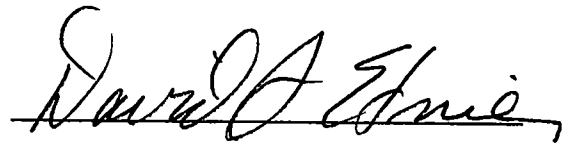


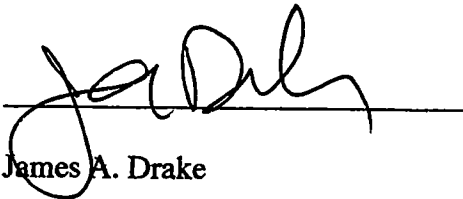
To the Graduate Council:

I am submitting herewith a thesis written by Barron Alexander Moody entitled "A survey of the aquatic insects of Crane Prairie Reservoir, Deschutes County, Oregon." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Ecology and Evolutionary Biology.

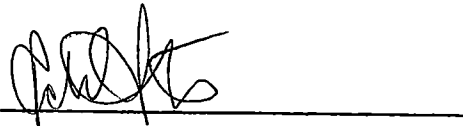
A handwritten signature in black ink, appearing to read "David A. Etnier", written over a horizontal line.

David A. Etnier, Major Professor

We have read this thesis
and recommend its acceptance:

A handwritten signature in black ink, appearing to read "James A. Drake", written over a horizontal line.

James A. Drake

A handwritten signature in black ink, appearing to read "Richard J. Strange", written over a horizontal line.

Richard J. Strange

Accepted for the Council:

A handwritten signature in black ink, appearing to read "Lew Minkus", written over a horizontal line.

Associate Vice Chancellor and
Dean of The Graduate School

A SURVEY OF THE AQUATIC INSECTS OF CRANE
PRAIRIE RESERVOIR, DESCHUTES COUNTY, OREGON

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Barron Alexander Moody
August 2000

Acknowledgements

While this work bears only my name, and any mistakes contained within are fully my responsibility, there are others who have contributed much to the completion of this thesis.

My major professor, David A. Etnier, has been my advisor, colleague, teacher, and friend. I am grateful for his expertise, encouragement, patience, and the good example he set. James A. Drake and Richard J. Strange also served on my committee and lent equipment and constructive comment to the project.

The following experts provided or confirmed identifications for me: Steve W. Chordas III (Heteroptera), Michael Floyd (*Oecetis*), James Glover (*Triaenodes*), Boris Kondratieff (*Callibaetis*), Arwin Provonsha (Caenidae), David Ruitter (*Limnephilus*) and Ken Tennessen (Odonata). Norman Anderson and John Morse answered questions about Trichoptera distributions and systematics.

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My colleagues and friends, particularly the past and present members of Ets' lab, struggled through similar experiences. They shared their insight, encouragement, and comradery.

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My sincerest gratitude to you all.

Abstract

A study of game fish diet overlap, followed by the illegal introduction of non-native fish into Crane Prairie Reservoir, spurred interest in the aquatic insect fauna of the reservoir. The results of a survey of the reservoir during the summers of 1997 and 1998 are presented here. Sixty-eight taxa of aquatic insects are recorded here. Three of these are new state records for Oregon, one is an undescribed species, and undescribed morphological variation is discussed in three others. The new state records are *Caenis youngi* Romehild (Ephemeroptera: Caenidae), *Callicorixa alaskensis* Hungerford (Heteroptera: Corixidae), and *Polycentropus flavus* (Banks) (Trichoptera: Polycentropodidae). The undescribed species belongs to the *Oecetis inconspicua* (Walker) species group (Trichoptera: Leptoceridae).

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1. Introduction

To date there has been no comprehensive study of the aquatic insects of Crane Prairie Reservoir. In the late 1960s the Oregon Department of Fish and Wildlife (ODFW) did an evaluation of important invertebrate fish prey items in the flooded standing timber (King 1968). However, this work did little more than qualitatively conclude that more invertebrates were collected in timber samples than from bottom grabs. In 1994 a fairly extensive game-fish diet analysis was conducted by ODFW (Shrader and Moody 1997). This work showed that several taxa of aquatic insects were very important prey items for rainbow trout (*Oncorhynchus mykiss*) and largemouth bass (*Micropterus salmoides*). Since that time, the illegal introductions of bluegill (*Lepomis macrochirus*) and black crappie (*Pomoxis nigromaculatus*) to Crane Prairie Reservoir have occurred. As of May 1999 bluegill are at low densities throughout the reservoir; black crappie have been recorded in inventory sampling, but it is unclear if they are established in the reservoir (Shrader personal communication). Additionally, the commercial harvest of larvae of the aquatic insect order Odonata (dragonflies) to be sold as fishing bait, from Crane Prairie Reservoir and other high elevation lakes in the vicinity, is of concern among interested parties (Steve Valley and Greg Robart, personal communication).

There is an abundant body of literature examining the effects of fish and other vertebrate predation on aquatic insect assemblages (Blois-Heulin et al 1990, Gilinsky 1984, Mittelbach 1988, Morin 1984a and b, Flecker and Allen 1984, Thorp and Bergy 1981, Thorp 1986). This literature is not all in agreement on the role predation plays in structuring the aquatic insect community.

Because of the need barnacles and bivalves have for substrate space for attachment, Paine (1966) was able to show in his classic work that the starfish (*Pisaster ochraceus*) can perpetually structure the rocky inter-tidal community through predation. However, in many aquatic systems this habitat constraint is not in place or not as strong, changing the role of predators from a structuring and maintaining role in the sense of Paine (1966) to a role of causation. In these systems the present (and thus future) communities are a result of the past influence of the predators (Thorp and Bergy 1981, cf. Thorp 1986) and are thus structured by the predators. While Thorp (1986) states that predators are not responsible for maintaining community structure, his conclusions do support the possibility that changes in the predator assembly could influence the future aquatic insect community. Perhaps what is critical is that Thorp was focusing on native predators. Although, he does acknowledge the difference and considerable effect that introduced predators could have. Crane Prairie Reservoir is known to contain at least four introduced predators (bluegill, largemouth bass, kokanee, brook trout, and probably black crappie), two of which are relatively new to the community (bluegill and black crappie). Thorp also dealt primarily with changes in predator density, not changes in the diversity of the predator community and potential changes in the total number of predators. The conclusions of Pierce and Hinrichs (1997) comparing the effects of two different fish assemblages on invertebrate prey would support the hypothesis that a change in the fish assemblage in Crane Prairie Reservoir will have an effect on the structure of the insect community there. This could then provide a causation of community diversity (Thorp 1986). Bluegill, and to a lesser extent black crappie, are important predators on aquatic invertebrates (Etnier and Starnes 1993) and are also

potential competitors with aquatic insects for zooplankton resources (Blois-Heulin et al 1990). With incomplete resource partitioning in Crane Prairie Reservoir (Mittelbach 1984, Shrader and Moody 1997) changes in invertebrate prey abundance could have noticeable competitive impacts on the fish community. If bluegill and/or black crappie become established in Crane Prairie Reservoir the entire reservoir could be a case study of the effects of fish predators on insect assemblages and community structuring (Diehl 1992). However, the complex interactions of omnivory and indirect effects may make assessing changes very difficult.

Fundamentally, this work provides distributional and zoogeographic information of aquatic insects from North America. Specifically, it provides some needed baseline information on the aquatic insect community of Crane Prairie Reservoir.

2. Site Description

Located in Deschutes County, south and west of Bend, OR, in the Cascade mountains (figure 1), Crane Prairie Reservoir is an irrigation storage reservoir created by the damming of the upper Deschutes River just downstream from its confluence with Cultus River, Cultus Creek, Quinn River, Rock Creek, and several other minor tributaries. Reaching a maximum depth of 20 feet, Crane Prairie Reservoir has a mean depth of 11 feet and covers 4,167 acres (Johnson et al. 1985). The current dam was constructed in 1939 and 1940, replacing the original leaking rock dam which was constructed in 1922 (Johnson et al. 1985). The 22.3 miles of shoreline are dominated by sand, downed trees, and volcanically derived rocky substrates. The reservoir is wholly contained within the Deschutes National Forest and has several USFS maintained roads and campgrounds surrounding it.

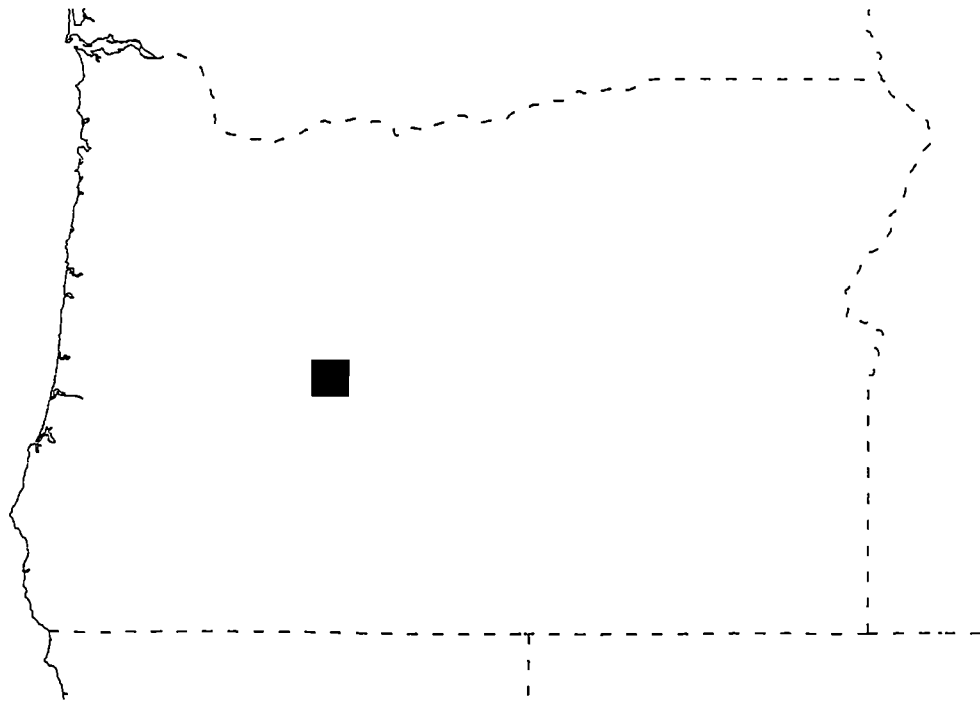


Figure 1.

