13 Collections of Ephemeroptera from Kluane National Park, Yukon Territory, and Nahanni National Park, Northwest Territories, Canada

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Limnological surveys of standing and flowing waters within Kluane National Park, Yukon Territory and Nahanni National Park, Northwest Territories in northwestern Canada from 1973-1978 resulted in the collection of seven families, 16 genera and at least 20 species of nymphs and adults of mayflies. Although most sites were visited only once, useful distributional information for species collected is presented. Lakes generally had lower species richness than streams, while lake outflow streams had higher species richness than turbid mountain streams. As in other northern studies, the mayfly fauna appears to consist of relatively few, widely distributed species.

Introduction

This paper presents the mayfly species collected in a series of limnological investigations by Parks Canada (1973-1978) of Kluane National Park in the Yukon Territory and Nahanni National Parks in the Northwest Territories. The insect fauna of these parks and of northwestern North America is poorly known. McCafferty (1985) provided the most recent synopsis of the Alaska and adjacent Yukon mayfly species. Other faunistic studies pertaining to northwest Canada include Wiens et al. (1975), Cobb and Flannagan (1980) and Harper and Harper (1981). This report presents the first synopsis of Kluane and Nahanni mayflies and will also expand present knowledge of the mayflies of northern Canada.

Materials and Methods

Study Areas

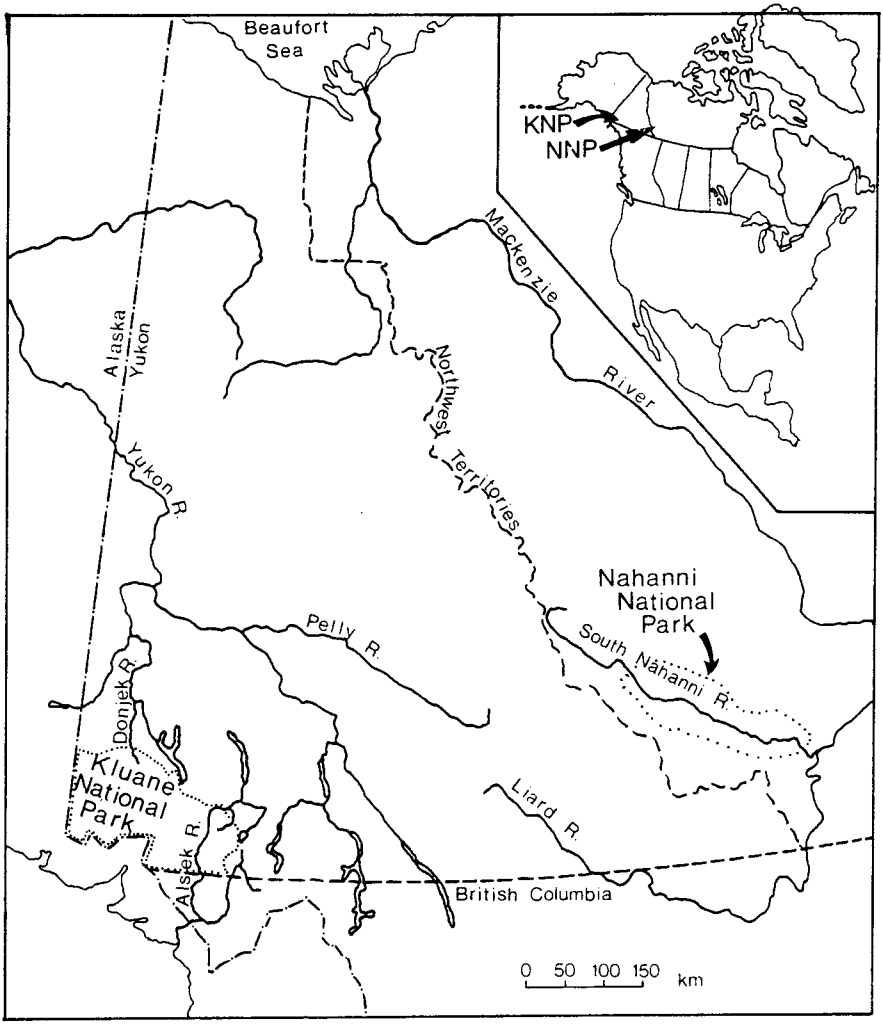
The Kluane National Park, located in the southwest corner (60^0 N, 140^0 W) of the Yukon Territory (Fig. 1), is Canada's second largest national park (22,015 km^2). The park is situated among the largest mountain ranges in Canada (Mt. Logan, 6050 m), and much of the area is covered by active icefields and glaciers. The maritime component of the borderline maritime/continental climate provides ample precipitation, which, combined with the high elevation, maintains the glacial fields.

