

Distribution and Species' Composition of Leeches (*Annelida: Hirudinea*) in the Aquatic Habitats of Nepal

HASKO NESEMANN

DEPARTMENT of Hydrobiology, UNIVERSITY of AGRICULTURE,
MAX-EMANUEL STR. 17, A-1180 VIENNA, AUSTRIA

AND

SUBODH SHARMA

DEPARTMENT of Biology,
KATHMANDU UNIVERSITY, P.O. Box 6250, KATHMANDU, NEPAL

Abstract

This paper reports on nine different species of leeches from Nepal belonging to four families. Among the Glossiphoniidae, *Hemiclepsis marginata*, *Batracobdelloides reticulatus*, *Placobdelloides fulvus*, *Alboglossiphonia weberi*, *A. hyalina*, and *Helobdella stagnalis* are recorded, and their distribution and ecology described. Further, *Barbronia weberi* (Salifidae), *Haemadipsa sylvestris*, *H. zeylanica* (Haemadipsidae), and an unidentified specimen (Hirudinidae?) are also dealt with.

Introduction

Relatively very little is known about the freshwater leech fauna of Nepal. Of studies conducted in the neighbouring country of India, however, the work by Baugh (1960a, 1960b), Bhatia (1930, 1934, 1939), Chandra (1976, 1977, 1983a and 1983b), Harding and Moore (1927), and Ramanandan et al. (1989) may be mentioned.

Except for Yadav and Mishra (1982), who studied the freshwater leech fauna in Kathmandu, and Rundle et al. (1993), who mentioned their presence in the Annapurna and Langtang regions, no other references relating exclusively to Nepal are known to the authors. A recent contribution that touches on leeches in Nepal has come from Neseemann (1995). Leeches are, however, associated with ancient Nepalese literature. Leech, in Nepali called *juko*, appears to have been derived from Sanskrit, *jaluka*, which means 'having water at its home'.

Study Area

Nepal is situated between the latitudes 26°22' and 30°27'N and longitudes 80°4' and 88°12'E, with an average length of 886km and width of 193km. Geomorphologically, the country is sub-divided as follows: the alluvial *Tera*i plain varies in elevation from 100 to 200masl. The Churia Hills are the first range in front of the plains, with sandstone rising up to 1,300masl. They form a continuous range from east to west except in some places where they merge with the Mahabharat Range and in other places they form Dun valleys, also

called the Inner *Terai*. The Mahabharat Mountains of granite and schist rise to the west with some minor breaks. North of the Mahabharat and south of the high Himalayas lies the midland, consisting of lower hills, valleys, and upper and middle valleys and mountains. North of the High Himalayas and south of the Tibetan plateau are found the Inner Himalayan valleys.

The area studied covered the tropical to subalpine zones ranging from an altitude of 85m in the Central *Terai* to 3,800masl in the Inner Himalayan zone of the Tibetan Plateau (Sharma 1996). The eastern Midland river investigated were the Bhothe Koshi near Namche Bazaar, extending up to the valley of the Arun basin at Tumlingtar. The central Midland rivers crossing the Kathmandu-Kodari Rajmarg and the bodies of water in the Kathmandu Valley were also included, together with the central lowland rivers of the *Terai*. This research also extended from the lower Marsyangdi basin to the Pokhara Valley and up to the Tinau watershed in samplings along the course of the Andhi *Khola*. The virgin rivers of the Far-western and Mid-western zones of the country, such as the Midland tributaries of the Mahakali and lowland tributaries of the Karnali, together with the Surkhet Valley and Phyuthan, were also investigated. The Kali Gandaki River which flows through the world's deepest gorge and its tributaries bordering Gulmi and Syangja districts in the Western zone of Nepal were also sampled during the present research.

General Distribution of Aquatic Leeches in Nepal

More than 180 sites in 100 rivers were investigated, including all the major river systems. In the Sapta Gandaki river system, aquatic leech fauna were observed in the Chudi *Khola* at Bimalnagar in Tanahun district; the Kumle *Khola* at Khairenitar in Tanahun; Phewa *Tal* (lake) and Begnas *Tal* (lake) in the Pokhara Valley; Dhumba *Tal* (lake) near Jomsom in Mustang; the Andhi *Khola* and Araundi *Khola* at Putalibazar in Syangja; the Bakhre *Khola* (Kharjyang *Khola*) at Kharjyang in Gulmi; the Karra *Khola* and Hetauda Fish Pond at Hetauda in Makwanpur; Katuwa *Khola* (Babai river system) at Deukhuri in Dang; the Sukaura *Khola* near Butwal in Rupandehi; and Tau Daha pond at Pharping in the Kathmandu Valley.