Approximate location of Crane Prairie Reservoir in Oregon.

3. Methods

During the summers (June-August) of 1997 and 1998 aquatic insect samples were collected at two week intervals from sites which were scattered over the range of available habitats. Access to sampling locations was by road and boat. However, portions of the northwest shoreline remained essentially inaccessible. Approximate locations for each collection are shown in figure 2. Specimens were preserved in 60-70% isopropanol for later identification.

Most samples were collected by hand along the shoreline or in areas less than four feet deep using a dipnet and jeweler's forceps. A long handled dipnet was used in deeper macrophyte beds and log jams. This method also allowed for the opportunistic collection of diurnal adults by using the dipnet aerially.

An Ekman dredge was employed in deeper areas with soft bottoms. Ekman samples were placed in a bucket and strained through a #30 sieve. Specimens were then carefully picked from the sieve with jeweler's forceps and preserved.

Hester-Dendy artificial substrates, each with nine plates and a total surface area of .00106 m² were secured in a variety of locations and habitats around the reservoir at the beginning of each field season. These were retrieved at the end of each season by carefully placing a dipnet or bucket under the Hester as it was lifted, to prevent the escape of any individuals that had colonized the substrate. The individual plates of the substrate were separated in a bucket of water, washed, and then the contents of the bucket strained through a #30 sieve to ensure the capture of all individuals on the substrates.

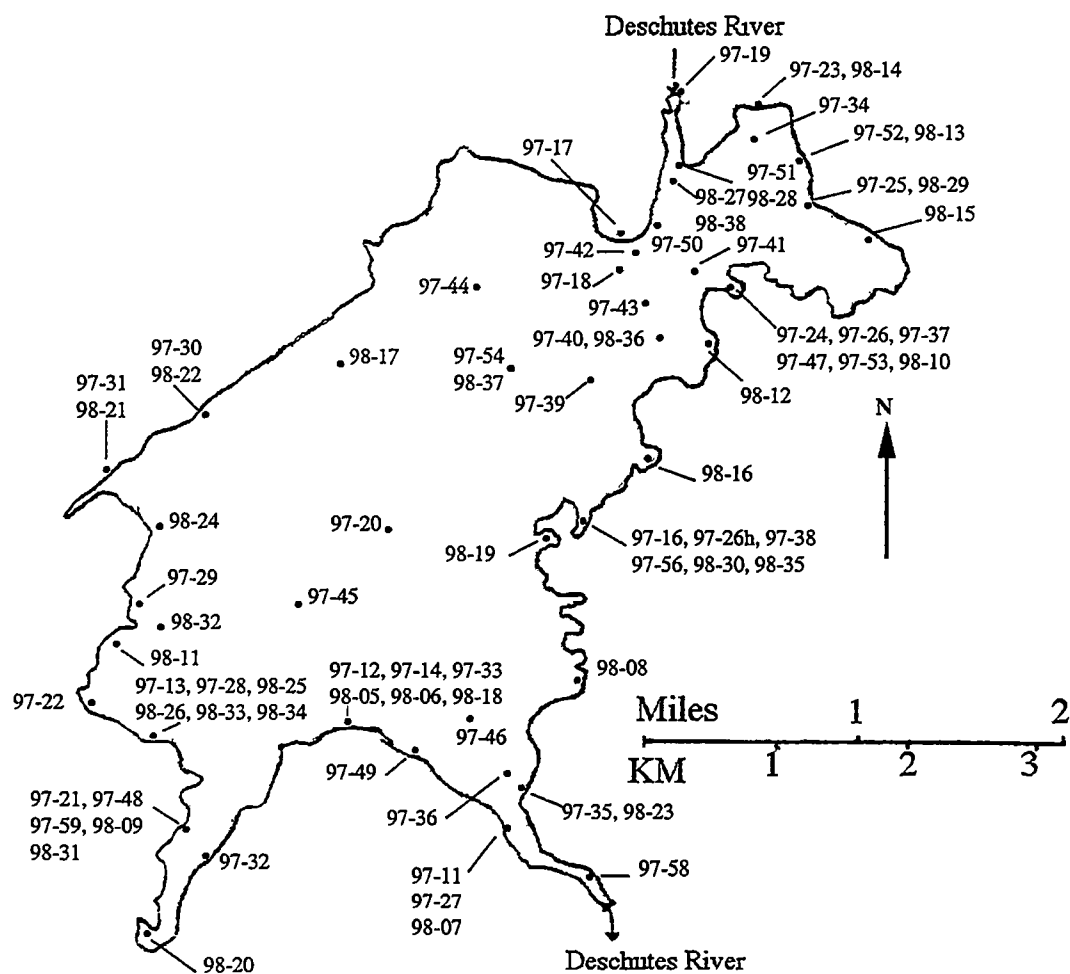


Figure 2
Approximate locations for aquatic insect samples from
Crane Prairie Reservoir, Deschutes County,
Oregon 1997-1998.

Many adults were collected at dusk and into the night using a Coleman lantern in a pan of alcohol as a light trap. These samples were typically collected for 60-120 minutes at boat ramps around the reservoir with the pan sitting on top of an inverted bucket to reduce the capture of terrestrial insects.

In the lab, individuals were identified using a Bausch and Lomb "Stereozoom 7" dissecting microscope (providing 10-70x) and a wide range of taxonomic references (referenced elsewhere). Preserved specimens were identified to the lowest taxonomic level reasonably possible – for most taxa this was species or generic level. However, dipterans were the notable exception; lower level identification of dipterans was deemed beyond the scope of this study. Furthermore, adult dipterans were excluded as well. In some cases, species identifications were confirmed or provided by outside experts.

4. Results

Over the course of this study, 68 putative taxa in 35 families of 8 orders of aquatic insects were identified from 80 collections. In 1997 there were 54 taxa collected, and 17 of these were only collected in 1997. Fifty-two taxa were collected in 1998, including 14 taxa not collected in 1997. Table 1 lists the putative taxa, and the annotated species list (Appendix A) describes them in greater detail. Three of these species are reported from Oregon for the first time. These new state records are *Caenis youngi* Romehild (Ephemeroptera: Caenidae), *Callicorixa alaskensis* Hungerford (Heteroptera: Corixidae), and *Polycentropus flavus* (Banks) (Trichoptera: Polycentropodidae). One, or perhaps two, new species is (are) reported here as *Oecetis* sp. cf. *inconspicua* (Trichoptera: Leptoceridae). A summary of which collections contained each taxon is presented in Appendix B; the specific taxa identified in each collection are detailed in Appendix C.

Table 1
List of Putative Taxa

Family (n=34)	Taxon (n=68)
Ephemeroptera	
Baetidae	<i>Callibaetis ferrugineus hageni</i>
Caenidae	<i>Caenis amica</i> <i>Caenis youngi</i>
Leptophlebiidae	<i>Paraleptophlebia debilis</i> ?
Odonata	
Aeshnidae	<i>Aeshna californica</i> <i>Aeshna multicolor</i> <i>Aeshna palmata</i>
Corduliidae	<i>Epiheca spinigera</i>
Libellulidae	<i>Leucorrhinia intacta</i> <i>Libellula forensis</i> <i>Libellula quadrimaculata</i> <i>Sympetrum costiferum</i> <i>Sympetrum obtrusum</i> <i>Sympetrum pallipes</i>
Coenagrionidae	<i>Enallagma boreale</i> <i>Enallagma carunculatum</i> <i>Enallagma cyathigerum</i> <i>Ischnura cervula</i> <i>Ischnura perparva</i>
Heteroptera	
Belostomatidae	<i>Lethocerus americanus</i>
Corixidae	<i>Callicorixa alaskensis</i>
Gerridae	<i>Aquarius remigis</i> <i>Gerris incurvatus</i> <i>Limnopus notabilis</i>
Nepidae	<i>Ranatra fusca</i>
Megaloptera	
Sialidae	<i>Sialis rotunda</i>
Trichoptera	
Hydroptilidae	<i>Agraylea multipunctata</i> <i>Hydroptila</i> sp.
Leptoceridae	<i>Ceraclea</i> sp. <i>Mystacides alafimbriata</i> <i>Oecetis</i> sp. cf. <i>inconspicua</i> <i>Triaenodes injustus</i> <i>Triaenodes tardus</i>
Lepidostomidae	<i>Lepidostoma cinereum</i>
Limnephilidae	<i>Clistronia magnifica</i> <i>Limnephilus flavastellus</i>

Table 1 (continued)

Family	Taxon
	<i>Limnephilus occidentalis</i>
	<i>Psychoglypha</i> sp.
Phryganeidae	Phryganeidae sp.
Polycentropodidae	<i>Polycentropus cinereus</i>
	<i>Polycentropus flavus</i>
	<i>Polycentropus</i> sp.
Sericostomatidae	<i>Gumaga griseola</i>
Lepidoptera	
Noctuidae	Noctuidae sp.
Pyalidae	Pyalidae sp.
Coleoptera	
Dryopidae	Dryopidae sp.
Dytiscidae	<i>Oreodytes</i> sp.
	<i>Rhantus</i> sp.
	<i>Uvarus</i> sp.
Elmidae	<i>Dubiraphia</i> sp.
	<i>Rhizelmis?</i> sp.
Gyrinidae	<i>Gyrinus picipes</i>
Halplidae	<i>Halplus</i> sp.
Hydrophilidae	<i>Berosus</i> sp.
	<i>Enochrus</i> sp.
	<i>Helphorus</i> sp.
	<i>Tropisternus</i> sp.
Staphylinidae	<i>Stenus</i> sp.
Curculidae	<i>Lixellus filiformis</i>
	<i>Steremnius</i> sp.
Diptera	
Ceratopogonidae	Ceratopogonidae sp.
Chironomidae	Chironominae sp.
	Orthocladinae sp.
	Tanypodinae sp.
Tabanidae	<i>Chrysops</i> sp.
	<i>Silvus</i> sp.
Tipulidae	<i>Prionocera/Tipula</i> sp.
Sciomyzidae	<i>Dictya</i> sp.