Kluane park is drained by two major systems: the northern portion drains to the northwest via the Yukon River to the Bering Sea, and the southern Alsek River system drains southwest to the Pacific Ocean. Valley glaciers are the principle source for the largest rivers; smaller creeks originate from cirque or alpine glaciers and snowmelt from upper slopes, while relatively few streams originate from alpine lakes. Most streams are turbid, with unpredictable flow regimes and are highly braided. Lakes were formed by glacial activity (ice scour and moraines) resulting in perched ice scour lakes, valley rock basins and drift basin lakes. Details of glacial history, geology, climate, vegetation and descriptions of lakes and rivers are presented in Bostock (1948) and Wickstrom (1978).

The Nahanni National Park is located in the southwestern region of the Northwest Territories (61°30'N, 126° W), near the border with the Yukon Territory (Fig. 1), and encompasses 4880 km^2 along the South Nahanni River. The South Nahanni River is a major tributary to the Liard River, which flows via the Mackenzie River to the Beaufort Sea. With its canyons and falls (Victoria Falls 90 m) the South Nahanni River dominates the park. The central portion of the park (Deadman Valley) has been unglaciated for at least 350,000 years (Ford 1974), and may have served as a glacial refugium during the last three Ice Ages. The South Nahanni River is bordered by the Mackenzie Mountains to the north and the Logan Mountains to the west. Climate is continental, with brief periods of moderation from "chinook winds" (mild downslope airflows) during winter.

Three major tributaries feed the South Nahanni River: Flat River, Rabbitkettle River and Meilleur River. The surrounding mountains are essentially unglaciated, with only a few cirque glaciers. Most of the rivers are turbid, swift mountain streams. Discharge regimes are influenced by melt patterns and basin terrain. Lakes in the park resulted from glacial and fluvial processes and include glacial drift basins and flood plain lakes. Several hot springs also occur in this park. Details of the glacial history, geology, vegetation, climate and detailed lake and river descriptions are found in Ford (1974) and Wickstrom (1985).

Figure 1. Location of Kluane and Nahanni national parks showing major drainages.



Insect Collections

A total of 118 streams and 58 lakes were surveyed within the Kluane park during the summers of 1973-76, while 49 streams and 11 lakes were sampled in the Nahanni park from 1975-78 by R.D. Wickstrom. Lotic habitats were sampled using the kick sampling method with a D-framed net, while lentic habitats were sampled with a Burton-Flannagan type Ekman grab (Burton and Flannagan 1973), and by sweeping through plant and debris along the shore with a D-framed net. In addition, aerial sweep-nets and aspirators were used to collect adults.

