CONCLUSIONS

In these concluding pages I will address the major questions posed at the beginning of this thesis: 1) Which genera are represented in lacustrine sediments of the Pacific Northwest?; 2) How are these taxa distributed in space and time?; 3) How did their present patterns of distribution originate?

At least 58 different taxa, representing 5 chironomid subfamilies, were recovered from surface or fossil samples. A list of these taxa, and descriptions of each are provided as an appendix. It is certain, however, that many more taxa are present in British Columbia. Although most chironomid remains were identifiable to the generic level, several closely related genera, and a great many species could not be distinguished. Nevertheless, 5 genera (*Corynocera, Hydrobaenus, Nilotanypus, Omisus, Stilocladius*) are first reported from British Columbia as a part of this research.

My studies of chironomid distributions were mostly limited to coastal British Columbia, although surface samples from the Rocky Mountain national parks were included. Details regarding the distribution of chironomids in other areas were primarily obtained from literature sources.

Many chironomid genera are widely distributed at low-elevations in southern British Columbia, and elsewhere in temperate North America, but the fauna is much less diverse at high elevation (within the upper subalpine and alpine vegetation zones) and north of arctic treeline. In contrast, a few chironomid taxa (*Heterotrissocladius, Paracladius, Parakiefferiella* sp.A, *Protanypus, Stictochironomus*) are more common in the cold waters of arctic/alpine regions, and the profundal waters of the largest and deepest low elevation lakes. These patterns of distribution suggest that water temperature is an important influence limiting the distribution of chironomid taxa.

Stratigraphic analyses indicate that most chironomid taxa rapidly colonized British Columbia following glacial retreat. This rapid colonization suggests that one or more species of most chironomid genera had survived in refugial areas near southern British Columbia, probably in unglaciated regions of the western United States. Although late-glacial temperatures were colder than present conditions, the climate was sufficiently warm to permit the survival of a diverse fauna.

Other refugial areas may have existed along the British Columbia coast. A Queen Charlotte glacial refugium would have permitted *Corynocera* nr. *ambigua* to rapidly colonize adjacent glaciated areas of these islands.

The late-glacial fauna of small low-elevation lakes in southwestern British Columbia included several taxa (*Heterotrissocladius, Parakiefferiella* sp.A, *Protanypus, Pseudodiamesa, Stictochironomus*) which are commonly associated with cold, well-oxygenated waters. These taxa decrease greatly in abundance or completely disappear near the end of the Pleistocene, when palynological evidence suggests a rapidly warming climate. Thus, changing climatic conditions are likely responsible for these changes. Warm temperatures eliminated cold-stenothermous taxa from littoral habitats. Indirect climatic effects, including hypolimnetic oxygen depletion (a product of increased autochthonous and allochthonous organic loading) may have eliminated these taxa from the profundal waters of small lakes.

A very similar pattern of late-glacial chironomid succession is apparent throughout North America and Europe. A cold-stenothermous fauna was common in cold regions adjacent to the retreating continental glaciers. These cold-stenothermous taxa have since survived in the deep profundal waters of the largest and deepest temperate lakes and in arctic/alpine regions.

During the early phases of deglaciation *Chaoborus* (Chaoboridae) and 3 Chironomidae, which are presently common in British Columbia, may have been absent.

These taxa are *Paracladius*, *Psectrocladius* subg. *Monopsectrocladius*, and Tanytarsini sp.A. Future stratigraphic investigations may require revision of this list. Cold late-glacial temperatures may have limited the spread of some of these taxa, but the absence of *Paracladius* fossils from late-glacial sediments is intriguing. At present *Paracladius* appears to be common in cold water, in association with several taxa which had been common in late-glacial times at low-elevation. Since conditions in the low-elevation late-glacial lakes of British Columbia seem to have been suitable for *Paracladius*, this taxon may be a recent immigrant to British Columbia, having survived in a distant glacial refuge. *Paracladius* may have survived in unglaciated areas far to the east, or perhaps in the Beringian refugium.

My studies indicate that climate has had an important bearing upon the past and present chironomid fauna of British Columbia. Although Chironomidae seem less sensitive to climate than terrestrial vegetation, stratigraphic analyses of their fossils may provide important paleoclimatological evidence.