5. Discussion

Most of the taxa listed in Table 1 are not reported in the previous insect sampling from the reservoir (King 1968). King (1968) lists only 14 taxa, most at the family level: Baetidae, Ephemeridae, Gyrinidae, Gomphidae, Lestidae, Zygoptera, Perlodidae, Hydropsychidae, Phryganeidae, Ceratopogonidae, Chironomidae, Culicidae, Tipulidae, and Simuliidae. Several of these taxa are not recorded here. With no references provided in the earlier work, or material saved or vouchered for comparison these differences are open to speculation, although large differences in methodologies and objectives must be given top consideration. The three primarily lotic families, Perlodidae(Plecoptera), Hydropsychidae(Trichoptera), and Simuliidae (Diptera), might have been hold overs from the pre-impoundment community, although the nearly 30 years of impoundment prior to King's study reduces the likelihood of this. It would seem more logical to expect that these might have drifted in from a tributary or might represent misidentifications. The commonly collected coenagrionids (Odonata) of the present study may well be included under King's Zygoptera (Odonata) taxon, but that does not explain the absence of King's Lestidae (Odonata) from the 1997 and 1998 collections. Misidentification and sampling error seem to be the best possible explanations. Culicidae (Diptera) adults were observed during the sampling for this study; their larvae were likely not represented in the collections do to the bias of the sampling methods employed. Other differences between these two lists of taxa are perplexing and may not be resolvable.

The collection of *Caenis youngi* (Ephemeroptera, Caenidae) in Oregon represents a considerable extension of the known range of this species. When first described, *C. youngi* was known only from a few localities in western Montana and northern Wyoming (Roemhild 1984). When the genus was revised in 1990 it was still only known from Michigan, Montana, Wyoming, and Alberta (Provonsha 1990). It now appears that this species is fairly widespread, occurring from Iowa to Alberta to Oregon (Provonsha 1990, Klubertanz 1995). The small balloon-like projection on the second abdominal tergum allows for quick positive identification (Roemhild 1984, Provonsha 1990). However, this projection can become damaged or be difficult to see depending on the condition of the specimen and the viewing angle.

The known distribution of *Callicorixa alaskensis* (Heteroptera, Corixidae) is also somewhat scattered (Henry and Froeschner 1988). This new state record is rather exciting as it makes the known distribution more continuous.

Polycentropus flavus (Trichoptera, Polycentropodidae) is reported from Oregon for the first time based on single adults collected on three separate nights by light trap. With no larvae identified, the conclusion that *P. flavus* is a resident of the reservoir is tentative. The occurrence of *P. flavus* in Oregon is not too surprising given the distribution in adjoining states presented by Nimmo (1986).

The similarity of *Enallagma boreale* and *E. cyathigerum* (Odonata, Zygoptera, Coenagrionidae) presented difficulties throughout this study, particularly in attempting to identify the larvae. The species account of *E. boreale* given by Westfall and May (1996) would lead one to suspect that it would not occur in Crane Prairie Reservoir due to the

high fish density. However, this account does not agree with other observations (Ken Tennessen, personal communication). Although the tentative larval identifications support *E. boreale*'s residence in the reservoir, with the only positive identifications based on adults, the possibility that *E. boreale* adults were only in the area foraging or mating can not be dismissed entirely. The same argument could be made for *E. cyathigerum*. Regardless, it would appear that both species are residents of the reservoir, and the collection of these species in flight together (Appendix C, BAM 98-14) is a rare occurrence (Westfall and May 1996).

The suspicion, based on previously published collection records (Anderson 1976), that the regularly collected *Gumaga* sp. (Trichoptera, Sericostomatidae) larvae are *Gumaga griseola* is supported by the collection of adult *G. griseola* once each summer.

When Floyd (1995) officially recognized the long suspected *Oecetis inconspicua* complex (Trichoptera, Leptoceridae) he did not examine any material from Oregon, and consequently did not recognize any member of the complex as including Oregon in its distribution. However, specimens from Crane Prairie Reservoir are clearly members of the complex, but do not agree with the diagnosis of any of Floyd's species A-G. As might be expected in this situation, large numbers of "typical" *O. inconspicua* adults were collected.

All of these are examples of the difficulty of using previously published habitat and distributional information as part of the identification process. This is clearly a two-edged sword. To rely solely on morphological descriptions, especially when working with larvae, places great limitations on the investigator, reducing his ability to resolve

taxa to lower levels. This is further compounded by undescribed morphological variation – for example, *Limnephilus flavastellus* (Trichoptera, Limnephilidae) and *E. cyathigerum* (see Appendix A). Alternatively, to rely too heavily on distributional information impedes the ability to recognize new distributional records and new species – for example, *Caenis youngi* and the *Oecetis inconspicua* complex (above, and see Appendix A).

The collection of only larvae or only adults of some taxa also merits discussion. Only larvae of *Triaenodes injustus* (Trichoptera, Leptoceridae), *Psychoglypha* sp. (Trichoptera, Limnephilidae), and *Polycentropus* sp. (Trichoptera, Polycentropodidae) were collected. Only adults of *Caenis amica*, *Triaenodes tardus*, and *Polycentropus cinereus*, and *P. flavus* were collected.

In his work on *Triaenodes*, Glover (1996) observed that larvae of *T. tardus* were not present in larval collections as frequently as might be predicted by adult numbers. While this might explain why no *T. tardus* larvae were collected, it does nothing to explain why no adults of *T. injustus*, whose larvae were fairly common, were collected. One explanation might be that they are a species that is more readily attracted to blacklight traps (see *Psychoglypha* sp. Appendix A). However, there were also adult females collected that were identified as only *Triaenodes* sp. Some of these may well be *T. injustus*. While Ross (1944) illustrates female genitalia of both *T. tardus*, and *T. injustus*, Glover prefers not to identify females at all (personal communication). With only limited material and the difficulty of associating these specimens with Ross's illustrations positive identifications could not be made.

Flight periods of *Psychoglypha* sp. are typically fall and winter (Nimmo 1971). As a result, it would have been more noteworthy had adults been collected during the summer sampling of this study. Larvae are currently essentially unidentifiable as only one is described (see Appendix A).

Due to the abundance of *Caenis youngi* larvae and adults in samples collected through out the summer of 1997, it was clear that larvae of *C. amica* were under represented when compared to the number of adults collected. As a result, an effort was made to preserve more *Caenis* sp. larvae during the summer of 1998. However, still no positively identified larvae of *C. amica* were collected. A number larvae were identified as *C. sp.*, many of which were immature. These could be either damaged *C. youngi* (as described above) or *C. amica*. If no *C. amica* larvae were collected there are several possible explanations for why this was the case. Sampling error might easily account for this absence, but given the habitat range and preferences of *C. amica* (Provonsha 1990), the frequency with which *C. youngi* larvae were collected, and the sampling effort, this does not seem likely. Secondly, while *Caenis* sp. are not powerful fliers, the collected *C. amica* adults could be dispersing from another population. However, given the frequency with which they were collected, this is not a convincing argument. Finally, there also exists the possibility that previously undocumented variation occurs in the morphology of the projection on the second abdominal tergum, leading to the misidentification of some *C. youngi* as *C. amica*. While Provonsha would support this conclusion (Provonsha, personal communication), it seems hasty with out further evidence.

Given the rarity of adult *Polycentropus* collected and the apparent bias of the sampling methods against larvae, it is not that surprising to have only adult *P. cinereus* and *P. flavus*. However, with the density at which *P* sp. larvae were collected (29 on one Hester, which roughly translates to greater than 27,000/m²) it is surprising that no adults of the third polycentropodid were collected. A fall or early spring flight period might explain this. Unfortunately, *P. halidus*, which might reasonably be expected, has been collected in flight from Deschutes County during July and August (Anderson 1976). Therefore, sampling error must also be considered.

There is also a lack of correspondence between the larvae and adults collected of the odonates. The difficulties of positively identifying several groups of these taxa contributes to this apparent incongruence. Additionally, their high mobility increases their ability to disperse from surrounding areas and to evade capture.

The question remains as to whether all taxa present in the community were sampled. Clearly, the reported number of taxa would increase with species level identification of Diptera and Coleoptera, as well as the potential description of two members of the *O. inconspicua* complex. The plateau in the plot of collections versus cumulative taxa (Fig. 3) for the last nine collections might support the assertion that most or all of the present taxa were collected. However, a similar plot of the two-week sampling periods vs. cumulative taxa (Fig 4) does not have a similar plateau.

