503	2.700 125610 13.277	2.161 115890 13.618	1.921 117200 13.973	.902 116070 14.591	1.229 108270 15.238	2.932 1075520 13.598

RAW CHI SQUARE = 3481.41485 WITH 24 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 187810

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 18.06.53. PAGE 13
BETA FISH AGGRESSION BY THE HOUR BY EXP
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* C R O S S---B R E A K D O W N O F *

EFACT CONTROL-EXPERIMENTAL BY HR EXP. TIME ELAPSED

VARIABLE AVERAGED.. BETAS BETA FISH AGGRESSION SCALE

* PAGE 1 OF 1

EFACT (MEAN / STD DEV)	HR	1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
CONTROL	0	-.677	.201	1.495	1.574	-2.697	-.599	1.681	1.948	2.487	.617
		15.535	14.020	16.065	12.520	14.460	15.849	14.232	14.590	16.951	15.029
EXPERIMENTAL	1	3.968	5.251	4.735	5.426	3.545	2.588	1.962	.715	1.006	3.306
		11.700	12.425	11.857	13.565	12.875	13.189	13.928	14.584	14.903	13.315
TOTAL COLUMN		3.371	4.575	4.316	4.865	2.700	2.161	1.921	.902	1.229	2.932
		127220	119460	127860	117940	125610	115890	117200	116070	108270	1075520
		12.358	12.766	12.530	13.503	13.277	13.618	13.973	14.591	15.238	13.598

RAW CHI SQUARE = 644.58288 WITH 8 DEGREES OF FREEDOM. SIGNIFICANCE = 0

NUMBER OF MISSING OBSERVATIONS = 187810

```
RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA                 82/11/04.     18.06.53.     PAGE   14
BETA FISH AGGRESSION BY THE HOUR BY EXP

CPU TIME REQUIRED..    63.7280 SECONDS

                    FINISH

TOTAL CPU TIME USED..   174.1890 SECONDS

RUN COMPLETED

NUMBER OF CONTROL CARDS READ  30
NUMBER OF ERRORS DETECTED      0

18.11.11.UCLP, AA, 050,      0.640KLNS. AGFD.
```

APPENDIX F

RF-1A; STATISTICS ON "SEC SECONDS" IN A BEHAVIOR

RFIA'-copy 2

Statistics on
 ...
(... in a given
 ...)

by expl. by hr.
for each Cish

```
OPERATING SYSTEM = NOS 2.0-562/552 AK   82/10/10. PRINTED = 82/11/04. 19.40.03.

AM2I        JSN = AGVG       FAMILY        = KRONOS         JOB ORIGIN    = BATCH.
CREATING JSN    = AGUY       USER NUMBER   = DUB2027        SERVICE CLASS = BATCH.

BBBBBBBBBBB    PPPPPPPPPPP    LL
BBBBBBBBBBBB   PPPPPPPPPPPP   LL
BB        BB   PP        PP   LL
BB        BB   PP        PP   LL
BB        BB   PP        PP   LL
BB        BB   PP        PP   LL
BB        BB   PPPPPPPPPPPP   LL
BBBBBBBBBBBB   PPPPPPPPPPP    LL
BBBBBBBBBBBB   PP             LL
BB        BB   PP             LL
BB        BB   PP             LL
BB        BB   PP             LL
BB        BB   PP             LL
BB        BB   PP             LL          LL
BBBBBBBBBBBB   PP             LLLLLLLLLLLL
BBBBBBBBBBB    PP             LLLLLLLLLLLL

******************** NEWS AS OF 82/11/01. 15.37 *******************
*                                                                 *
*       ***** DALHOUSIE UNIVERSITY COMPUTER USERS' GROUP *****    *
*                                                                 *
*   DUCUG IS HOLDING A GENERAL MEETING ON TUESDAY, NOVEMBER 9, AT *
*   2:30 P.M. IN ROOM 312 OF THE SCHOOL OF BUSINESS BUILDING      *
*   (ART COLLEGE) TO DISCUSS THE STATUS OF DALHOUSIE'S COMPUTING  *
*   RESOURCES WITH SENIOR ADMINISTRATION OFFICIALS.  EVERYONE WHO *
*   USES OR IS AFFECTED BY COMPUTING AT DAL IS INVITED TO ATTEND. *
*   FOR FURTHER INFORMATION, RUN "BGN,DUCUG/LIB".                 *
*                                                                 *
*                      ******************                         *
*                      * REMEMBRANCE DAY *                        *
*                      ******************                         *
*                                                                 *
* ON REMEMBRANCE DAY, NOVEMBER 11, THE COMPUTER CENTRE OPERATIONS *
* AREA, INCLUDING TERMINAL ROOMS 8504 AND 8507, WILL BE OPEN FROM *
* 9 AM TO 5 PM.  UNATTENDED IAF/RBF WILL BE AVAILABLE OUTSIDE OF  *
* THESE HOURS.  THE MAIN COMPUTER CENTRE OFFICES WILL BE CLOSED.  *
*                                                                 *
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COMPUTER CENTRE                                                                  82/11/04.     19.38.56.      PAGE    1
DALHOUSIE UNIVERSITY

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- APRIL 1981


          ECOLOGY          OFF
          RUN NAME         RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA
          GET FILE         RUFUS


                 FILE RUFUS    HAS  15 VARIABLES

                 THE SUBFILES ARE..

                               N OF
                 NAME         CASES

                 E11           1609
                 E13           1939
                 E29           2022
                 E32           2078
                 E34           1859
                 E41           2034
                 E38           1672
                 E36           1938
                 E50           1624
                 E51           1612
                 E52           1830
                 E53           1666
                 E54           1779
                 E55           1851

                 TOTAL        25513


          RUN SUBFILES     ALL

          TASK NAME        ALPHA FISH MEAN TIMES BY THE HOUR BY EXP
          BREAKDOWN        VARIABLES=SEC(LO,HI),HR(1,9),EXPNO(11,55)/
                           CROSSBREAK=SEC BY EXPNO BY HR
          OPTIONS          6,7

     00054700 CM NEEDED FOR BREAKDOWN

     OPTION - 1
     IGNORE MISSING VALUE INDICATORS
     (NO MISSING VALUES DEFINED...OPTION 1 WAS FORCED)
```

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 19.38.56. PAGE 3
ALPHA FISH MEAN TIMES BY THE HOUR BY EXP
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* C R O S S - - B R E A K D O W N O F *