Descriptions of the Sites

Dhumba *Tal* is situated in the rainshadow region of the Inner Himalayas. The annual rainfall in the Inner Himalayas is low and vegetation, when present, sparse and xerophytic. Tau Daha (pond), the Chudi *Khola*, Kumle *Khola*, Phewa *Tal*, Begnas *Tal*, Araundi *Khola*, and Andhi *Khola* are located in the Midland valleys and hills. The Katuwa *Khola*, Karra *Khola*, and Hetauda Fish Pond are all situated in the Inner *Terai*; the Sukaura River is the only true *Terai* river where leeches are found. The Midland rocks are less resistant to erosion and are weakly to moderately metamorphosed, the land being amenable to terrace cultivation. Having a temperate climate, this zone is the most heavily populated area of Nepal, with about 52 per cent of the total population (Sharma 1990). The lowest parts of the central midland, such as the Pokhara Valley, feature some ancient lakes (Phewa *Tal*, Begnas *Tal*, etc.) which are found in structurally controlled

valleys. The Chudi *Khola*, Kumle *Khola*, Araundi *Khola*, and Andhi *Khola* were some of the midland rivers observed during the present investigation that flow through lower midland valleys. The southernmost part of the country is a flat plain, with soil composed mainly of sand, silt, and clay. The Sukaura *Khola* near Butwal is a typical river of this region.

Specimens and Methodology

The method used in collecting leeches was fairly simple, namely, picking the animal by hand from its sub-stratum. Proper care has to be taken, for it holds on firmly, and careless picking may cause rupturing of the delicate parts. Initially the leeches were properly fixed in 15 per cent ethanol and later transferred to 70 per cent ethanol for preservation. Collection of the specimens was carried out by Ursula Grasser, Wolfram Graf, Sanjay Khanal, Otto Moog, Hasko Nesemann, Thomas Ofenböck, Klaus Grasser, Gerhard Hutter, Bandana Pradhan, Andreas Römer, Astrid Schmidt-Kloiber, and Subodh Sharma on different occasions from November 1993 to April 1996. Identification of the specimens was done by Hasko Nesemann at the Department of Hydrobiology in Vienna with the aid of the identification keys of Harding and Moore (1927), Chandra (1983a and 1983b), and Sawyer (1986).

Results

Family Glossiphoniidae

Hemiclepsis marginata

Distribution: *H. marginata* is distributed widely in palaeartic and oriental regions. It is known from Europe, the eastern Mediterranean countries, Russia, Japan, and the Indian subcontinent. In India, it has been recorded in several localities in the Ganges River basin and Western Ghats (Bombay). It is also known from the Upper Indus River basin. In Nepal, *H. marginata* was mentioned for the first time as being located in Janakpur, Chitwan, and Chukey Mukei by Harding and Moore (1927).

Ecology: Aquatic leeches are temporary ectoparasites of fishes and amphibians. In India, this species has been recorded as a parasite of the freshwater mud turtle *Trionyx gangetica* (Singhal et al. 1985). According to Chandra (1983a) it also attacks certain molluscs. During the present investigations, it was found in the slowly running effluent of Phewa Lake. This habitat represents a metapotamal region, which is rich in typical species of lowland rivers.

Batracobdelloides reticulatus

Distribution: *B. reticulatus* is known only from several localities in India. The hitherto known records are from the Indus River basin and from Maharashtra. The material mentioned above is the first record for the Ganges River basin and for Nepal. A closely related species is the European *B. moogi*, which differs by

virtue of the absence of papillae. It is known from the Carpathian basin in Hungary, Austria, and Slovakia.

Ecology: This leech inhabits the litoral zone of the lakes in the Pokhara basin. The crop caeca of the specimens were filled with blood. It seems to be an ectoparasite of the Indian ramshorn snail, *Indoplanorbis exustus*, which has been collected numerously in the same habitat. Harding and Moore (1927) reported *B. reticulatus* from the mantle of a bivalve species of the Anodontinae. Chandra (1983a) mentioned this leech as being a parasite of molluscs.