Furthermore, roughly 30% of the taxa collected in each year were unique to that year. Therefore, it seems reasonable to conclude that additional sampling, particularly in the spring and fall, would produce additional taxa. Additionally, the use of different methods

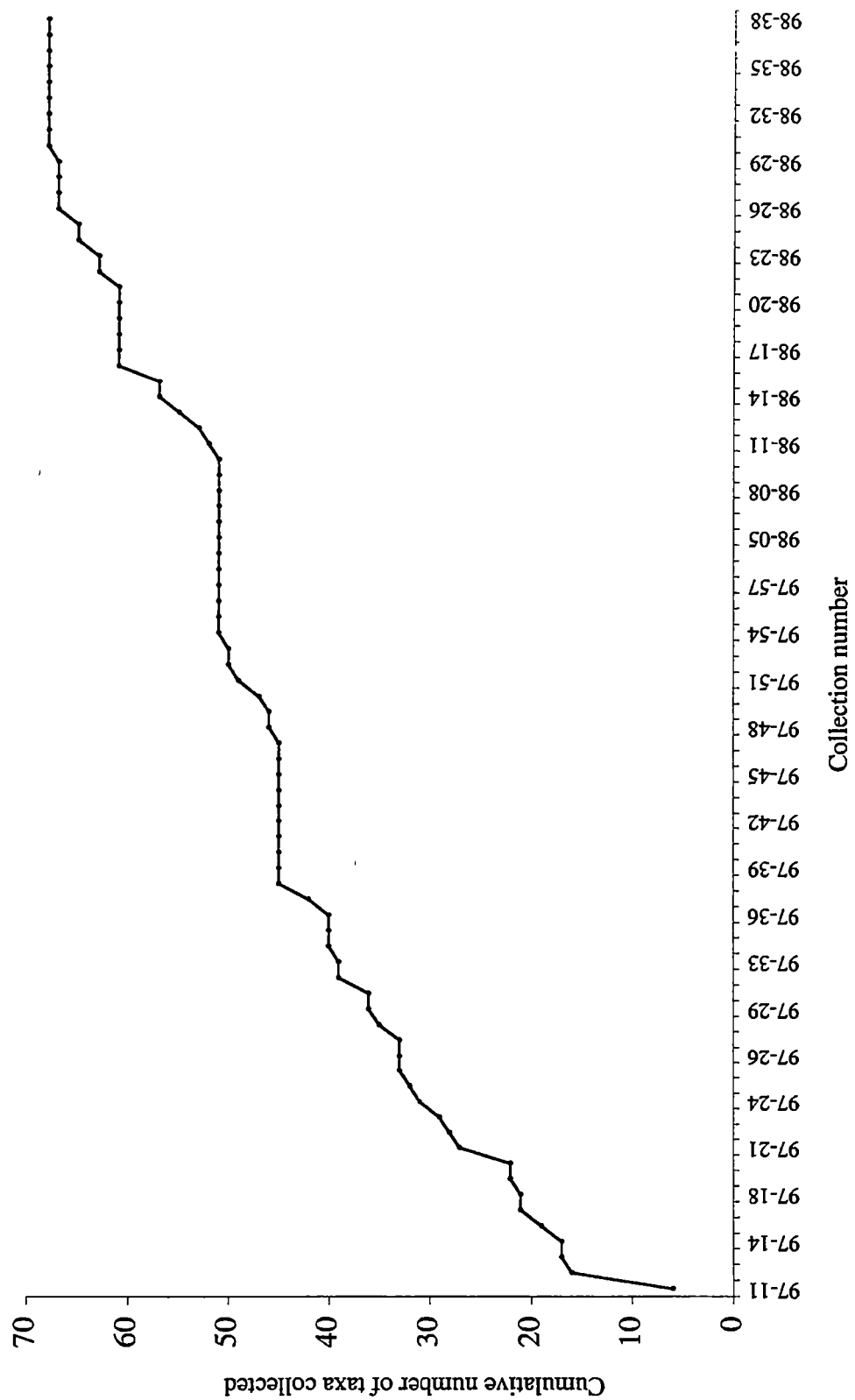


Figure 3
Cumulative number of aquatic insect taxa collected from individual samples
taken from Crane Prairie Reservoir, Deschutes County, Oregon during 1997-1998.

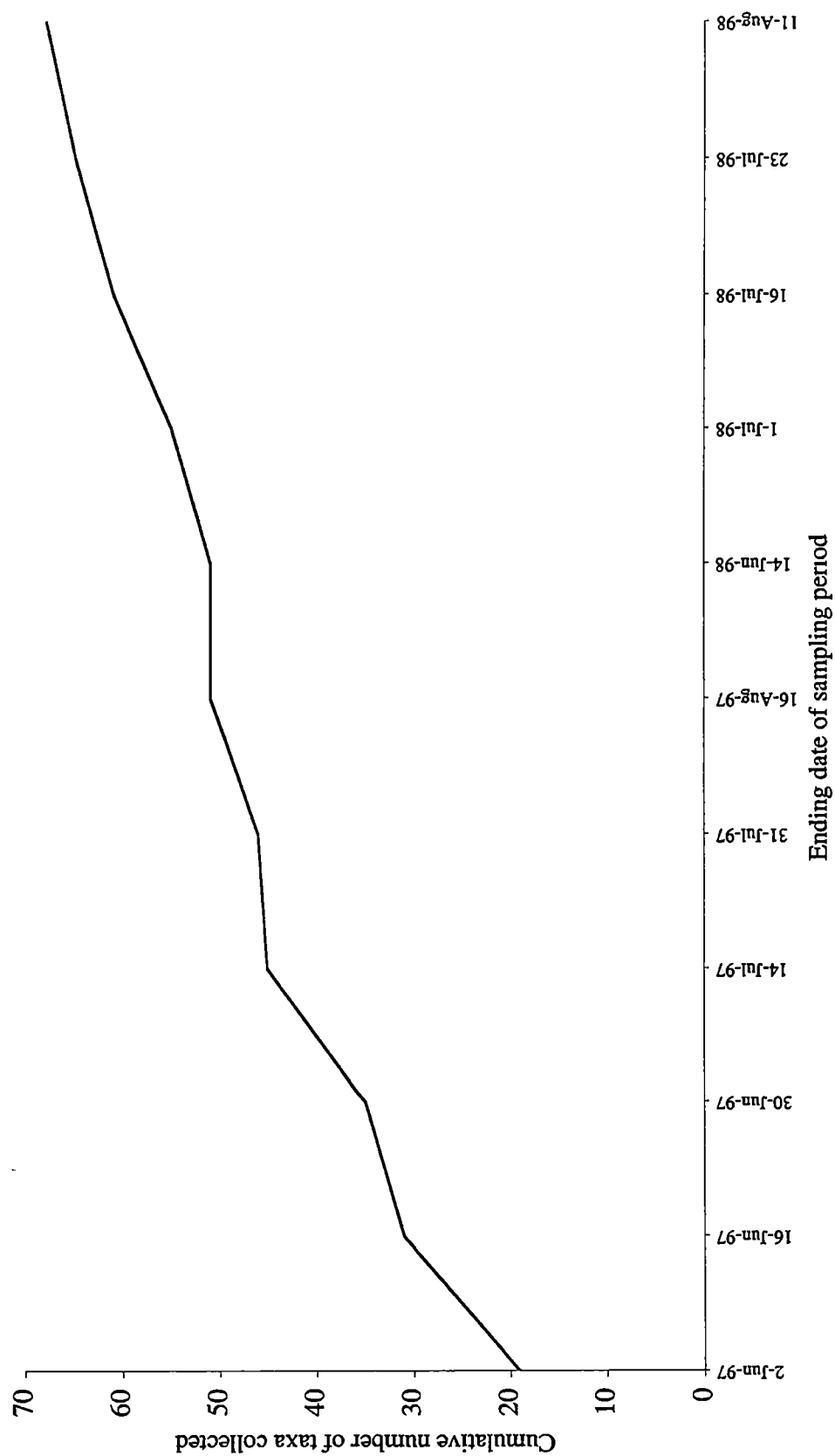


Figure 4
Cumulative number of aquatic insect taxa collected at two week intervals
from Crane Prairie Reservoir, Deschutes County, Oregon during 1997-1998.

than those employed here would likely increase the chances to provide additional taxa by addressing some of the instances of potential sampling bias. Specifically, the use of black light traps, collecting odonates while copulating (not just in tandem), additional artificial substrates – such as substrate cages, and rearing collected larval material would all strengthen this work.

Any future sampling should clearly include efforts in the areas of the reservoir that provided the greatest diversity in repeated collections. Three areas in the reservoir that combine a variety of habitat elements into relatively smaller reaches of shoreline were consistent producers of relatively speciose collections. The northeastern shore near the resort camping area with ample coarse woody debris, frequent patches of aquatic vegetation, and ample direct sunlight was a very productive collecting area (for example 98-13 and 98-29 in Appendix C). Important collections were also made in the vicinity of the Rock Creek Campground and further east back into the Rock Creek arm of the reservoir (for example 97-21 and 98-26 in Appendix C). Lastly, two small coves along the east shore, one of which is known as Bass Heaven to ODFW personnel, produced some of the most speciose collections made during the course of the study (for example 97-38 and 98-16 in Appendix C).

With the near certainty that with further collecting additional species would be added to the known fauna of Crane Prairie Reservoir a key to the species is not presented as had been originally planned. Presenting a key would have implied confidence that no other species would be collected, encouraged the mis-identification of specimens from future collections, and only served to further the difficulties of keying aquatic insects as

discussed above. The species listed here can be identified using a good general reference, such as Merritt and Cummins (1996), in combination with the appropriate specific literature (cited elsewhere).

The literature indicates that the first observable changes to the insect community due to the change in the fish community would be a shift in the relative abundance of the common species. With a list of the most common taxa occurring in Crane Prairie Reservoir, references to the literature required to identify those taxa, and some productive sampling areas identified, the beginnings of a monitoring program are provided here.

This could complement a GIS (Geographical Information Systems) project. GIS is making substantial inroads to aquatic ecology, as can be seen in the recent special section in the journal *Freshwater Biology* (#37 1997). A relatively unknown species like *Caenis youngi* with a range that is expanding in large leaps seems to present an ideal opportunity to develop a habitat model that could be tested and validated by collecting at predicted sites.

It is obvious that further survey work, accompanied by careful taxonomic examination, is needed to continue to address our relative ignorance of larval forms and the zoogeography of aquatic insect species. Clearly, there are many more new distributional records and undescribed species to be found if relatively limited sampling as this can produce new state records and apparent new species in well studied groups.

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Appendices

Appendix A

An annotated list of aquatic insect species from Crane Prairie Reservoir, Deschutes County, Oregon

Ephemeroptera

Callibaetis ferrugineus hageni Eaton

These delicate mayflies were often seen flying low to the surface of the water or stuck in the surface film. Larvae were not frequently collected. The species and sub-species determination was provided by Boris Kondratieff, who has retained specimens.