Results and Discussion

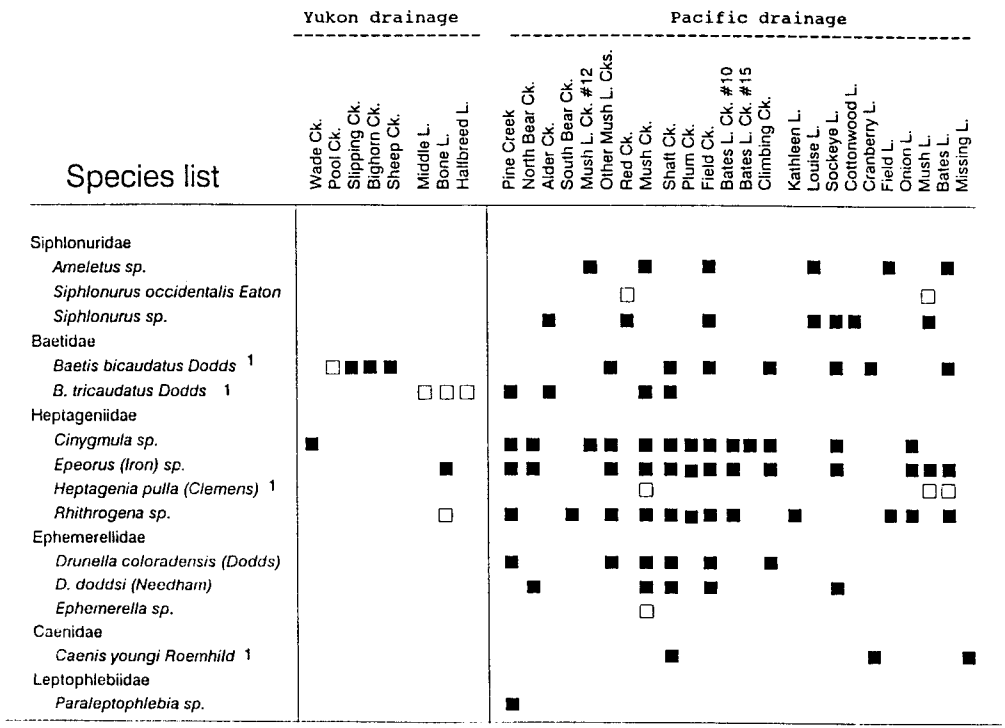
Seven families, 16 genera and at least 20 species of mayflies were collected from both parks (Tables 1 and 2). Four species: *Baetis tricaudatus* Dodds, *Ametropus neavi* McDunnough, *Epeorus (Ironopsis) grandis* (McDunnough) and *Caenis youngi* (Roemhild) are new records for America north of 60° N latitude.

Six families, 11 genera and at least 13 species of mayflies, of which six are new records for the Yukon Territory, were collected from Kluane National Park (Table 1). Waters of the southeast region (Pacific drainage) of the park had higher species richness (13 species) than those of the northern waters in the Yukon drainage (5 species), The north-flowing, glacier-fed streams (e.g., Bighorn and Sheep Creeks) are cold, low in nutrients and very turbid, while lakes in this region are generally shallow (<2 m), and at high altitudes (>1180 m.a.s.l.). These habitats are not likely to be suitable for most mayfly species. In contrast, alpine and sub-alpine lake outflow or inflow streams (e.g., Mush Creek and Field Creek) in the southeast region of the park had the highest species richness. The lakes are deeper and streams are at lower altitude and are further away from their sources, so they receive more nutrients from local run-off. Lake-outflow streams tend to have a more uniform discharge. These conditions appear to provide a more hospitable habitat for aquatic insects.

Mayflies representing seven families, 15 genera and at least 19 species, of which ten are new records for the Northwest Territories, were collected in the Nahanni National Park (Table 2). The higher species richness than in Kluane park may be due to several reasons. This park is in the Mackenzie River watershed, a diverse faunal pool from which species interchanges are possible (Cobb and Flannagan 1980). The central area of the park is thought to have been a glacial refugium, and species may have dispersed from this area to other parts of the park during deglaciation. Finally, the climate is less severe than the Kluane area.