EXPNO BY HR EXP. TIME ELAPSED
VARIABLE AVERAGED.. SEC
* PAGE 1 OF 1

EXPNO	MEAN / COUNT	1 HR (1)	2 HR (2)	4 HR (3)	8 HR (4)	16 HR (5)	32 HR (6)	64 HR (7)	128 HR (8)	256 HR (9)	ROW TOTAL
UNTREATED	11	6.050 159	4.323 158	5.884 164	5.732 149	5.127 165	4.822 180	5.909 198	4.443 212	5.585 224	5.308 1609
UNTREATED	13	6.771 170	7.154 195	4.870 254	3.631 271	3.898 254	4.819 199	4.326 227	5.467 199	6.771 170	5.125 1939
SEVIN 1MG	29	5.688 199	5.403 211	7.007 142	4.798 248	3.644 247	5.529 225	5.716 225	4.870 254	3.631 271	4.999 2022
SEVIN 1MG	32	4.136 265	4.906 171	4.284 243	6.898 197	4.306 265	4.052 232	3.706 252	4.819 199	3.898 254	4.483 2078
SEVIN 2MG	34	6.515 206	7.138 167	5.815 324	5.098 153	4.191 299	5.392 217	6.344 151	4.807 181	5.404 161	5.551 1859
SEVIN 4MG	36	4.824 255	5.207 193	6.466 174	5.299 221	6.261 249	5.526 156	4.989 204	4.326 227	5.467 199	5.335 1938
SEVIN 4MG	38	6.432 176	5.574 183	5.888 224	4.994 180	4.695 200	5.090 200	4.204 157	6.435 177	5.429 175	5.428 1672
SEVIN 2MG	41	3.996 280	4.650 234	4.586 198	5.513 228	5.438 203	4.175 206	3.622 254	4.232 259	5.076 172	4.535 2034
MALATHION 1MG	50	5.374 190	4.095 221	4.471 210	3.552 248	5.279 172	4.396 222	4.351 202	6.050 159	0 0	4.600 1624
MALATHION 1MG	51	4.893 197	4.734 192	4.790 214	5.927 191	6.171 129	5.186 183	4.995 184	4.323 158	5.884 164	5.175 1612
MALATHION 2MG	52	5.058 190	4.318 220	4.316 225	5.457 184	3.543 247	3.700 227	5.306 173	4.014 215	5.732 149	4.501 1830
MALATHION 2MG	53	4.863 183	4.978 178	4.324 222	5.094 159	4.872 188	4.143 210	5.006 179	5.144 167	4.822 180	4.775 1666
MALATHION 4MG	54	5.044 182	4.683 196	4.546 205	4.224 192	4.795 195	5.029 205	4.639 194	5.909 198	4.443 212	4.832 1779
MALATHION 4MG	55	4.821 212	4.004 223	4.787 197	4.523 195	5.221 199	5.231 208	4.389 211	4.555 182	5.585 224	4.794 1851
TOTAL COLUMN		5.216 2864	5.055 2742	5.088 2996	4.977 2816	4.720 3012	4.765 2870	4.790 2871	4.908 2787	5.103 2555	4.952 25513

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 19.38.56. PAGE 5
BETA FISH MEAN TIMES BY THE HOUR BY EXP
FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * * * * * * * * * * C R O S S---B R E A K D O W N O F *

EXPNO BY HR EXP. TIME ELAPSED

VARIABLE AVERAGED.. SEC

* * * * * * * * * * * * * PAGE 1 OF 1

MEAN COUNT		HR 1 HR 1	2 HR 2	4 HR 3	8 HR 4	16 HR 5	32 HR 6	64 HR 7	128 HR 8	256 HR 9	ROW TOTAL
EXPNO											
UNTREATED	11	6.050 159	4.323 158	5.884 164	5.732 149	5.127 165	4.822 180	5.909 198	4.443 212	5.585 224	5.308 1609
UNTREATED	13	6.771 170	7.154 195	4.870 224	3.631 271	3.898 254	4.819 199	4.326 227	5.467 199	6.771 170	5.125 1939
SEVIN 1MG	29	5.688 199	5.403 211	7.007 142	4.798 248	3.644 247	5.229 225	5.716 225	4.870 254	3.631 271	4.999 2022
SEVIN 1MG	32	4.136 265	4.906 171	4.284 243	6.898 197	4.366 265	4.052 232	3.706 252	4.819 199	3.898 254	4.483 2078
SEVIN 2MG	34	6.515 206	7.138 167	5.815 324	5.098 153	4.191 299	5.392 217	6.344 151	4.807 181	5.404 161	5.251 1859
SEVIN 4MG	36	4.824 255	5.207 193	6.466 174	5.299 221	6.261 249	5.526 156	4.989 264	4.326 227	5.467 199	5.335 1938
SEVIN 4MG	38	6.432 176	5.574 183	5.888 224	4.994 180	4.695 200	5.090 200	4.204 157	6.435 177	5.429 175	5.428 1672
SEVIN 2MG	41	3.996 280	4.650 234	4.586 198	5.513 228	5.438 203	4.175 206	3.622 254	4.232 259	5.076 172	4.535 2034
MALATHION 1MG	50	5.374 190	4.095 221	4.471 210	3.552 248	5.279 172	4.396 222	4.321 202	6.050 159	0 0	4.600 1624
MALATHION 1MG	51	4.893 197	4.734 192	4.790 214	5.927 191	6.171 129	5.186 183	4.995 184	4.323 158	5.884 164	5.175 1612
MALATHION 2MG	52	5.058 190	4.318 220	4.316 225	5.457 184	3.543 247	3.700 227	5.306 173	4.014 215	5.732 149	4.501 1830
MALATHION 2MG	53	4.863 183	4.978 178	4.324 222	5.094 159	4.872 188	4.143 210	5.006 179	5.144 167	4.822 180	4.775 1666
MALATHION 4MG	54	5.044 182	4.883 196	4.546 205	4.224 192	4.795 195	5.029 205	4.639 194	5.909 198	4.443 212	4.832 1779
MALATHION 4MG	55	4.821 212	4.004 223	4.787 197	4.523 195	5.221 199	5.231 208	4.389 241	4.555 182	5.585 224	4.794 1851
TOTAL COLUMN		5.216 2864	5.052 2742	5.088 2996	4.977 2816	4.720 3012	4.765 2870	4.760 2871	4.908 2787	5.103 2555	4.952 25513

APPENDIX G

RF-2B; ANOVA AND MCA'S (BEHAVIOR INDEX AGGRESSION)

