The leeches of some lakes in the Southern Interior Plateau region of British Columbia

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Ten species of leeches are recorded from a series of saline lakes in the Southern Interior Plateau region of British Columbia. The relationship between the distribution and salinity is discussed and experiments on one species described.

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Introduction

There are very few studies on the leeches relating their distribution to the chemical features of the environment. The work of Mann (1955) and Tucker (1958) shows that the chemical composition of the water in which they live can be important in limiting distribution. However, this work was done in Europe and there appears to be no such study on species in North America where, in some areas, a great diversity of water bodies is to be found. This paper presents the results of a study on the leeches in a series of lakes in the Southern Interior Plateau region of British Columbia, a notable feature of many of these lakes being the high conductivity of the water. It is an attempt to investigate the relationship between distribution of leeches and the salinity of their environment.

The Study Area

All collections were made in the Chilcotin and Cariboo parklands areas of the Southern Interior Plateau region of British Columbia (Northcote and Larkin, 1963). The terrain in the study area is a rolling upland around 3,500 feet elevation, with range grassland dotted with patches of aspen and conifers. Munro (1945) gives a more complete description of the region. The area is overlain with glacial till and has outcrops of Miocene and of olive basalts (Holland, 1964). The summers are cool and the winters cold, the means for January and July at Big Creek being −10.6° C (13° F) and 13.3° C (56° F) respectively; the annual precipitation at the same locality is 12.66 inches.

Lakes are abundant in the area and are greatly variable both in size and character. Some are deep with firm margins, others shallow with boggy shores. In the latter there is usually a marginal growth of *Scirpus*. Ponds in groves of trees usually lack emergent vegetation, as do the larger and the most saline of the lakes. The saline lakes have a boulder-strewn edge and bottom, and a muddy shore with a distinct margin of white salt deposit. Some of these contain large populations of Ephydrids and Phyllopods and have a peripheral zone of *Salicornia*. The temporary ponds have an extremely varied fauna, whereas those water bodies which are permanent or semipermanent, and have a low salinity and much marginal vegetation, have the most abundant invertebrate populations. Cattle ranching is one of the main industries in the area and many of the water bodies are disturbed by animals; some with warm springs are fenced off from cattle. There are large populations of water birds, and the temporary and semipermanent lakes often have Amphibia. Fish are only found in the large lakes with access streams.

Material and Methods

Collections of both animals and water were made in the ice-free periods of 1961–68; i.e., between the months of May and October.

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Water samples were collected in the marginal areas. Conductivities and pH were measured using Radiometer meters.

Animals were collected by vigorously sweeping with a pond net in the marginal areas in depths less than 2 metres. Eckman dredge samples from depths greater than 1.5 m contained no leeches. Samples were sorted in the field in white plastic trays and preserved in 5 per cent formalin.

Nephelopsis obscura was used in a laboratory study of survival as related to water salinity. Leeches were collected in the field when the water temperature was 20° C and placed in 250 ml beakers containing 200 ml of natural lake water kept in a constant temperature cabinet at 20° C. The natural waters used in the experiment were of different salinity and were obtained from lakes in the study area. Leeches in the experiment were examined at frequent intervals and time of death recorded. The experiment was terminated after 30 days. Death was defined as the state in which no movement of the leech could be detected on mechanical stimulation at the anterior end.

Field Results

The habitats studied are listed in Tables I and II, together with the details of leech occurrence. In Table I water bodies are arranged in decreasing surface conductivity. A detailed account of the chemical limnology of many of these waters will be given elsewhere (Topping and Scudder, in prep.). Most of the water bodies have sodium as the main cation and carbonate-bicarbonate as the main anions. However, there is extreme variation in chemical composition.

Ten species of leeches were found in the samples, seven of these being fairly common and widely distributed.

Species List

Rhynchobdellæ

Theromyzon rude (Baird)

This species was found in waters up to and including a conductivity of 3,200 micromhos/cm. It is the most saline tolerant of the species taken in the study. It is possible that it cannot breed at the high salt concentrations, for no specimens with cocoons or young were taken above 1,500 micromhos/cm. Adults with young were taken from May 26 to July 13, 1962.

There are three species of *Theromyzon* in North America. *T. rude* has been taken from the nostrils of various species of duck, particularly in Manitoba and the Northwest Territories. It is especially common along the Rocky Mountain duck flyway. Moore (1964) recorded it from various species of grebe in Alberta.

Placobdella ornata (Verrill)

This species is said to suck the blood of aquatic turtles and fish, and its presence or absence is often thought to be determined by the distribution of the host. However, Moore (1964) reported a specimen, partly distended with blood, from among the feathers of a horned grebe *Podiceps auritus* (L.), in Alberta. In the Cariboo parklands area of British Columbia, this leech was taken in five of the smaller bodies of water, all without either aquatic turtles or fish, and with a conductivity not exceeding 1,650 micromhos/cm.

Glossiphonia complanata (L.)

This species, widespread in Canada, is a snail predator and was found in waters with a conductivity under 1,100 micromhos/cm. Newly hatched young were seen on May 26 and juvenile specimens on June 17, 1963.

Oculobdella lucida Meyer and Moore

This species is described as new in Meyer and Moore (1954) from material taken in Whitewater Lake, Manitoba. Specimens in the type locality were taken from various submerged and emergent plants and their debris, in water not exceeding 1 foot in depth. The present captures show that this leech is established also in a number of habitats in British Columbia. It was taken from 10 different water bodies with conductivity in general below 1,300 micromhos/cm. It is possible that it has hitherto escaped attention on account of its evident preference for temporary ponds. Moore

(1964) has reported its occurrence in a number of temporary and permanent ponds in Alberta. He found that it attacked snails, showing a preference for *Physa heterostropha*.