Placobdelloides fulvus

Distribution: *P. fulvus* is known only from Manbhum district in Bihar in northern India (Harding and Moore 1927, Chandra 1983a). It was found during the present investigations for the first time in Nepal. Here it occurs in small rivers and streams of the Midland. It was also collected in the litoral zone of an artificial pond.

Ecology: This leech occurs mainly in unpolluted streams of water quality class I-II to II. In one case it was collected in a polluted river of water quality class III. The food of *P. fulvus* remains unknown. According to Chandra (1983a), it is an ectoparasite of aquatic turtles. In our opinion, it may be a predator on small molluscs.

Alboglossiphonia weberi

Distribution: *A. weberi* is the most common member of the family Glossiphoniidae, known from nearly all freshwater bodies in India, Pakistan, Burma, and Sumatra. In Nepal, its occurrence was already noticed by Harding and Moore (1927) in Janakpur. During our investigations, it was collected from various types of running and stagnant water all over Nepal. It is restricted to the lowlands and midlands.

Ecology: This leech was mainly found in the lentic zones of streams and rivers as well as in the litoral zones of lakes. It is a predator of small aquatic molluscs. Harding and Moore (1927) and Chandra (1983a) mentioned *A. weberi* as a predator of aquatic beetles. This leech tolerates organic pollution, its saprobic range including water quality classes I-II to III.

Alboglossiphonia hyalina

Distribution: The specimen of *A. hyalina* collected in the Kathmandu Valley is the first record of the fauna in Nepal and the Indian subcontinent.

Ecology: In Austria, Hungary, and Germany, *A. hyalina* has been found to be an ectoparasite of certain pulmonate snails, mainly Lymnaeidae, e.g., *Lymnaea stagnalis* and *Stagnicola corvus*. In Nepal, *A. hyalina* is associated with species of the genera *Radix*, *Gyraulus*, and *Tricola*. Here, it occurs in an unpolluted spring, representing the limno-crenal region, of water quality class I-II.

Helobdella stagnalis

Distribution: Holarctic region. In India, *H. stagnalis* is known only from the transitional zone of the palaeartic and oriental regions. It was listed for the Himalayan fauna of Himachal Pradesh, Jammu and Kashmir by Harding and Moore (1927) and by Chandra (1983b). All known localities are from tributaries of the Indus River system. In Nepal, *H. stagnalis* was found for the first time during the present studies. Thus the Nepalese specimens are the first records from the Ganges River basin. It is restricted to the Inner Himalayan zone (Kali Gandaki River basin) and occurs at altitudes of more than 2,500masl.

Ecology: This species was collected from the limnocrenal and metarhithral region of running and stagnant waters. Together with the amphipod, *Gammarus lacustris*, it is a true member of the holarctic fauna of Nepal. *H. stagnalis* is a predator of small invertebrates. It lives in Nepal in the water quality class I-II, whereas in Europe it tolerates high organic pollution.

Family Salifidae*Barbronia weberi*

Distribution: *B. weberi* is distributed widely all over the oriental region, from the Indus River basin (Afghanistan, Pakistan) in the west to Borneo, Celebes, and Japan in the east. In India it is known from the Western Himalayas in Jammu and Kashmir and Himachal Pradesh. It also occurs in Central India in Madhya Pradesh. All localities known from the Indian subcontinent are restricted to the mountains and hills between the two river systems of the Ganges and Indus. In Nepal it was recorded for the first time in the Kathmandu Valley by Harding and Moore (1927). The present investigations showed its distribution from the Central to Mid-western regions in Nepal. Recently, *B. weberi* was introduced to Europe where it was recorded in Austria, Germany (Nesemann 1996), and Great Britain (Sawyer 1986). Its relationship to the African *B. assiuti* (Hussein and El-Shimy 1982), described from the River Nile in Egypt, remains doubtful.

Ecology: This is the most common leech species in Nepal. It was collected from various types of running water and from the litoral zone of several lakes and ponds. In the central region, it was found to be highly abundant in the Bagmati River system in Kathmandu (1,350m) and Hetauda (465m). In the Mid-western region it was found plentiful in lakes and rivers from the Katuwa *Khola* (1,200m) to the Sukaura *Khola* (188m). In the pharynx of preserved specimens, numerous Tubificidae were found and they alone. This euryoecious leech occurs in slightly polluted rivers (water quality class I-II) as well as in bodies of water with high organic pollution (water quality class III-IV).