BY HR AND EXPNO

R F2 B- copy 2

anova
aggression
by HR vs RxPNO

```
OPERATING SYSTEM =  NOS 2.0-562/552 AK   82/10/10. PRINTED = 82/11/04. 20.47.53.

AM2I        JSN =  AHJH       FAMILY       = KRUNOS        JOB ORIGIN    = BATCH.
CREATING JSN =  AHIR       USER NUMBER  = DUB2027       SERVICE CLASS = BATCH.

BBBBBBBBBBB   PPPPPPPPPPP   LL
BBBBBBBBBBBB  PPPPPPPPPPPP  LL
BB        BB  PP        PP  LL
BB        BB  PP        PP  LL
BB        BB  PP        PP  LL
BB        BB  PP        PP  LL
BB        BB  PPPPPPPPPPPP  LL
BBBBBBBBBBBB  PPPPPPPPPPP   LL
BBBBBBBBBBB   PP            LL
BB        BB  PP            LL
BB        BB  PP            LL
BB        BB  PP            LL
BB        BB  PP            LL
BB        BB  PP            LL          LL
BBBBBBBBBBBB  PP            LLLLLLLLLLLL
BBBBBBBBBBB   PP            LLLLLLLLLLLL

******************** NEWS AS OF 82/11/01. 15.37 ********************
*                                                                  *
*        ***** DALHOUSIE UNIVERSITY COMPUTER USERS' GROUP *****    *
*                                                                  *
*   DUCUG IS HOLDING A GENERAL MEETING ON TUESDAY, NOVEMBER 9, AT  *
*   2:30 P.M. IN ROOM 312 OF THE SCHOOL OF BUSINESS BUILDING       *
*   (ART COLLEGE) TO DISCUSS THE STATUS OF DALHOUSIE'S COMPUTING   *
*   RESOURCES WITH SENIOR ADMINISTRATION OFFICIALS.  EVERYONE WHO  *
*   USES OR IS AFFECTED BY COMPUTING AT DAL IS INVITED TO ATTEND.  *
*   FOR FURTHER INFORMATION, RUN "BGN,DUCUG/LIB".                  *
*                                                                  *
*                      ++++++++++++++++++                          *
*                      + REMEMBRANCE DAY +                         *
*                      ++++++++++++++++++                          *
*                                                                  *
* ON REMEMBRANCE DAY, NOVEMBER 11, THE COMPUTER CENTRE OPERATIONS  *
* AREA, INCLUDING TERMINAL ROOMS B504 AND B507, WILL BE OPEN FROM  *
* 9 AM TO 5 PM.  UNATTENDED IAF/RBF WILL BE AVAILABLE OUTSIDE OF   *
* THESE HOURS.  THE MAIN COMPUTER CENTRE OFFICES WILL BE CLOSED.   *
*                                                                  *
********************************************************************

MWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMW
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COMPUTER CENTRE                                              82/11/04.    20.45.06.    PAGE   1
DALHOUSIE UNIVERSITY

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VERSION 8.0 -- APRIL 1981


          ECOLOGY        OFF
          RUN NAME       RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA
          GET FILE       RUFUS


               FILE RUFUS    HAS  15 VARIABLES

               THE SUBFILES ARE..

                            N OF
               NAME         CASES

               E11          1609
               E13          1939
               E29          2022
               E32          2078
               E34          1859
               E41          2034
               E38          1672
               E36          1938
               E50          1624
               E51          1612
               E52          1830
               E53          1666
               E54          1779
               E55          1851

               TOTAL        25513


          COMPUTE        EXPN=3*ETREAT+ECONC
          IF             (EXPN GT 0) EXPN=EXPN-3
          COMPUTE        EXPNO=2*EXPN+EREPL
          VAR LABEL      EXPN, EXPERIMENTAL GROUP/

          COMPUTE        WT=SEC/4.95
          WEIGHT         WT

          RUN SUBFILES   ALL

          ANOVA          ALPHAS BY HR(1,9),EXPNO(1,14)
          STATISTICS     1
```

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 20.45.06. PAGE 3

```
FILE     RUFUS  (CREATION DATE =  82/11/04.)
SUBFILE  E11      E13      E29      E32      E34      E41      E38      E36      E50      E51
         E52      E53      E54      E55
```

* * * * * * * * * A N A L Y S I S   O F   V A R I A N C E * * * * * * * * *

```
             ALPHAS    ALPHA FISH AGGRESSION SCALE
          BY HR        EXP. TIME ELAPSED
             EXPNO
```

* *

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	136484.015	21	6499.239	40.128	.001
HR	11809.573	8	1476.197	9.114	.001
EXPNO	124360.868	13	9566.221	59.064	.001
2-WAY INTERACTIONS	103069.035	103	1000.670	6.178	.001
HR EXPNO	103069.035	103	1000.670	6.178	.001
EXPLAINED	239553.050	124	1931.879	11.928	.001
RESIDUAL	3498737.007	21602	161.964		
TOTAL	3738290.057	21726	172.065		

25522 CASES WERE PROCESSED.
3794 CASES (14.9 PCT) WERE MISSING.

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 20.45.06. PAGE 4

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S * *

ALPHAS ALPHA FISH AGGRESSION SCALE
BY HR
EXPNO EXP. TIME ELAPSED

* *

GRAND MEAN = 2.13

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	ETA	ADJUSTED FOR INDEPENDENTS DEV'N	BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	BETA
HR							
1 1 HR	2570	-1.20		-1.15			
2 2 HR	2413	-.76		-.74			
3 4 HR	2583	.50		.48			
4 8 HR	2383	-.70		-.68			
5 16 HR	2538	.01		.00			
6 32 HR	2341	.27		.21			
7 64 HR	2368	.53		.59			
8 128 HR	2345	1.37		1.38			
9 256 HR	2187	.08		-.01			
			.06		.06		
EXPNO							
1	1486	.40		.39			
2	1535	1.51		1.49			
3	1551	3.74		3.74			
4	1524	.84		.82			
5	1793	1.31		1.31			
6	1617	-1.66		-1.64			
7	1601	-.05		-.01			
8	1488	2.29		2.29			
9	1436	-.64		-.85			
10	1486	2.23		2.25			
11	1553	-3.32		-3.31			
12	1537	-4.31		-4.33			
13	1552	1.79		1.78			
14	1568	-3.89		-3.88			
			.18		.18		
MULTIPLE R SQUARED					.037		
MULTIPLE R					.191		

```
RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA          82/11/04.   20.45.06.     PAGE    5

CPU TIME REQUIRED..   110.2430 SECONDS

                    ANOVA          BETAS BY HR(1,9),EXPNO(1,14)
                    STATISTICS     1
            00111700 CM NEEDED FOR ANOVA
```

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * A N A L Y S I S O F V A R I A N C E * * * * * * * * *
BETAS BETA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
EXPNO
* *

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	103342.894	21	4921.090	27.773	.001
HR	40707.876	8	5088.484	28.718	.001
EXPNO	62533.976	13	4810.306	27.148	.001
2-WAY INTERACTIONS	86482.011	103	839.631	4.739	.001
HR EXPNO	86482.011	103	839.631	4.739	.001
EXPLAINED	189824.905	124	1530.846	8.640	.001
RESIDUAL	3827597.477	21602	177.187		
TOTAL	4017422.382	21726	184.913		

25522 CASES WERE PROCESSED.
3794 CASES (14.9 PCT) WERE MISSING.

```
RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA                 82/11/04.     20.45.06.     PAGE    7

FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE   E11        E13          E29          E32          E34          E41          E38          E36          E50          E51
          E52        E53          E54          E55

* *  M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S  * *
            BETAS     BETA FISH AGGRESSION SCALE
       BY   HR        EXP. TIME ELAPSED
            EXPNO
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

GRAND MEAN =     2.93
```

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	ETA	ADJUSTED FOR INDEPENDENTS DEV'N	BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	BETA
HR							
1 1 HR	2570	.44		.41			
2 2 HR	2413	1.64		1.59			
3 4 HR	2583	1.38		1.44			
4 8 HR	2383	1.93		1.94			
5 16 HR	2538	-.23		-.19			
6 32 HR	2341	-.77		-.80			
7 64 HR	2368	-1.01		-1.02			
8 128 HR	2345	-2.03		-2.03			
9 256 HR	2187	-1.70		-1.69			
			.10		.10		
EXPNO							
1	1486	-1.34		-1.23			
2	1535	-3.25		-3.28			
3	1551	.04		.11			
4	1524	-2.67		-2.62			
5	1793	-.98		-1.08			
6	1617	-.92		-.94			
7	1601	.16		.19			
8	1488	.62		.65			
9	1436	1.04		.88			
10	1486	.21		.16			
11 UNTREATED	1553	1.89		1.86			
12	1537	.06		.08			
13 UNTREATED	1552	2.30		2.34			
14	1568	2.97		3.00			
			.12		.12		

```
MULTIPLE R SQUARED                               .026
MULTIPLE R                                       .160
```

APPENDIX H

RF-2C; ANOVA BEHAVIOR INDEX AND HR BY EXPN, ETREAT, ECONC, EFACT, EREPL AND MCA'S

R.22.C- copy 2.