Helobdella stagnalis (L.)

This species is widespread in the Northern Hemisphere, particularly in alkaline, productive bodies of water where it feeds extensively on chironomid larvæ (Mann, 1955; Hilsenhoff, 1963). It has been reported from many parts of Canada. Specimens were taken in waters with a conductivity up to 1,450 micromhos/cm. Young were being brooded in samples taken on May 26, 1963.

GNATHOBDELLÆ

Hæmopis marmoratis (Say)

This species is a macrophagous carnivore widely distributed in North America. One specimen only was taken in the present study in the locality GR3 with water conductivity of 1,130 micromhos/cm at time of capture.

PHARYNGOBDELLÆ

Nephelopsis obscura Verrill

This species is common and widespread in North America and is the most abundant leech in the collections. It is a macrophagous carnivore. The place (Sp. 6) where it was taken most abundantly has a surface area less than 2 acres. It has been taken in this study in waters with a conductivity of 1,130 micromhos/cm and less.

Erpobdella punctata Leidy

This is a carnivorous species common throughout Canada. In this study, its association with dense stands of emergent vegetation suggests that it may have a greater tolerance than other species of low oxygen concentrations resulting from the decay of plant material. It was taken in waters with a conductivity not exceeding 1,650 micromhos/cm.

Dina anoculata Moore

This is a widely distributed macrophagous carnivore. A single specimen was taken in the locality GR3 in water of 1,130 micromhos/cm conductivity.

Piscicola salmositica Meyer

This species is a parasite of the coho salmon and other fish; it has been previously recorded in the rivers of Washington State and British Columbia (Becker and Katz, 1965). It is reported herein from Canim Lake, a large lake which is part of the Fraser River drainage system, in which salmon live. Becker and Katz (1965) report that this leech breeds during the period October to February, when the salmon are on the spawning ground.

Grouping of Habitats

It is possible to divide the smaller water bodies studied (Table I) into three groups according to the leech distribution.

(1) Permanent water bodies with conductivity of marginal water generally above 3,500 micromhos/cm: locality numbers 1–7. In these lakes, no leeches were found in the present study. The lakes are possibly too saline.

(2) Permanent water bodies with conductivity generally between 1,650 and 3,500 micromhos/cm: locality numbers 8–10. The only leech recorded in these waters is *Theromyzon rude*.

(3) Water bodies both permanent and temporary, with a conductivity generally below 1,650 micromhos/cm: locality numbers 11–37. In this latter group, nine species of leech were recorded, but the distribution appears somewhat irregular. This irregularity is possibly the result of incomplete sampling.

Effect of a Changing Environment

In the period 1961–64, no leeches were found in Boitano Lake (conductivity about 4,500 micromhos/cm). In 1964 a small part of this lake was isolated from the rest of the lake by the construction of an earth-fill dam. This was built in a position allowing the isolated part of the lake to receive run-off in the spring of 1965 and 1966. This resulted in a sharp dilution of the contained water, such that the conductivity fell to a value of about 1,000 micromhos/cm, while the rest of the lake remained unchanged. Within a period of six

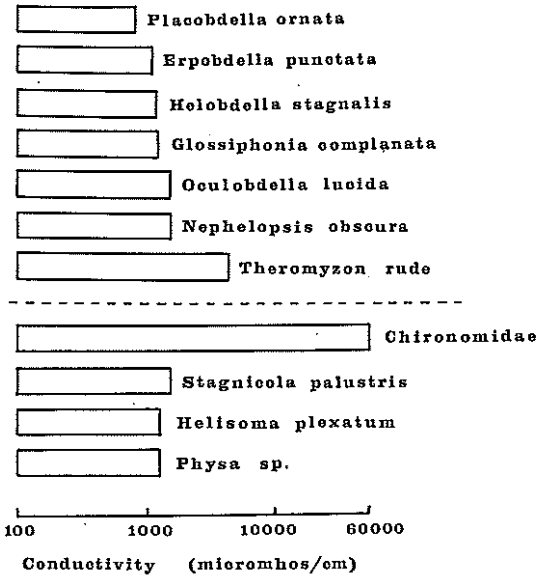

FIGURE 1. Distribution of the commoner leeches in waters of the Southern Interior Plateau region of British Columbia with respect to conductivity and availability of certain food organisms (leeches above, food organisms below).

bian blood, it is possible that *P. ornata* does likewise. Another possibility is that it sucks the blood of birds, since Moore (1964) reported a specimen taken from a horned grebe. If so, the distribution of the leech is limited by factors other than food, for the horned grebe occurs on water bodies where no specimens of *Placobdella* were taken.

Similar remarks apply to *Helobdella stagnalis,* which sucks the blood of chironomid larvæ. Chironomids were found in all water bodies studied, even the highly saline ones, whereas the distribution of *Helobdella* was much more limited.

Glossiphonia complanata and *Oculobdella lucida* are thought to feed primarily on snails and, as Figure 1 shows, the conductivity range of these leeches and of the three commonest gastropods, *Stagnicola palustris* (Miller), *Heliosoma plexatum* (Ingersoll), and *Physa* sp., are about the same, up to 1,250 micromhos/cm. It may be that the distribution of the leeches is governed by that of their food organisms. Alternatively, the same chemical factors may limit both leeches and molluscs.

Nephelopsis obscura was the only species that could be obtained in sufficient numbers for laboratory experiments on its salinity tolerance. It is a macrophagous carnivore which could be expected to flourish on insect larvæ that occur in high conductivity waters. The coincidence of the lethal levels for conductivity with the limits of its occurrence in nature suggest that chemical factors determine its distribution.

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