Caenis amica Hagen

No larvae were identified, although adults were taken in moderate numbers in light trap samples. Identification confirmed by A. Provonsha and specimens have been added to the Purdue University collection.

Caenis youngi Roemhild

The identification of adult and larval *C. youngi* has been confirmed by A. Provonsha and those specimens have been added to the Purdue University collection. This is one of the new state records.

Paraleptophlebia debilis? (Walker)

This tentative identification is based on Lehmkuhl and Anderson (1971), who indicate that most adults occur in autumn, perhaps explaining why no adults were collected.

Odonata

Aeshna californica Calvert

Aeshna multicolor Hagen

Aeshna palmata Hagen

Aeshna sp.

Adults of each of the three above species were collected, but larvae could not be positively identified past genus. It is highly likely that most, or all, of the larvae collected are *A. palmata*. Locally, these larvae are referred to as "hellgrammites", and are popular fishing bait.

Epitheca spinigera Selys

The massive lateral spines on abdominal segment 9 are very useful in separating this cordulid from the otherwise rather similar libellulids.

Leucorrhinia intacta Hagen

This species is represented in the collections by one positively identified larva, and perhaps some immature larvae identified as Libellulidae sp.

Libellula forensis Hagen

The small size of the spots in the wings of this species provides for quick visual discrimination of the two species of *Libellula*

Libellula quadrimaculata Linnaeus

Adults of this species were more frequently observed in flight than the frequency of larvae in the samples might suggest.

Sympetrum costiferum (Hagen)

Sympetrum obtrusum (Hagen)

Sympetrum pallipes (Hagen)

Sympetrum sp.

The listing of three members of this genus in the List of Putative Taxa (Table 1) is one of the least conservative decisions in this work. The species identifications are strongly influenced by distributional information and should be regarded as somewhat tentative. Several species pairs at different stages can not be differentiated (Walker and Corbet 1975). The adult females of *S. internum* and *S. obtrusum*, whose males are quite similar, can be extraordinarily difficult to separate. The larvae of *S. pallipes* and *S. obtrusum* can not be differentiated, nor can *S. internum* and *S. danae* be reliably separated.

Enallagma boreale (Selys)

E. boreale were the most common coenagrionid collected; they occurred in flight through out the sampling period. Larval identifications should not be viewed as 100% positive.

Enallagma carunculatum Morse

The only specimens collected were the two males taken in the same sample in August, 1998.

Enallagma cyathigerum (Charpentier)

E. cyathigerum were captured in flight during July and August. Larval identifications should not be viewed as 100% positive. Also of note is the proximity of vein M_2 to the 6th antenodal crossvein in this population. This is an *E. durum* character, but the Atlantic and Gulf coastal plain distribution of *E. durum* and clear differences in the male appendages clearly identify these Oregon specimens as *E. cyathigerum* (see Westfall and May 1996).

Ischnura cervula Selys

Although somewhat less commonly collected than the *Enallagma* sp. this species was collected repeatedly in both summers.

Ischnura perparva McLachlan in Selys

Only one adult female of this species was collected.

Heteroptera

Lethocerus americanus (Leidy)

This widespread species was collected only in 1998.

Callicorixa alaskensis Hungerford

These represent a new state record Determined by S.W. Chordas III.

Aquarius remigis (Say)

This widespread species was collected once in 1998. It was formerly *Gerris remigis*.

Gerris incurvatus Drake and Hottes

The smallest of the gerrids collected was also the most difficult of the three to identify. It was collected five times over both summers.

Limnoporus notabilis (Drake and Hottes)

This large gerrid was infrequently collected in both summers. This genus is an elevated sub-genus of *Gerris* based on different antennae segment lengths (Henry and Froeschner 1988).

Ranatra fusca Palisot

This species may well have been over-looked in the field considering its cryptic appearance and close association with macrophytes. It was collected only twice in 1998.

Saldidae sp.

Twelve genera of saldids occur in North America and due to their habits are typically infrequently collected (Henry and Foeschner 1988). This group being represented in only one collection here fits that pattern.

Megaloptera

Sialis rotunda Banks

Sialis sp.

Adults were occasionally collected flying near the water during the day. The regularly collected *Sialis* sp. larvae are presumed to be this species.

Trichoptera

Agraylea multipunctata Curtis

Agraylea sp.

Adult males and females were collected. Association of these adults and A. sp. larvae is presumed. Representative specimens are held at UT, catalog lot #5.407.

Hydroptila sp.

Only larvae and adult females were collected. Although the observation leads to no real conclusion, it is worth noting that the collected females do not appear to match any of Ross's (1944) drawings for species listed for Oregon by Anderson (1976).

Ceraclea sp.

This infrequently collected larva has less prominent antennae than the other leptocerids collected.

Mystacides alafimbriata Hill-Griffin

This was the most common caddis collected. It was collected in 43 samples and frequently in abundance. The case of this species typically incorporates bits of bark or other terrestrial detritus. Representative specimens are held at UT, catalog lot #12.414.

Oecetis sp. cf. *inconspicua* (Walker)

The second most common leptocerid larva collected keys to the *Oecetis inconspicua* Complex of Floyd (1995). While Floyd did not record any taxa of the *O. inconspicua* complex from Oregon, it has been previously reported (Anderson 1976). These would represent an additional, or perhaps two, undescribed and un-keyed member(s) of the complex (Moody, personal observation, Floyd, personal communication). It has a small tapered sand case. Representative specimens are held at UT, catalog lot #12.415.

Triaenodes injustus (Hagen)

Only the distinctive larvae of this species were collected. Representative specimens are held at UT, catalog lot #12.416.

T. tardus Milne

Adults were collected by light trap from mid-June through August. Representative specimens are held at UT, catalog lot #12.443

Lepidostoma cinereum (Banks)

This rarely collected species was present only in 1998 samples. This species is listed for Oregon under its junior synonym *L. strophis* (Anderson 1976, Weaver 1988) Representative specimens are held at UT, catalog lot #14.116.

Clistoronia magnifica (Banks)

This distinctive limnephilid has conspicuous white spots on its wings. It was very rarely collected and keys to *Limnephilus* in Ross (1944) as this genus does not occur in Illinois. Representative specimens are held at UT, catalog lot #7.529.

Limnephilus flavastellus Banks

Adults and mature pupae were collected in July and August of 1997 and 1998. The females collected do not completely match published drawings (Ruiter 1995) for *L.*

flavastellus or the very similar, and previously synonymized, *L. externus*. However, based on expected variability in members of the *L. externus* species group this is not surprising (Ruiter, personal communication). The identity of males and females was confirmed by D. Ruiter. The larvae are undescribed, but are presumed here to be represented by *Limnephilus* sp. larvae that have cockle-burr cases similar to those of the mature pupae. Representative specimens are held at UT, catalog lot #7.469.

Limnephilus occidentalis Banks

This species was collected less frequently and is slightly smaller than *L. flavastellus*. It has an untapered cylindrical case of small pebbles. Representative specimens are held at UT, catalog lots #7.477 and #7.559.

Limnephilus sp.

Currently larvae and immature pupae are not identifiable. Most of the specimens identified here are probably *L. flavastellus* based on case morphology.

Psychoglypha sp.

Species level identification of these larvae can not be provided. Only *P. subborealeis* is described, and specimens from this study do not appear to represent that species. Black light traps might be more effective for this genus (Denning 1970). Representative specimens are held at UT, catalog lot #7.558

Phryganeidae sp.

Two early instar larvae were collected on one occasion, 6 August, 1998 (BAM 98-30). Anderson (1976) lists two phryganeids from Deschutes Co., *Banksiola crotchii*, which has a similar head pattern to these, and *Yphria californica*, which has a different head pattern and uses different case materials (Wiggins 1977). The cases of these are very similar to the distinctive cases of *Fabria inornata*, but at this early stage of development no conclusion can be drawn.

Polycentropus cinereus Hagen

Adults were collected in 6 light trap samples. These are presumed to be reservoir residents based on the consistency with which they were collected, although no larvae were collected. Representative specimens are held at UT, catalog lot #3.308.

Polycentropus flavus (Banks)

This new state record is presumed to be a resident based on the collection of one male in 1997, and two females in 1998. Representative specimens are held at UT, catalog lot #3.309.

Polycentropus sp.

The only *Polycentropus* larvae collected were in Hester Dendy samples and did not match Ross's (1944) descriptions of larvae of either of the adults recorded here, but do key to *Polycentropus sensu stricto* in Hudson et al. (1981). Larval identifications

should be considered somewhat tentative since all *Polycentropus* larvae are not described and keyed (Ross 1944, Wiggins 1977). However, it seems reasonable to attempt larval identifications since larvae of both *Polycentropus* spp. adults collected are keyed. The obvious conclusion is that there are three species in Crane Prairie Reservoir, these larvae likely representing one of the three other *Polycentropus* listed in Oregon (Anderson 1976) whose larvae are not described. Based on previous collection records (Anderson 1976) it seems likely that this is *P. halidus*.

Gumaga griseola (MacLachlan)

Gumaga sp.

Confirmed adult males of *G. griseola* were collected on multiple occasions. Larvae and females identified as *G. sp.* are presumed here to be *G. griseola* based on the presence of the males and Anderson (1976) reporting only one record for *G. nigricula* from much farther south in OR. Representative specimens are held at UT, catalog lots #16.28, #16.30 and #16.32.

Lepidoptera

Noctuidae sp.

Collected only once in 1997, perhaps as a result of sampling bias.

Pyrilidae sp.

Two adults and one larva were collected in 1998. The larva has single gills and keys to subfamily Nymphulinae, genus unknown in Merritt and Cummins (1996).

Coleoptera

Dryopidae sp.

Little is known about this small and rarely collected family.

Oreodytes sp.

These were difficult to separate from *Deronectes* sp.

Rhantus sp.

This larva was collected only once in 1998.

Uvarus sp.

This was the most common dytiscid collected; the adults were collected with regularity.

Dubiraphia sp.

The only genus of elmud described as being lentic (Merritt and Cummins 1996). This taxon was collected only once.