Anova

aggression

by HR by BAPN

E TREAT

E CONC

E DGPL

E ...

```
OPERATING SYSTEM =  NOS 2.0-562/552 AK    82/10/10. PRINTED = 82/11/04. 20.58.01.

AMZI        JSN =  AHLE        FAMILY        = KRONOS         JOB ORIGIN     = BATCH.
CREATING JSN =  AHJV        USER NUMBER = 0082027        SERVICE CLASS = BATCH.

BBBBBBBBBBBB    PPPPPPPPPPP    LL
BBBBBBBBBBBBB   PPPPPPPPPPPP   LL
BB         BB   PP        PP   LL
BB         BB   PP        PP   LL
BB         BB   PP        PP   LL
BB         BB   PP        PP   LL
BB         BB   PPPPPPPPPPPP   LL
BBBBBBBBBBBBB   PPPPPPPPPPP    LL
BBBBBBBBBBBB    PP             LL
BB         BB   PP             LL
BB         BB   PP             LL
BB         BB   PP             LL
BB         BB   PP             LL
BB         BB   PP             LL         LL
BBBBBBBBBBBBB   PP             LLLLLLLLLLLL
BBBBBBBBBBBB    PP             LLLLLLLLLLLL


******************** NEWS AS OF 82/11/01. 15.37 ********************
*                                                                  *
*      ***** DALHOUSIE UNIVERSITY COMPUTER USERS' GROUP *****      *
*      ---------------------------------------------------         *
*   DUCUG IS HOLDING A GENERAL MEETING ON TUESDAY, NOVEMBER 9, AT  *
*   2:30 P.M. IN ROOM 312 OF THE SCHOOL OF BUSINESS BUILDING       *
*   (ART COLLEGE) TO DISCUSS THE STATUS OF DALHOUSIE'S COMPUTING   *
*   RESOURCES WITH SENIOR ADMINISTRATION OFFICIALS.  EVERYONE WHO  *
*   USES OR IS AFFECTED BY COMPUTING AT DAL IS INVITED TO ATTEND.  *
*   FOR FURTHER INFORMATION, RUN "BGN,DUCUG/LIB".                  *
*                                                                  *
*                       ++++++++++++++++++                         *
*                       + REMEMBRANCE DAY +                        *
*                       ++++++++++++++++++                         *
*                                                                  *
* ON REMEMBRANCE DAY, NOVEMBER 11, THE COMPUTER CENTRE OPERATIONS  *
* AREA, INCLUDING TERMINAL ROOMS B204 AND B507, WILL BE OPEN FROM  *
* 9 AM TO 5 PM.  UNATTENDED IAF/RBF WILL BE AVAILABLE OUTSIDE OF   *
* THESE HOURS.  THE MAIN COMPUTER CENTRE OFFICES WILL BE CLOSED.   *
*                                                                  *
********************************************************************
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                                                                 82/11/04.    20.31.06.    PAGE   1
COMPUTER CENTRE
DALHOUSIE UNIVERSITY

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- APRIL 1981


        RUN NAME       RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA
        GET FILE       RUFUS

             FILE RUFUS    HAS  15 VARIABLES

             THE SUBFILES ARE..

                            N OF
             NAME          CASES

             E11            1609
             E13            1939
             E29            2022
             E32            2078
             E34            1659
             E41            2034
             E38            1672
             E36            1938
             E50            1624
             E51            1612
             E52            1830
             E53            1606
             E54            1779
             E55            1851

             TOTAL         25513


        COMPUTE        EXPN=3*ETREAT+ECUNC
        IF             (EXPN GT 0) EXPN=EXPN-3
        VAR LABEL      EXPN, EXPERIMENTAL GROUP/

        COMPUTE        EFACT=0
        IF             (ETREAT NE 0) EFACT=1
        VAR LABELS     EFACT, CONTROL-EXPERIMENTAL/
        VALUE LABELS   EFACT (0) CONTROL (1) EXPERIMENTAL/

        COMPUTE        WT=SEC/4.95
        WEIGHT         WT

        RUN SUBFILES   ALL
```

```
ANOVA          ALPHAS BY HR(1,9),EXPN(0,6)/ALPHAS BY HR(1,9),ETREAT(0,2)/
                ALPHAS BY HR(1,9),ECONC(0,3)/ALPHAS BY HR(1,9),EFACT(0,1)/
                 ALPHAS BY HR(1,9),EREPL(1,2)/
STATISTICS      1
00066200 CM NEEDED FOR ANOVA
```

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 20.51.06. PAGE 3

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * A N A L Y S I S O F V A R I A N C E * * * * * * * * *
ALPHAS ALPHA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
EXPN EXPERIMENTAL GROUP
* *

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	84785.987	14	6056.142	36.360	.001
HR	12030.228	8	1503.779	9.028	.001
EXPN	72662.840	6	12110.473	72.709	.001
2-WAY INTERACTIONS	45121.528	48	940.032	5.644	.001
HR EXPN	45121.528	48	940.032	5.644	.001
EXPLAINED	129907.515	62	2095.283	12.580	.001
RESIDUAL	3608382.542	21664	166.561		
TOTAL	3738290.057	21726	172.065		

25522 CASES WERE PROCESSED.
3794 CASES (14.9 PCT) WERE MISSING.

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA   82/11/04.   20.51.06.   PAGE 4

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S * *

ALPHAS   ALPHA FISH AGGRESSION SCALE
BY HR   EXP. TIME ELAPSED
EXPN   EXPERIMENTAL GROUP

* *

GRAND MEAN = 2.13

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
HR							
1 1 HR	2570	-1.20		-1.20			
2 2 HR	2413	-.76		-.72			
3 4 HR	2583	.50		.55			
4 8 HR	2383	-.70		-.73			
5 16 HR	2538	.01		-.02			
6 32 HR	2341	.27		.25			
7 64 HR	2368	.53		.54			
8 128 HR	2345	1.37		1.34			
9 256 HR	2187	.08		.09			
			.06		.06		
EXPN							
0	3021	.97		.95			
1	3075	2.30		2.29			
2	3410	-.10		-.09			
3	3089	1.08		1.10			
4	2922	.72		.73			
5	3090	-3.82		-3.82			
6	3120	-1.06		-1.07			
			.14		.14		
MULTIPLE R SQUARED					.023		
MULTIPLE R					.151		

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA   82/11/04.   20.51.00.   PAGE 5

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E30 E50 E51
E52 E53 E54 E55

* * * * * * * * A N A L Y S I S   O F   V A R I A N C E * * * * * * * *

ALPHAS   ALPHA FISH AGGRESSION SCALE
BY HR   EXP. TIME ELAPSED
ETREAT   EXPERIMENT TREATMENT CHEMICAL

* *

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	44030.775	10	4403.077	25.931	.001
HR	12115.973	8	1514.497	8.919	.001
ETREAT	31907.627	2	15953.814	93.958	.001
2-WAY INTERACTIONS	9638.860	16	602.429	3.548	.001
HR ETREAT	9638.860	16	602.429	3.548	.001
EXPLAINED	53669.634	26	2064.217	12.157	.001
RESIDUAL	3684620.423	21700	169.798		
TOTAL	3738290.057	21726	172.065		