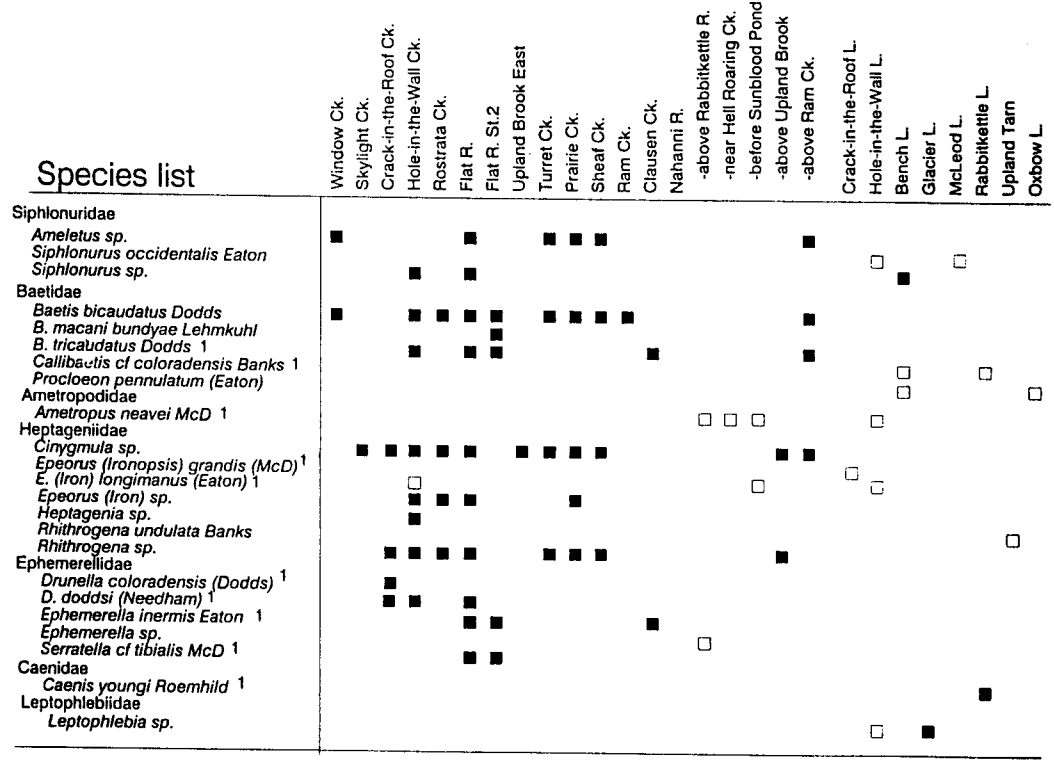
The lakes of Nahanni park had low species richness compared to its streams, and most of the specimens collected at lake sites were adults of uncertain origin. Nymphs were collected in only three lakes. The Flat River and several streams in

Table 1. Mayfly species collected from Kluane National Park lakes and rivers (❑ adults, ■ nymphs).



[1] New record for Yukon Territory. Note: during the conference the Harpers advised us of a manuscript on the mayflies of the Yukon submitted to the Biological Survey of Canada to be included in the Arthropods of the Yukon. They also reported *H. pulla* from the Yukon.

Table 2. **Mayfly species collected from Nahanni National Park lakes and rivers (❑ adults, ■ nymphs).**



1 New records for Yukon Territory.

the Hole-in-the-Wall lake chain had the highest species richness. Streams in the Hole-in-the-Wall alpine lake chain were the least turbid and had the most uniform seasonal flows. The Flat River is a typical swift, turbid mountain stream and the reason for its relatively high species richness is unknown.

The mayfly fauna of the Kluane and Nahanni parks consists of at least three groups of species based on present day distributions: species with a largely Western distribution (e.g., *Drunella* spp. *Serratella tibialis* McDunnough), those whose distribution is north transcontinental (e.g., *Baetis macani bundyae* Lehmkuhl) and those widely distributed from the northwest to southeast (e.g., *Heptagenia pulla* (Clemens), *Baetis tricaudatus*). Opportunities for insect (Flannagan and Flannagan 1982) and fish (Bodaly et al. 1992) species exchanges between present-day Canadian drainage basins existed via temporary water connections at various times during the Wisconsin glaciation. The extent to which the Nahanni glacial refugium acted as a pool for dispersal of mayfly species in Northwestern Canada is uncertain. It is interesting to note that several of the western species of Ephemerellidae are distributed in a similar pattern to the "Nahanni" genetic strain of Lake Whitefish identified by Bodaly et al. (1992).

Although higher in species richness than most regions of northern Canada, when compared to the total mayfly fauna of Canada, relatively few species were collected from the two parks. Many of the streams and lakes sampled did not produce mayflies. This could be the result of inadequate seasonal sampling, as this study was expeditionary and most sites were visited only once. However, the paucity of species is more likely a result of a combination of climate, the uninhabitable nature of the turbid, glacier-fed streams and the altitude and physical nature (e.g., depth) of the lakes. Downes (1962) and McCafferty (1985) suggested that the northern mayfly fauna consists of relatively few, widely distributed species. This would appear to be the case in the present study.

The results of this study are a contribution towards an understanding of the mayfly fauna of the extreme northwest region of Canada. To further the knowledge of this area, intensive sampling with rearing of associated material is required.

Acknowledgements

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