Rhizelmus? sp.

This tentatively identified specimen came from one of the most speciose

collections. While the habitat seems wrong, perhaps the proximity to a tributary or wave action explains the presence of this lotic taxon.

Gyrinus picipes Aube

One adult was present in a 1997 sample.

Halplus sp.

These small beetles were occasionally collected in weedy speciose areas.

Berosus sp.

Collected twice from rather different habitats in the reservoir, this taxon may be more common than the collections suggest.

Enochrus sp.

Collected only once, when it was one of three hyrophilids in the sample.

Helphorus sp.

The distinctive furrows in the pronotum makes this one of the easiest of the collected beetles to identify.

Tropisternus sp.

This moderate sized beetle is easily recognized due to its pointed ventral keel. It was the most commonly collected hyrophilid.

Stenus sp.

The short elytra of the staphylinids was quite helpful in recognizing this taxon which was collected once in 1997.

Lixellus filiformis LeConte

Adults were collected at a wide variety of locations around the reservoir; this species is probably more abundant than its frequency in collections suggests.

Steremnius sp.

Although Usinger (1956) does not treat this genus, it keys with Merritt and Cummins (1996) and two species (*S. carinatus* and *S. tuberosus*) are listed from Oregon by O'Brien and Wibmer (1982).

Ceratopogonidae sp.

These were rarely collected in numbers, but could have been over-looked in the field due to their cryptic appearance. They were always taken in association with aquatic vegetation or with Hesters.

Chironominae sp.

These were present in 53 samples, sometimes in great number – up to 891 were collected with one Hester. At least two head pigment morphologies were noticed during sorting and counting.

Orthocladinae sp.

This taxon was distinguished by having a single eye spot and often a dark line attached to the eye. Although often collected, it was far less abundant than *Chironominae* sp.

Tanypodinae sp.

This taxon was distinguished by having a single eye spot, a large head, and long anterior prolegs. It was the least frequently collected chironomid.

Chrysops sp.

One of two tabanids collected, this taxon was seen only in 1998.

Silvus sp.

This tabanid was collected twice in 1997.

Prionocera/Tipula sp.

The subgenus *Angarotipula* keys out with *Prionocera* (Merritt and Cummins 1984, 1996) necessitating the hedge.

Dictya sp.

A larva of this genus of marsh fly was collected once in 1997

Appendix B

Collections in which taxa from Appendix A appear.

Ephemeroptera

Callibaetis ferrugineus hageni

From collections: 97-32,38; 98-18, 26, 27, 29, 33.

Caenis amica

From collections: 97-24, 31, 53; 98-10, 15, 21, 26, 33.

Caenis youngi

From collections: 97-12, 13, 16, 17, 21, 22, 23, 24, 26h, 27, 28, 29, 30, 31, 32, 33, 35, 37, 38, 42, 47, 48, 49, 51, 52, 53, 54, 56, 59; 98-06, 08, 09, 10, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 25, 26, 29, 29, 30, 31, 33, 35, 36, 37, 38.

Paraleptophlebia debilis?

From collections: 97-32; 98-28, 38.

Odonata

Aeshna californica

From collections: 98-16, 23.

Aeshna multicolor

From collection: 98-12.

Aeshna palmata

From collections: 97-35, 52; 98-30.

Aeshna sp.

From collections: 97-12, 16, 17, 21, 25, 27, 28, 32, 38, 48, 50, 52, 56, 59; 98-07, 09, 11, 12, 14, 16, 17, 19, 20, 21, 23, 24, 28, 29, 30, 31, 32, 37.

Epitheca spinigera

From collections: 97-25, 26h, 38, 50, 52.

Leucorrhinia intacta

From collection: 98-22.

Libellula forensis

From collections. 98-16, 29.

Libellula quadrimaculata

From collections: 97-38; 98-13, 14, 22, 23, 24.

Sympetrum costiferum

From collection: 97-51.

Sympetrum obtrusum

From collection: 97-52.

Sympetrum pallipes

From collection: 98-14.

Enallagma boreale

From collections: 97-21, 27, 34, 42, 48, 50; 98-06, 07, 13, 14, 17, 20.

Enallagma carunculatum

From collection: 98-24

Enallagma cyathigerum

From collections: 97-12, 21, 29, 33; 98-13, 14, 24, 29.

Enallagma sp.

From collections: 97-13, 16, 17, 22, 26h, 27, 28, 38, 52; 98-09, 13, 14, 16, 24, 29, 30.

Ischnura cervula

From collections: 97-26h, 38; 98-13, 14, 16, 22, 23.

Ischnura perparva

From collection: 97-38.

Heteroptera

Lethocerus americanus

From collections: 98-16, 29.

Callicorixa alaskensis

From collections: 97-13, 17, 19.

Aquarius remigis

From collections: 98-13.

Gerris incurvatus

From collections: 97-17, 23, 42; 98-22, 24.

Limnoporus notabilis

From collections: 97-48; 98-11, 14.

Ranatra fusca

From collections: 98-22, 30.

Ochterus sp.

From collection: 98-24.

Saldidae sp.

From collections: 98-16.

Megaloptera

Sialis rotunda

Sialis sp.

From collections: 97-16, 52, 59; 98-11, 13, 16, 30, 35.

Trichoptera

Agraylea multipunctata

Agraylea sp.

From collections: 97-23, 25; 98-10, 15, 24, 26.

Hydroptila sp.

From collections: 97-19; 98-15, 35, 36.

Ceraclea sp.

From collections: 98-37, 38.

Mystacides alafimbriata

From collections: 97-11, 12, 13, 14, 15, 16, 21, 22, 24, 26, 27, 28, 32, 33, 34, 35, 36, 38, 47, 48, 49, 52, 53; 98-05, 07, 09, 11, 12, 14, 15, 16, 18, 18, 19, 20, 23, 25, 26, 29, 30, 33, 34, 35.

Oecetis sp. cf. *inconspicua*

From collections: 97-11, 21, 23, 24, 32, 33, 37, 42, 47, 49, 53, 58, 59; 98-06, 07, 14, 45, 19, 20, 21, 22, 23, 26, 29, 33, 34.

Triaenodes injustus

From collections: 97-12, 13, 21, 22, 32, 35, 37, 38, 54; 98-16, 17, 20, 22, 23.

Triaenodes tardus

From collections: 97-24, 53; 98-15, 26, 33.

Triaenodes sp.

From collections: 98-15, 16.

Lepidostoma cinereum

From collections: 98-11, 33.

Clistoronia magnifica

From collection: 98-26.

Limnephilus flavastellus

From collections: 97-34, 35, 51, 53; 98-09, 14, 15, 19, 25, 28.

Limnephilus occidentalis

From collections. 97-11, 12, 14, 17, 18, 21, 23, 34; 98-06.

Limnephilus sp.

From collections: 97-11, 12, 13, 16, 17, 21, 22, 23, 26h, 27, 28, 29, 32, 35, 38, 48, 49; 98-06, 07, 08, 09, 11, 12, 14, 16, 18, 19, 20, 23, 28, 29.

Psychoglypha sp.

From collections: 97-51; 98-11, 18, 25.

Phryganeidae sp.

From collections: 98-30.

Polycentropus cinereus

From collections: 97-47; 98-15, 26, 33.

Polycentropus flavus

From collections: 97-37, 98-15, 26.

Polycentropus sp.

From collections: 97-37, 54; 98-36.

Gumaga griseola

Gumaga sp.

From collections: 97-11, 22, 27, 49; 98-06, 07, 10, 12, 15, 29, 30.

Lepidoptera

Noctuidae sp.

From collection: 97-28.

Pyralidae sp

From collections: 98-26, 30.

Coleoptera

Dryopidae sp.,

From collection: 97-12.

Oreodytes sp.

From collections: 97-28, 48, 52; 98-09.

Rhantus sp.

From collections: 98-16.

Uvarus sp.

From collections: 97-11, 21, 29, 32; 98-06, 07, 18, 23.

Dubiraphia sp.

From collections: 97-16.

Rhizelmis? sp.

From collections: 97-21.

Gyrinus picipes

From collections: 97-50.

Haliplus sp.

From collections: 97-21, 38; 98-24.

Berosus sp.

From collections: 97-12; 98-13.

Enochrus sp.

From collections: 97-12.

Helphorus sp.

From collections: 97-17.

Tropisternus sp.

From collections: 97-17, 23, 50

Pontamalota sp.

From collections: 97-12.

Stenus sp.

From collections: 97-21.

Lixellus filiformis

From collections: 97-32; 98-07, 14, 17.

Steremnius sp.

From collections: 98-24.

Diptera

Ceratopogonidae sp.

From collections: 97-29, 32; 98-20, 22, 31, 32.

Chironominae sp.

From collections: 97-11, 13, 17, 18, 21, 22, 23, 25, 26h, 27, 28, 29, 32, 33, 34, 35, 36, 38, 40, 42, 43, 44, 48, 49, 50, 51, 52, 54, 56, 58, 59; 98-06, 07, 09, 11, 12, 13, 14, 17, 18, 19, 20, 23, 25, 27, 28, 29, 30, 32, 35, 36, 37, 38.

Orthocladinae sp.

From collections: 97-21, 22, 27, 35, 38, 42, 48, 49, 54, 56, 58; 98-16, 24, 25, 35, 36, 37.

Tanypodinae sp.

From collections: 97-22, 32, 38, 48, 54, 56, 58, 59; 98-06, 29, 36, 38.

Chrysops sp.

From collections: 98-14.

Silvus sp.

From collections: 97-12, 21.

Prionocera/Tipula sp.

From collections: 98-13, 23.

Dictya sp.

From collections: 97-12.

Appendix C
List of individual collections.

BAM 97-11 1 June, 1997 Hand

Dam arm boat ramp

Mystacides alafimbriata

Oecetis inconspicua

Limnephilus occidentalis

Limnephilus sp.

Gumaga sp.

Uvarus sp.

Chironominae sp.