25522 CASES WERE PROCESSED.
3794 CASES (14.9 PCT) WERE MISSING.

```
FILE     RUFUS    (CREATION DATE = 82/11/04.)
SUBFILE  E11      E13      E27      E32      E34      E41      E38      E36      E50      E51
         E52      E53      E54      E55

* * M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S * *
            ALPHAS    ALPHA FISH AGGRESSION SCALE
        BY  HR        EXP. TIME ELAPSED
            ETREAT    EXPERIMENT TREATMENT CHEMICAL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

GRAND MEAN = 2.13

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
HR							
1 1 HR	2570	-1.20		-1.19			
2 2 HR	2413	-.76		-.72			
3 4 HR	2583	.50		.52			
4 8 HR	2383	-.70		-.69			
5 16 HR	2538	.01		-.06			
6 32 HR	2341	.27		.32			
7 64 HR	2368	.53		.58			
8 128 HR	2345	1.37		1.36			
9 256 HR	2187	.08		-.02			
			.06		.06		
ETREAT							
0 UNTREATED	3021	.97		.95			
1 SEVIN	9574	1.05		1.06			
2 MALATHION	9132	-1.42		-1.42			
			.09		.09		
MULTIPLE R SQUARED					.012		
MULTIPLE R					.109		

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * A N A L Y S I S O F V A R I A N C E * * * * * * * * *

ALPHAS ALPHA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
ECONC EXPERIMENT TREATMENT CONCENTRATION

* *

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	51411.649	11	4673.804	27.655	.001
HR	11908.616	8	1488.577	8.808	.001
ECONC	39288.702	3	13096.234	77.490	.001
2-WAY INTERACTIONS	20964.320	24	873.513	5.169	.001
HR ECONC	20964.320	24	873.513	5.169	.001
EXPLAINED	72376.169	35	2067.891	12.236	.001
RESIDUAL	3665913.889	21691	169.005		
TOTAL	3738290.057	21726	172.065		

25522 CASES WERE PROCESSED.
3794 CASES (14.9 PCT) WERE MISSING.

```
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA                          82/11/04.    20.51.06.     PAGE    8

FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE   E11         E13          E29          E32          E34          E41          E38          E36          E50          E51
          E52         E53          E54          E55

* *  M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S  * *
                ALPHAS     ALPHA FISH AGGRESSION SCALE
        BY      HR         EXP. TIME ELAPSED
                ECONC      EXPERIMENT TREATMENT CONCENTRATION
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

GRAND MEAN =     2.13                                                           ADJUSTED FOR
                                                               ADJUSTED FOR     INDEPENDENTS
                                            UNADJUSTED         INDEPENDENTS     + COVARIATES
VARIABLE + CATEGORY              N          DEV'N   ETA        DEV'N    BETA    DEV'N    BETA

HR
    1  1  HR                   2570         -1.20              -1.19
    2  2  HR                   2413          -.76               -.75
    3  4  HR                   2583          -.50               -.58
    4  8  HR                   2383          -.70               -.74
    5  16 HR                   2538           .01                .06
    6  32 HR                   2341           .27                .21
    7  64 HR                   2368           .53                .48
    8  128 HR                  2345          1.37               1.32
    9  256 HR                  2187           .08                .12
                                                    .06                  .06

ECONC
    0  CONTROL                 3021           .97                .95
    1  1 MG                    5997          1.53               1.53
    2  2 MG                    6500         -1.87              -1.86
    3  4 MG                    6209           .00                .01
                                                    .10                  .10

MULTIPLE R SQUARED                                                       .014
MULTIPLE R                                                               .117
```

```
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA              82/11/04.    20.31.06.    PAGE    9

FILE    RUFUS     (CREATION DATE =  82/11/04.)
SUBFILE   E11          E13          E29          E32          E34          E41          E38          E36          E50          E51
          E52          E53          E54          E55

* * * * * * * *  A N A L Y S I S   O F   V A R I A N C E  * * * * * * * *
          ALPHAS      ALPHA FISH AGGRESSION SCALE
       BY HR          EXP. TIME ELAPSED
          EFACT       CONTROL-EXPERIMENTAL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	15258.643	9	1695.405	9.907	.001
HR	11977.086	8	1497.136	8.748	.001
EFACT	3135.496	1	3135.496	18.322	.001
2-WAY INTERACTIONS	7899.442	8	987.430	5.770	.001
HR EFACT	7899.442	8	987.430	5.770	.001
EXPLAINED	23158.085	17	1362.240	7.960	.001
RESIDUAL	3715131.973	21709	171.133		
TOTAL	3738290.057	21726	172.065		

```
25522 CASES WERE PROCESSED.
 3794 CASES ( 14.9 PCT) WERE MISSING.
```

```
RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA                 82/11/04.   20.51.06.    PAGE   10

FILE    RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE   E11          E13          E29          E32          E34          E41          E38          E36          E50          E51
          E52          E53          E54          E55

* *  M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S  * *
               ALPHAS    ALPHA FISH AGGRESSION SCALE
          BY   HR        EXP. TIME ELAPSED
               EFACT     CONTROL-EXPERIMENTAL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

GRAND MEAN =     2.13
                                                                   ADJUSTED FOR
                                                   ADJUSTED FOR    INDEPENDENTS
                                   UNADJUSTED      INDEPENDENTS    + COVARIATES
VARIABLE + CATEGORY          N     DEV'N   ETA     DEV'N   BETA    DEV'N   BETA

HR
     1  1 HR               2570    -1.20           -1.19
     2  2 HR               2413     -.76            -.75
     3  4 HR               2583      .50             .51
     4  8 HR               2383     -.70            -.70
     5  16 HR              2538      .01             .01
     6  32 HR              2341      .27             .27
     7  64 HR              2368      .53             .52
     8  128 HR             2345     1.37            1.36
     9  256 HR             2187      .06             .07
                                            .06             .06

EFACT
     0  CONTROL            3021      .97             .95
     1  EXPERIMENTAL       *187     -.16            -.15
                                            .03             .03

MULTIPLE R SQUARED                                          .004
MULTIPLE R                                                  .064
```

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * A N A L Y S I S O F V A R I A N C E * * * * * * * * *
ALPHAS ALPHA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
EREPL EXPERIMENT TREATMENT REPLICATE
* *

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	16932.069	9	1881.341	10.999	.001
HR	12160.753	8	1520.094	8.887	.001
EREPL	4808.921	1	4808.921	28.113	.001
2-WAY INTERACTIONS	7948.860	8	993.607	5.809	.001
HR EREPL	7948.860	8	993.607	5.809	.001
EXPLAINED	24880.926	17	1463.584	8.556	.001
RESIDUAL	3713409.129	21709	171.054		
TOTAL	3738290.057	21726	172.065		

25522 CASES WERE PROCESSED.
3794 CASES (14.9 PCT) WERE MISSING.

```
RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA                 82/11/04.    20.51.06.    PAGE   12

FILE     RUFUS      (CREATION DATE =  82/11/04.)
SUBFILE     E11          E13          E29          E32          E34          E41          E38          E36          E50          E51
            E52          E53          E54          E55

* *   M U L T I P L E    C L A S S I F I C A T I O N    A N A L Y S I S   * *
                ALPHAS     ALPHA FISH AGGRESSION SCALE
         BY     HR         EXP. TIME ELAPSED
                EREPL      EXPERIMENT TREATMENT REPLICATE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

GRAND MEAN =      2.13
                                                                                 ADJUSTED FOR
                                                               ADJUSTED FOR      INDEPENDENTS
                                              UNADJUSTED       INDEPENDENTS      + COVARIATES
VARIABLE + CATEGORY                   N       DEV'N   ETA      DEV'N   BETA      DEV'N   BETA

HR
     1  1  HR                       2570     -1.20             -1.21
     2  2  HR                       2413      -.76              -.76
     3  4  HR                       2583       .50               .51
     4  8  HR                       2383      -.70              -.70
     5  16  HR                      2538       .01              -.01
     6  32  HR                      2341       .27               .26
     7  64  HR                      2368       .23               .53
     8  128  HR                     2345      1.37              1.36
     9  256  HR                     2187       .08               .10
                                                       .06               .06

EREPL
     1                              *109       .46               .47
     2                              *107      -.47              -.48
                                                       .04               .04

MULTIPLE R SQUARED                                                       .005
MULTIPLE R                                                               .067
```

```
CPU TIME REQUIRED..  174.950 SECONDS

               ANOVA          BETAS BY HR(1,9),EXPN(0,6)/BETAS BY HR(1,9),ETREAT(0,2)/
                               BETAS BY HR(1,9),ECONC(0,3)/BETAS BY HR(1,9),EFACT(0,1)/
                                BETAS BY HR(1,9),EREPL(1,2)/
               STATISTICS     1
            00064100 CM NEEDED FOR ANOVA
```

- -

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA   82/11/04.   20.51.06.   PAGE 14

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * A N A L Y S I S O F V A R I A N C E * * * * * * * *
BETAS BETA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
EXPN EXPERIMENTAL GROUP
* *

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	91116.960	14	6508.354	36.350	.001
HR	40482.483	8	5060.310	28.263	.001
EXPN	50308.042	6	8384.674	46.830	.001
2-WAY INTERACTIONS	47457.471	48	988.697	5.522	.001
HR EXPN	47457.471	48	988.697	5.522	.001
EXPLAINED	138574.431	62	2235.071	12.483	.001
RESIDUAL	3878847.951	21664	179.046		
TOTAL	4017422.382	21726	184.913		

25522 CASES WERE PROCESSED.
3794 CASES (14.9 PCT) WERE MISSING.

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 20.51.00. PAGE 15

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * M U L T I P L E C L A S S I F I C A T I O N A N A L Y S I S * *
BETAS BETA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
EXPN EXPERIMENTAL GROUP
* *

GRAND MEAN = 2.93

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	ETA	ADJUSTED FOR INDEPENDENTS DEV'N	BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	BETA
HR							
1 1 HR	2570	.44		.41			
2 2 HR	2413	1.64		1.61			
3 4 HR	2583	1.38		1.39			
4 8 HR	2383	1.93		1.95			
5 16 HR	2538	-.23		-.20			
6 32 HR	2341	-.77		-.78			
7 64 HR	2368	-1.01		-1.03			
8 128 HR	2345	-2.03		-2.01			
9 256 HR	2187	-1.70		-1.69			
			.10		.10		
EXPN							
0	3021	-2.31		-2.27			
1	3075	-1.30		-1.24			
2	3410	-.95		-1.01			
3	3089	.38		.41			
4	2922	.62		.51			
5	3090	.98		.97			
6	3120	2.63		2.68			
			.11		.11		

MULTIPLE R SQUARED .023
MULTIPLE R .151

```
RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA                 82/11/04.    20.51.06.     PAGE   16

FILE    RUFUS      (CREATION DATE =  82/11/04.)
SUBFILE    E11          E13          E29          E32          E34          E41          E38          E36          E50          E51
           E52          E53          E54          E55

* * * * * * * *   A N A L Y S I S   O F   V A R I A N C E   * * * * * * * *
                BETAS     BETA FISH AGGRESSION SCALE
         BY HR            EXP. TIME ELAPSED
                ETREAT    EXPERIMENT TREATMENT CHEMICAL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

                                   SUM OF                MEAN              SIGNIF
SOURCE OF VARIATION               SQUARES       DF      SQUARE        F     OF F

MAIN EFFECTS                    78237.867       10    7823.787   43.401     .001
   HR                           39603.632        8    4950.454   27.462     .001
   ETREAT                       37428.949        2   18714.475  103.814     .001

2-WAY INTERACTIONS              27352.017       16    1709.501    9.483     .001
   HR         ETREAT            27352.017       16    1709.501    9.483     .001

EXPLAINED                      105589.885       26    4061.149   22.528     .001

RESIDUAL                      3911832.497    21700     180.269

TOTAL                         4017422.382    21726     184.913

  25522 CASES WERE PROCESSED.
   3794 CASES ( 14.9 PCT) WERE MISSING.
```

```
RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA                82/11/04.    20.51.06.    PAGE  17

FILE     RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE  E11           E13          E29          E32          E34          E41          E38          E36          E50          E51
         E52           E53          E54          E55

* *   M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S   * *
              BETAS     BETA FISH AGGRESSION SCALE
        BY    HR        EXP. TIME ELAPSED
              ETREAT    EXPERIMENT TREATMENT CHEMICAL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

GRAND MEAN = 2.93

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
HR							
1 1 HR	2570	.44		.41			
2 2 HR	2413	1.64		1.60			
3 4 HR	2583	1.38		1.35			
4 8 HR	2383	1.93		1.94			
5 16 HR	2538	-.23		-.18			
6 32 HR	2341	-.77		-.82			
7 64 HR	2368	-1.01		-1.04			
8 128 HR	2345	-2.03		-2.00			
9 256 HR	2187	-1.70		-1.60			
			.10		.10		
ETREAT							
0 UNTREATED	3021	-2.31		-2.27			
1 SEVIN	9574	-.63		-.63			
2 MALATHION	9132	1.43		1.41			
			.10		.10		
MULTIPLE R SQUARED					.019		
MULTIPLE R					.140		

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA   82/11/04.   20.51.06.   PAGE 18

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * A N A L Y S I S   O F   V A R I A N C E * * * * * * * * *

BETAS BETA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
ECONC EXPERIMENT TREATMENT CONCENTRATION

* *

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	72150.838	11	6559.167	36.370	.001
HR	40897.232	8	5112.154	28.346	.001
ECONC	31341.920	3	10447.307	57.929	.001
2-WAY INTERACTIONS	33356.911	24	1389.871	7.707	.001
HR ECONC	33356.911	24	1389.871	7.707	.001
EXPLAINED	105507.749	35	3014.507	16.715	.001
RESIDUAL	3911914.632	21691	180.347		
TOTAL	4017422.382	21726	184.913		

25522 CASES WERE PROCESSED.
3794 CASES (14.9 PCT) WERE MISSING.

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 20.51.06. PAGE 19

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * M U L T I P L E C L A S S I F I C A T I O N A N A L Y S I S * *

BETAS BETA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
ECONC EXPERIMENT TREATMENT CONCENTRATION

* *

GRAND MEAN = 2.93

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
HR							
1 1 HR	2570	.44		.40			
2 2 HR	2413	1.64		1.64			
3 4 HR	2583	1.38		1.39			
4 8 HR	2383	1.93		1.96			
5 16 HR	2538	-.23		-.26			
6 32 HR	2341	-.77		-.75			
7 64 HR	2368	-1.01		-.99			
8 128 HR	2342	-2.03		-2.01			
9 256 HR	2187	-1.70		-1.75			
			.10		.10		
ECONC							
0 CONTROL	3021	-2.31		-2.27			
1 1 MG	5997	-.37		-.39			
2 2 MG	6500	-.03		-.07			
3 4 MG	6209	1.51		1.55			
			.09		.07		

MULTIPLE R SQUARED .018
MULTIPLE R .134