BAM 97-12 1 June, 1997 Hand

Wind swept shore near Rock Creek arm

Caenis youngi

Aeshna sp.

Enallagma cyathigerum

Mystacides alafimbriata

Triaenodes injustus

Limnephilus occidentalis

Limnephilus sp.

Dryopidae sp.

Berosus sp.

Enochrus sp.

Tropisternus sp.

Chironominae sp.

Dictya sp.

Silvus sp.

BAM 97-13 1 June, 1997 Hand

Rock Creek Campground

Caenis youngi

Enallagma sp.

Callicorixa alaskaensis

Mystacides alafimbriata

Triaenodes injustus

Limnephilus sp

Chironominae sp.

BAM 97-14 1 June, 1997 Light trap
Wind swept shore near Rock Creek arm
Mystacides alafimbriata
Limnephilus occidentalis

BAM 97-16 2 June, 1997 Hand
Bass Heaven
Caenis youngi
Aeshna sp.
Enallagma sp
Sialis rotunda
Mystacides alafimbriata
Limnephilus sp.
Dubiraphia sp.

BAM 97-17 15 June, 1997 Hand
North shore west of Cow Camp
Caenis youngi
Aeshna sp.
Enallagma sp.
Ischnura sp.
Libellulidae sp.
Gerris incurvatus
Callicorixa alaskaensis
Limnephilus occidentalis
Limnephilus sp.
Tropisternus sp.
Helophorus sp.
Chironominae sp.

BAM 97-18 15 June, 1997 2x Ekman
off north shore west of Cow Camp
Limnephilus sp.
Chironominae sp.

BAM 97-19 15 June, 1997 Light trap
Cow camp boat ramp
Corixidae sp.
Hydroptila sp.

BAM 97-20 16 June, 1997 1x Ekman
Mid-reservoir
Empty

BAM 97-21 16 June, 1997 Hand

Back in Rock Creek arm

Caenis youngi

Aeshna sp.

Enallagma boreale

E. cyathigerum

Sialis rotunda

Mystacides alafimbriata

Oecetis inconspicua

Triaenodes injustus

Limnephilus occidentalis

L. sp.

Uvarus sp.

Rhyzelmis sp.

Haliphus sp.

Stenus sp.

Chironominae sp.

Orthocladinae sp.

Sivus sp.

BAM 97-22 16 June, 1997 Hand

Shore east of Rock Creek arm

Caenis youngi

Enallagma sp.

Mystacides alafimbriata

Triaenodes injustus

Limnephilus sp.

Chironominae sp.

Orthocladinae sp

Tanypodinae sp.

BAM 97-23 16 June, 1997 Hand

Shore of burned area north east of resort

Caenis youngi

Gerris incurvatus

Agraylea multipunctata

Oecetis inconspicua

Limnephilus occidentalis

L. sp.

Tropisternus sp.

Chironominae sp.

BAM 97-24 16 June, 1997 Light trap
USFS Campground boat ramp

Caenis amica
C. youngi
Mystacides alafimbriata
Oecetis inconspicua
Triaenodes tardus

BAM 97-25 29 June, 1997 Hand
Weedbed near resort

Caenis youngi
Aeshna sp.
Epitheca spinigera
Agraylea multipunctata
Chironominae sp.

BAM 97-26h 29 June, 1997 Hand
Bass heaven

Caenis youngi
Aeshna sp.
Epitheca spinigera
Enallagma sp.
Ischnura cervula
Mystacides alafimbriata
Limnephilus sp.
Chironominae sp.

BAM 97-26 29 June, 1997 Light trap
USFS campground boat ramp
Mystacides alafimbriata

BAM 97-27 30 June, 1997 Hand
Dam arm boat ramp

Caenis youngi
Aeshna sp.
Enallagma boreale
E. sp.
Mystacides alafimbriata
Limnephilus sp.
Gumaga griseola
G. sp.
Chironominae sp.
Orthocladinae sp.

BAM 97-28 30 June, 1997 Hand

Rock Creek camp ground

Caenis youngi

Aeshna sp.

Enallagma sp.

Mystacides alafimbriata

Limnephilus sp.

Noctuidae sp.

Oreodytes sp.

Chironominae sp.

BAM 97-29 12 July, 1997 Hand

Rock Creek campground

Caenis youngi

Enallagma cyathigerum

Limnephilus sp.

Uvarus sp.

Ceratopogonidae sp.

Chironominae sp.

BAM 97-31 12 July, 1997 Light trap

Quinn River campground boat ramp

Caenis amica

C. youngi

BAM 97-32 13 July, 1997 Hand

East shore back in Rock Creek arm

Callibaetis ferrugineus

Caenis youngi

Paraleptophlebia debilis?

Aeshna sp.

Mystacides alafimbriata

Oecetis inconspicua

Triaenodes injustus

Limnephilus sp.

Lixellus filiformis

Uvarus sp.

Ceratopogonidae sp.

Chironominae sp.

BAM 97-33 13 July, 1997 Hand

Shore between Rock Creek and Dam arms

Caenis youngi

Enallagma cyathigerum

Mystacides alafimbriata

Oecetis inconspicua

Chironominae sp.

BAM 97-34 13 July, 1997 Hand

Emergent vegetation off the burned shore by the resort

Enallagma boreale

Mystacides alafimbriata

Limnephilus flavastellus

L. occidentalis

Chironominae sp.

BAM 97-35 13 July, 1997 Hand

Rock pile in dam arm

Caenis youngi

Aeshna palmata

Mystacides alafimbriata

Triaenodes injustus

Limnephilus flavastellus

L. sp.

Chironominae sp.

Orthocladinae sp.

BAM 97-36 13 July, 1997 1x Ekman

Dam arm near rock island

Mystacides alafimbriata

Chironominae sp.

BAM 97-37 13 July, 1997 Light trap

USFS Campground boat ramp

Caenis amica

C. youngi

Hydroptila sp.

Mystacides alafimbriata

Oecetis inconspicua

Triaenodes sp.

Polycentropus cinereus

P. flavus

BAM 97-38 14 July, 1997 Hand

East shore Bass Heaven

Callibaetis ferrugineus

Caenis youngi

Aeshna sp.

Epithea spinigera

Libellula quadrimaculata

Sympetrum sp.

Enallagma sp.

Ischnura cervula

I. perparva

Ceraclea sp.

Mystacides alafimbriata

Triaenodes injustus

Limnephilus sp.

Halipus sp.

Chironominae sp.

Orthocladiinae sp.

Tanypodinae sp.

BAM 97-39 14 July, 1997 1x Ekman

Off Deschutes channel, near big curve in channel

Empty

BAM 97-40 14 July, 1997 1x Ekman

In timber near USFS campground

Chironominae sp.

BAM 97-41 14 July, 1997 1x Ekman

Off USFS campground cove

Empty

BAM 97-42 30 July, 1997 Hand

Thick vegetation NW of USFS campground cove

Caenis youngi

Enallagma boreale

Gerris incurvatus

Oecetis inconspicua

Chironominae sp.

Orthocladiinae sp.

BAM 97-43 30 July, 1997 1x Ekman
Near mouth of Deschutes channel
Chironominae sp.

BAM 97-44 30 July, 1997 1x Ekman
In timber towards NW shore
Chironominae sp.

BAM 97-45 30 July, 1997 1x Ekman
Mid-reservoir, west end
Empty

BAM 97-46 30 July, 1997 1x Ekman
Mouth of dam arm
Empty

BAM 97-47 30 July, 1997 Light trap
USFS campground boat ramp

Caenis youngi
Mystacides alafimbriata
Oecetis inconspicua
Polycentropus cinereus

BAM 97-48 31 July, 1997
Rock Creek arm

Caenis youngi
Aeshna sp.
Enallagma boreale
Limnporus notabilis
Mystacides alafimbriata
Limnephilus sp.
Oreodytes sp.
Chironominae sp.
Orthocladinae sp.
Tanypodinae sp.

BAM 97-49 31 July, 1997

Rocky shore near mouth of dam arm

Caenis youngi

Mystacides alafimbriata

Oecetis inconspicua

Limnephilus sp.

Gumaga sp.

Chironominae sp.

Orthocladinae sp.

BAM 97-50 15 August, 1997 Hand

North shore across from campground

Aeshna sp.

Epitheca spinigera

Enallagma boreale

Gerridae sp.

Gyrinus picipes

Tropisternus sp.

Chironominae sp.

BAM 97-51 15 August, 1997 Hand

shallow area near mouth of Deschutes river

Caenis youngi

C. sp.

Sympetrum costiferum

Gerridae sp.

Limnephilus flavastellus

Psychoglypha sp.

Chironominae sp.

BAM 97-52 15 August, 1997 Hand

Blown timber along east shore near resort

Caenis youngi

Aeshna palmata

A. sp.

Epitheca spinigera

Sympetrum obtrusum

Enallagma sp.

Sialis sp.

Mystacides alafimbriata

Oreodytes sp.

Chironominae sp.

BAM 97-53 15 August, 1997 Light trap
USFS campground boat ramp

Caenis amica
C. youngi
Mystacides alafimbriata
Oecetis inconspicua
Triaenodes tardus
Limnephilus flavastellus

BAM 97-54 16 August, 1997 Hester
Mouth of Deschutes channel, set 2 June

Caenis youngi
Triaenodes injustus
Polycentropus sp.
Chironominae sp.
Orthocladiinae sp.
Tanypodinae sp.

BAM 97-56 16 August, 1997 Hester
Bass Heaven, set 2 June

Caenis youngi
Aeshna sp.
Zygoptera sp.
Chironominae sp.
Orthocladiinae sp.
Tanypodinae sp.

BAM 97-58 16 August, 1997 2x Hester
Dam arm near boom, set 2 June

Mystacides alafimbriata
Chironominae sp.
Orthocladiinae sp.
Tanypodinae sp.

BAM 97-59 16 August, 1997 Hand
Rock Creek arm

Caenis youngi
Aeshna sp.
Sialis sp.
Oecetis inconspicua
Chironominae sp.
Tanypodinae sp.

BAM 98-05 13 June, 1998 Light trap
Between Rock Creek arm and dam arm
Mystacides alafimbriata

BAM 98-06 14 June, 1998 Hand
Between Rock Creek arm and dam arm
Caenis youngi
C sp.
Enallagma boreale
Mystacides alafimbriata
Oecetis inconspicua
Limnephilus occidentalis
L. sp.
Gumaga sp.
Uvarus sp
Chironominae sp.
Tanypodinae sp.

BAM 98-07 14 June, 1998 Hand
Dam arm boat ramp
Caenis youngi
Aeshna sp
Enallagma boreale
Mystacides alafimbriata
Oecetis inconspicua
Limnephilus sp.
Gumaga sp.
Lixellus filiformis
Uvarus sp.
Chironominae sp.

BAM 98-08 30 June, 1998 Hand
first cove NE of dam arm
Caenis youngi
Limnephilus sp.

BAM 98-09 30 June, 1998 Hand
Rock Creek arm

Caenis youngi
Aeshna sp.
Enallagma sp.
Mystacides alafimbriata
Limnephilus flavastellus
Limnephilus sp.
Oreodytes sp.
Chironominae sp.

BAM 98-10 30 June, 1998 Light trap
USFS campground boat ramp

Caenis amica
C. youngi
Agraylea multipunctata
Gumaga sp.

BAM 98-11 1 July, 1998 Hand
West shore between Rock Creek and Quinn River

Aeshna sp.
Sialis sp.
Gerris notabilis
Mystacides alafimbriata
Limnephilus sp.
Psychoglypha sp.
Lepidostoma cinereum
Chironominae sp.

BAM 98-12 1 July, 1998 Hand
Cove west of USFS campground boat ramp

Caenis youngi
Aeshna multicolor
A. sp.
Enallagma cyathigerum
Mystacides alafimbriata
Limnephilus sp.
Gumaga sp.
Chironominae sp.

BAM 98-13 1 July, 1998 Hand
Down timber NW of resort

Caenis youngi
Aeshna sp.
Libellula quadrimaculata
Enallagma boreale
E. cyathigerum
E. sp
Ischnura cervula
Aquarius remigis
Gerridae sp.
Sialis sp.
Berosus sp.
Chironominae sp.
Prionocera/Tipula sp.

BAM 98-14 15 July, 1998 Hand
Burned shore opposite resort

Caenis youngi
Aeshna sp.
Sympetrum pallipes
Libellula quadrimaculata
Enallagma boreale
E. cyathigerum
E. sp.
Ischnura cervula
Corixidae sp.
Limnporus notabilis
Gerridae sp
Mystacides alafimbriata
Oecetis inconspicua
Limnephilus flavastellus
Limnephilus sp.
Lixellus filiformis
Chironominae sp.
Chrysops sp.

BAM 98-15 15 July, 1998 Light trap
USFS campground resort ramp

Caenis amica
C. youngi
Agraylea multipunctata
Hydroptila sp.
Mystacides alafimbriata
Oecetis inconspicua
Triaenodes tardus
T. sp.
Limnephilus flavastellus
Polycentropus cinereus
P. flavus
Gumaga griseola

BAM 98-16 16 July, 1998 Hand
Small cove off Deschutes channel

Callibaetis ferrugineus
Caenis youngi
Sialis sp.
Aeshna californica
A. sp.
Libellula forensis
Enallagma sp.
Ischnura cervula
Lethocerus americanus
Saldidae sp.
Mystacides alafimbriata
Triaenodes injustus
T. sp.
Limnephilus sp.
Rhantus sp.
Ceratopogonidae sp.
Chironominae sp.

BAM 98-17 16 July, 1998 Hand
Standing timber near Quinn River

Caenis youngi
Aeshna sp.
Enallagma boreale
Triaenodes injustus
Lixellus filiformes
Chironominae sp.

BAM 98-18 16 July, 1998 Hand
Shore between Rock Creek and dam arm
Callibaetis ferrugineus
Caenis youngi
C. sp.
Mystacides alafimbriata
Limnephilus sp.
Psychoglypha sp.
Uvarus sp.
Chironominae sp.

BAM 98-19 16 July, 1998 Hand
Small cove south of Bass heaven
Caenis youngi
Aeshna sp.
Mystacides alafimbriata
Oecetis inconspicua
Limnephilus flavastellus
Limnephilus sp.
Chironominae sp.

BAM 98-20 23 July, 1998 Hand
Back end of Rock Creek arm
Caenis youngi
Aeshna sp.
Enallagma boreale
Mystacides alafimbriata
Triaenodes injustus
Oecetis inconspicua
Limnephilus sp.
Ceratopogonidae sp.
Chironominae sp.

BAM 98-21 23 July, 1998 Light trap
Quinn River campground boat ramp
Caenis amica
C. youngi
Oecetis inconspicua

BAM 98-22 23 July, 1998 Hand

Emergent vegetation north of Quinn River

Caenis youngi

Aeshna sp.

Leucorrhinia intacta

Libellula quadrimaculata

Libellulidae sp.

Ischnura cervula

Gerris incurvatus

Ranatra fusca

Oecetis inconspicua

Triaenodes injustus

Ceratopogonidae sp.

BAM 98-23 5 August, 1998 Hand

Dam arm near rock island

Caenis youngi

Aeshna californica

Aeshna sp.

Libellula quadrimaculata

Ischnura cervula

Gerridae sp.

Mystacides alafimbriata

Oecetis inconspicua

Triaenodes injustus

Limnephilus sp.

Uvarus sp.

Chironominae sp.

Prionocera/Tipula sp.

BAM 98-24 5 August, 1998 Hand

Willows south of Quinn River boat ramp

Aeshna sp.

Libellula quadrimaculata

Enallagma carunculatum

E. cyathigerum

E. sp.

Gerris incurvatus

Agraylea sp.

Ochterus sp.

Steremnius sp.

Halipus sp.

Orthocladinae sp.

BAM 98-25 5 August, 1998 Hand

Rock creek campground cove

Caenis youngi

Mystacides alafimbriata

Limnephilus flavastellus

Psychoglypha sp.

Chironominae sp.

Orthocladinae sp.

BAM 98-26 5 August, 1998 Light trap

Rock Creek campground boat ramp

Caenis amica

C. youngi

Callibaetis ferrugineus

Agraylea multipunctata

Mystacides alafimbriata

Oecetis inconspicua

Triaenodes tardus

Clistoronia magnifica

Polycentropus cinereus

P. flavus

Pyrilidae sp.

BAM 98-27 6 August, 1998 Hand

Deep weeds off the mouth of the Deschutes

Callibaetis ferrugineus

Chironominae sp.

BAM 98-28 6 August, 1998 Hand

Near the mouth of the Deschutes

Paraleptophlebia debilis ?

Aeshna sp.

Limnephilus flavastellus

L. sp.

Chironominae sp.

BAM 98-29 6 August, 1998 Hand

Resort campground shore

Caenis youngi

C. sp.

Callibaetis ferrugineus

Aeshna sp.

Libellula forensis

Libellula sp.

Enallagma cyathigerum

Enallagma sp.

Lethocerus americanus

Gerridae sp.

Mystacides alafimbriata

Oecetis inconspicua

Limnephilus sp.

Gumaga sp.

Chironominae sp.

BAM 98-30 6 August, 1998 Hand

Back in Bass Heaven

Caenis youngi

Aeshna palmata

A. sp.

Libellulidae sp.

Enallagma sp.

Sialis sp.

Ranatra fusca

Pyralidae sp.

Mystacides alafimbriata

Gumaga sp.

Phryganeidae sp.

Chironominae sp.

Prionocera/Tipula sp.

BAM 98-31 10 August, 1998 Hester

Rock Creek arm, set 30 June

Caenis youngi

Aeshna sp.

Ceratopogonidae sp.

BAM 98-32 10 August, 1998 Hester
Between Rock Creek and Quinn River, set 1 July

Aeshna sp

Ceratopogonidae sp.

Chironominae sp.

BAM 98-33 10 August, 1998 Light trap
Rock Creek campground boat ramp

Caenis amica

C. youngi

Callibaetis ferrugineus

Mystacides alafimbriata

Oecetis inconspicua

Triaenodes tardus

Lepidostoma cinereum

Polycentropus cineris

BAM 98-34 11 August, 1998 Hand
Rock Creek boat ramp

Callibaetis ferrugineus

Mystacides alafimbriata

Oecetis inconspicua

Libellulidae sp.

BAM 98-35 11 August, 1998 Hester
Bass Heaven, set 30 June

Caenis youngi

C. sp.

Sialis sp.

Coenagrionidae sp.

Hydroptila sp.

Mystacides alafimbriata

Chironominae sp.

Orthocladinae sp.

BAM 98-36 11 August, 1998 Hester
Just off Deschutes channel, set 30 June

Caenis youngi

C sp.

Ephemeroptera sp

Hydroptila sp.

Polycentropus sp.

Chironominae sp.

Orthocladinae sp.

Tanypodinae sp.

BAM 98-37 11 August, 1998 Hester
Timber near start of channel, set 30 June

Caenis youngi

Aeshna sp.

Chironominae sp.

Orthocladinae sp.

BAM 98-38 11 August, 1998 Hester
Timber near start of channel, set 1 July

Caenis youngi

Paraleptophlebia debilis?

Chironominae sp.

Tanypodinae sp.

Vitae

Born on a vernal equinox, March 21, 1972 Barron Alexander Moody was raised in Webster Groves, Missouri. Following graduation from Webster Groves High School in June 1990 he enrolled in The College of Wooster, Wooster, Ohio. There he majored in Biology and minored in Chemistry. In May 1994 a Bachelor of Arts degree was conferred to him by the college. Immediately following graduation he moved to Oregon taking a seasonal position with the Oregon Department of Fish and Wildlife. After service in AmeriCorps in the Everglades and another season with ODFW he enrolled in graduate school at the University of Tennessee. Now, at the time of this publication in August 2000 he has no definite plans for the future.