```
RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA                02/11/04.    20.51.06.    PAGE   20

FILE     RUFUS     (CREATION DATE =  02/11/04.)
SUBFILE   E11        E13        E29        E32        E34        E41        E38        E36        E50        E51
          E52        E53        E54        E55

* * * * * * * *   A N A L Y S I S   O F   V A R I A N C E   * * * * * * * *
               BETAS      BETA FISH AGGRESSION SCALE
            BY HR         EXP. TIME ELAPSED
               EFACT      CONTROL-EXPERIMENTAL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	58859.397	9	6539.933	36.031	.001
HR	40054.820	8	5006.852	27.585	.001
EFACT	18050.476	1	18050.478	99.446	.001
2-WAY INTERACTIONS	18173.957	8	2271.745	12.516	.001
HR EFACT	18173.957	8	2271.745	12.516	.001
EXPLAINED	77033.354	17	4531.374	24.965	.001
RESIDUAL	3940389.028	21709	181.509		
TOTAL	4017422.382	21726	184.913		

25522 CASES WERE PROCESSED.
3794 CASES (14.9 PCT) WERE MISSING.

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA   82/11/04.   20.51.06.   PAGE 21

```
FILE    RUFUS   (CREATION DATE = 82/11/04.)
SUBFILE   E11       E13       E29       E32       E34       E41       E38       E36       E50       E51
          E52       E53       E54       E55
```

* * M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S * *

```
          BETAS     BETA FISH AGGRESSION SCALE
     BY   HR        EXP. TIME ELAPSED
          EFACT     CONTROL-EXPERIMENTAL
```

* *

GRAND MEAN = 2.93

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
HR							
1 1 HR	2570	.44		.41			
2 2 HR	2413	1.64		1.63			
3 4 HR	2383	1.38		1.36			
4 8 HR	2383	1.93		1.95			
5 16 HR	2538	-.23		-.24			
6 32 HR	2341	-.77		-.78			
7 64 HR	2368	-1.01		-.99			
8 128 HR	2345	-2.03		-2.00			
9 256 HR	2187	-1.70		-1.67			
			.10		.10		
EFACT							
0 CONTROL	3021	-2.31		-2.27			
1 EXPERIMENTAL	*187	.37		.37			
			.07		.07		
MULTIPLE R SQUARED					.015		
MULTIPLE R					.121		

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 20.51.06. PAGE 22

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * A N A L Y S I S O F V A R I A N C E * * * * * * * *

BETAS BETA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
EREPL EXPERIMENT TREATMENT REPLICATE

* *

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	44549.391	9	4949.932	27.098	.001
HR	40713.089	8	5089.135	27.860	.001
EREPL	3740.473	1	3740.473	20.477	.001
2-WAY INTERACTIONS	7399.505	8	924.938	5.064	.001
HR EREPL	7399.505	8	924.938	5.064	.001
EXPLAINED	51948.896	17	3055.817	16.729	.001
RESIDUAL	3965473.486	21709	182.665		
TOTAL	4017422.382	21726	184.913		

25522 CASES WERE PROCESSED.
3794 CASES (14.9 PCT) WERE MISSING.

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 20.51.05. PAGE 23

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * M U L T I P L E C L A S S I F I C A T I O N A N A L Y S I S * *
BETAS BETA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
EREPL EXPERIMENT TREATMENT REPLICATE
* *

GRAND MEAN = 2.93

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
HR							
1 1 HR	2570	.44		.44			
2 2 HR	2413	1.64		1.64			
3 4 HR	2583	1.38		1.39			
4 8 HR	2363	1.93		1.93			
5 16 HR	2538	-.23		-.25			
6 32 HR	2341	-.77		-.77			
7 64 HR	2368	-1.01		-1.01			
8 128 HR	2345	-2.03		-2.03			
9 256 HR	2187	-1.70		-1.68			
			.10		.10		
EREPL							
1	*109	.42		.41			
2	*107	-.42		-.42			
			.03		.03		

MULTIPLE R SQUARED .011
MULTIPLE R .105

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- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA                82/11/04.    20.51.06.     PAGE   24

CPU TIME REQUIRED..   116.3380 SECONDS

                    FINISH
TOTAL CPU TIME USED..   291.7090 SECONDS


RUN COMPLETED

NUMBER OF CONTROL CARDS READ  26
NUMBER OF ERRORS DETECTED      0
```

APPENDIX J

RF-2D; ANOVA BEHAVIOR INDEX AND HR, EXPN AND EREPL, HR AND EXPN HR AND EREPL, EREPL AND EXPN AND HR, EXPN, EREPL AND MCA'S

RF2D - copy 2

anova

aggression

by HR vs BXPN .. ERGPL

```
OPERATING SYSTEM = NOS 2.0-562/552 AK    82/10/10. PRINTED = 82/11/04. 20.58.39.
AM2I            JSN = AHLG      FAMILY      = KRONUS     JOB ORIGIN    = BATCH.
CREATING JSN        = AHJY      USER NUMBER = DUB2027    SERVICE CLASS = BATCH.

BBBBBBBBBBB   PPPPPPPPPPP   LL
BBBBBBBBBBBB  PPPPPPPPPPPP  LL
BB        BB  PP        PP  LL
BB        BB  PP        PP  LL
BB        BB  PP        PP  LL
BB        BB  PP        PP  LL
BB        BB  PPPPPPPPPPPP  LL
BBBBBBBBBBBB  PPPPPPPPPPP   LL
BBBBBBBBBBB   PP            LL
BB        BB  PP            LL
BB        BB  PP            LL
BB        BB  PP            LL
BB        BB  PP            LL
BB        BB  PP            LL          LL
BBBBBBBBBBBB  PP            LLLLLLLLLLLLLL
BBBBBBBBBBB   PP            LLLLLLLLLLLLLL

******************** NEWS AS OF 82/11/01. 15.37 ********************
*                                                                    *
*    ***** DALHOUSIE UNIVERSITY COMPUTER USERS' GROUP *****          *
*                                                                    *
*   DUCUG IS HOLDING A GENERAL MEETING ON TUESDAY, NOVEMBER 9, AT    *
*   2:30 P.M. IN ROOM 312 OF THE SCHOOL OF BUSINESS BUILDING         *
*   (ART COLLEGE) TO DISCUSS THE STATUS OF DALHOUSIE'S COMPUTING     *
*   RESOURCES WITH SENIOR ADMINISTRATION OFFICIALS.  EVERYONE WHO    *
*   USES OR IS AFFECTED BY COMPUTING AT DAL IS INVITED TO ATTEND.    *
*   FOR FURTHER INFORMATION, RUN "BGN,DUCUG/LIB".                    *
*                                                                    *
*                      ++++++++++++++++++                            *
*                      + REMEMBRANCE DAY +                           *
*                      ++++++++++++++++++                            *
*                                                                    *
* ON REMEMBRANCE DAY, NOVEMBER 11, THE COMPUTER CENTRE OPERATIONS    *
* AREA, INCLUDING TERMINAL ROOMS B504 AND B507, WILL BE OPEN FROM    *
* 9 AM TO 5 PM.  UNATTENDED IAF/RBF WILL BE AVAILABLE OUTSIDE OF     *
* THESE HOURS.  THE MAIN COMPUTER CENTRE OFFICES WILL BE CLOSED.     *
**********************************************************************
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COMPUTER CENTRE                                          82/11/04.     20.51.53.      PAGE    1
DALHOUSIE UNIVERSITY

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.0 -- APRIL 1981


ECOLOGY         OFF
RUN NAME        RUFUS FISH DATA  -  AGGRESSION SCALE - CROSSBREAK & ANOVA
GET FILE        RUFUS

          FILE RUFUS    HAS  15 VARIABLES

          THE SUBFILES ARE..

                        N OF
          NAME          CASES

          E11           1609
          E13           1939
          E29           2022
          E32           2078
          E34           1859
          E41           2034
          E38           1672
          E36           1938
          E50           1624
          E51           1612
          E52           1830
          E53           1666
          E54           1779
          E55           1851

          TOTAL        25513


COMPUTE         EXPN=3*ETREAT+ECONC
IF              (EXPN GT 0) EXPN=EXPN-3
VAR LABEL       EXPN, EXPERIMENTAL GROUP/

COMPUTE         EFACT=0
IF              (ETREAT NE 0) EFACT=1
VAR LABELS      EFACT, CONTROL-EXPERIMENTAL/
VALUE LABELS    EFACT (0) CONTROL (1) EXPERIMENTAL/

COMPUTE         WT=SEC/4.95
WEIGHT          WT
```

```
FILE     RUFUS    (CREATION DATE =  82/11/04.)
SUBFILE    E11        E13        E29        E32        E34        E41        E38        E36        E50        E51
           E52        E53        E54        E55

* * * * * * * * *  A N A L Y S I S   O F   V A R I A N C E  * * * * * * * * *
                ALPHAS    ALPHA FISH AGGRESSION SCALE
           BY   HR        EXP. TIME ELAPSED
                EXPN      EXPERIMENTAL GROUP
                EREPL     EXPERIMENT TREATMENT REPLICATE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	89558.738	15	5970.583	36.864	.001
HR	12069.587	8	1508.698	9.315	.001
EXPN	72626.669	6	12104.445	74.736	.001
EREPL	4772.751	1	4772.751	29.468	.001
2-WAY INTERACTIONS	99487.216	62	1604.633	9.907	.001
HR EXPN	43223.796	48	900.496	5.560	.001
HR EREPL	8789.622	8	1098.703	6.784	.001
EXPN EREPL	46843.541	6	7807.257	48.204	.001
3-WAY INTERACTIONS	50507.096	47	1074.619	6.635	.001
HR EXPN EREPL	50507.096	47	1074.619	6.635	.001
EXPLAINED	239553.050	124	1931.879	11.928	.001
RESIDUAL	3498737.007	21602	161.964		
TOTAL	3738290.057	21726	172.065		

25522 CASES WERE PROCESSED.
3794 CASES (14.9 PCT) WERE MISSING.

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * M U L T I P L E C L A S S I F I C A T I O N A N A L Y S I S * *

ALPHAS ALPHA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
EXPN EXPERIMENTAL GROUP
EREPL EXPERIMENT TREATMENT REPLICATE

* *

GRAND MEAN = 2.13

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
HR							
1 1 HR	2570	-1.20		-1.20			
2 2 HR	2413	-.76		-.72			
3 4 HR	2583	.50		.56			
4 8 HR	2383	-.70		-.73			
5 16 HR	2538	.01		-.04			
6 32 HR	2341	.27		.25			
7 64 HR	2368	.53		.54			
8 128 HR	2345	1.37		1.33			
9 256 HR	2187	.08		.11			
			.06		.06		
EXPN							
0	3021	.97		.96			
1	3075	2.30		2.29			
2	3410	-.10		-.11			
3	3089	1.08		1.09			
4	2922	.72		.74			
5	3090	-3.82		-3.81			
6	3120	-1.06		-1.06			
			.14		.14		
EREPL							
1	*109	.46		.46			
2	*107	-.47		-.47			
			.04		.04		
MULTIPLE R SQUARED					.024		
MULTIPLE R					.155		

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 20.51.53. PAGE 6

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * * * * * * * * A N A L Y S I S O F V A R I A N C E * * * * * * * * *

BETAS BETA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
EXPN EXPERIMENTAL GROUP
EREPL EXPERIMENT TREATMENT REPLICATE

* *

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	94949.326	15	6329.955	35.725	.001
HR	40388.510	8	5048.564	28.493	.001
EXPN	50399.935	6	8399.989	47.407	.001
EREPL	3832.366	1	3832.366	21.629	.001
2-WAY INTERACTIONS	63119.975	62	1018.064	5.746	.001
HR EXPN	47372.071	48	986.918	5.570	.001
HR EREPL	7368.122	8	921.015	5.198	.001
EXPN EREPL	7994.131	6	1332.355	7.519	.001
3-WAY INTERACTIONS	31755.603	47	675.651	3.813	.001
HR EXPN EREPL	31755.603	47	675.651	3.813	.001
EXPLAINED	189824.905	124	1530.846	8.640	.001
RESIDUAL	3827597.477	21602	177.187		
TOTAL	4017422.382	21726	184.913		

25522 CASES WERE PROCESSED.
3794 CASES (14.9 PCT) WERE MISSING.

RUFUS FISH DATA - AGGRESSION SCALE - CROSSBREAK & ANOVA 82/11/04. 20.51.53. PAGE 7

FILE RUFUS (CREATION DATE = 82/11/04.)
SUBFILE E11 E13 E29 E32 E34 E41 E38 E36 E50 E51
E52 E53 E54 E55

* * M U L T I P L E C L A S S I F I C A T I O N A N A L Y S I S * *

BETAS BETA FISH AGGRESSION SCALE
BY HR EXP. TIME ELAPSED
EXPN EXPERIMENTAL GROUP
EREPL EXPERIMENT TREATMENT REPLICATE

* *

GRAND MEAN = 2.93

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
HR							
1 1 HR	2570	.44		.40			
2 2 HR	2413	1.64		1.61			
3 4 HR	2583	1.38		1.39			
4 8 HR	2383	1.93		1.95			
5 16 HR	2238	-.23		-.21			
6 32 HR	2341	-.77		-.79			
7 64 HR	2368	-1.01		-1.03			
8 128 HR	2345	-2.03		-2.01			
9 256 HR	2187	-1.70		-1.67			
			.10		.10		
EXPN							
0	3021	-2.31		-2.26			
1	3075	-1.30		-1.24			
2	3410	-.95		-1.03			
3	3089	.38		.40			
4	2922	.62		.53			
5	3090	.98		.98			
6	3120	2.63		2.68			
			.11		.11		
EREPL							
1	*109	.42		.42			
2	*107	-.42		-.42			
			.03		.03		
MULTIPLE R SQUARED					.024		
MULTIPLE R					.154		

VITA

Rufus Morison was born in Abingdon, Virginia, October 12, 1934. He graduated from Kent School, Kent, Connecticut in 1954 and from Virginia Military Institute in 1956 with a Bachelor of Arts degree in Biology. He completed a Master of Arts degree in Biology at East Tennessee in 1965. He entered the graduate program in Ecology at the University of Tennessee. He received the Doctor of Philosophy degree with a major in Ecology in March 1984.

The author is the Science Review Administrator for Ecology and Environmental Biology, Office of Research Grants and Centers of the Office of Exploratory Research at the U.S. Environmental Protection Agency in Washington, D.C.