Family Hirudinidae

A very small hirudinid-like leech was collected from the Mahadev *Khola* at Budhanilkantha (Kathmandu Valley) by B. Pradhan. The elongated body is dorsoventrally flattened with quinqueannulate somites. The male and female

genital pores are separated by five annuli. The cranial sucker is distinctly separate from the anterior part of the body, as in many species of the Piscicolidae. The mouth porus is situated centrally in the sucker, and the head bears eight eyes. This leech may be a juvenile specimen of a member of the Hirudinidae. It could not be identified because of the number of eyes, which differs from all known Hirudinidae and Haemopidae.

Family Haemadipsidae

Haemadipsa sylvestris

This species of land leech was collected along the banks of one river (Budhi Rapti) and one pond (Tau Daha) of the Inner Terai and Kathmandu Valley respectively. It is known from the Western and Eastern Himalayas, and on to the North-eastern Frontier Agency in India (Chandra 1983a). The specimens found during the present study are the first recorded from Nepal.

Haemadipsa zeylanica

A single specimen was collected by G. Hutter from Solukhumbu district (near Boskom Gumba) in the Eastern region. It had already been reported from Nepal by Chandra (1983a).

Discussion

The occurrence of only four species of aquatic leeches (*Hemiclepsis marginata*, *Alboglossiphonia weberi*, *Barbronia weberi* and *Poecilobdella granulosa*) was previously known for Nepal (Chandra 1983a). All records are based on occasional collections from the beginning of the 20th century (Harding and Moore, 1927). Yadav and Mishra (1982) also reported the presence of four leech species in the Kathmandu Valley.

In the present study it has been observed that the leeches in Nepal are distributed more towards the mountains and hill streams. Their distribution in the lowlands is unclear, and without extensive research there nothing can be said with certainty.

Acknowledgements

The authors wish to express their thanks to collectors who put specimens at our disposal for the investigation. Many thanks are due on Dr Otto Moog and the Austrian Academic Exchange Service (ÖAD) for providing financial support.

References

Baugh, S.C., 1960a. 'Studies on Indian Rhynchobdellid Leeches I'. In *Parasitology* 50: 287-301.

- Baugh, S.C., 1960b. 'Studies in Indian Rhynchobdellid Leeches II'. In *Zoologischer Anzeiger* 165: 468-477.
- Bhatia, M.L., 1930. 'Sur une nouvelle hirudinée rhynchobdelle, *Glossiphonia cruciata* n. sp., provenant du vivier à truites d'Achha Bal, Kashmir'. In *Annales de Parasitologie* 8 (3/4): 344-348.
- Bhatia, M.L., 1934. 'Nouvelle sangsue rhynchobdellide *Glossiphonia lobata* n. sp. de l'établissement de pisciculture d'Achha Bal Kashmir'. In *Annales de Parasitologie* 12 (2): 121-129.
- Bhatia, M.L., 1939. 'On Some Leeches from the Dal Lake, Kashmir'. In *University of the Punjab Lahore, Department of Zoology Bulletin* 2: 1-17.
- Chandra, M., 1976. 'A Small Collection of Leeches from Maharashtra State, India'. In *Records of the Zoological Survey of India* 69: 325-328.
- Chandra, M., 1977. 'A Check-list of Leeches of Himachal Pradesh, India'. In *Records of the Zoological Survey of India* 73 (1-4): 189-195.
- Chandra, M., 1983a. 'A Check-list of Leeches of India' In *Records of the Zoological Survey of India* 80: 265-290.
- Chandra, M., 1983b. 'The Leech Fauna of the Jammu Region of Jammu and Kashmir State, India'. In *Records of the Zoological Survey of India* 81: 289-298.
- Hussein, M.A. and El-Shimy, N., 1982. 'Description of *Barbronia assiuti* sp. (*Hirudinea*) from Assiut, Egypt'. In *Hydrobiologia* 94:17-24
- Harding, W.A. and Moore, J.P., 1927. 'Hirudinea'. In Shipley, A.E. (ed.), *The Fauna of British India, Including Ceylon and Burma*. 1-302. New Delhi: Today and Tomorrow's printers and publisher.
- Nesemann, H., 1995. 'On the Morphology and Taxonomy of the Asian Leeches (*Hirudinea*: Erpobdellidae, Salifidae)'. In *Acta Zoologica Academiae Scientiarum Hungaricae* 41 (3): 165-182. Budapest.
- Nesemann, H., 1996. Die Egel und Kriebsegel (*Clitellata*: *Hirudinea*, *Branchiobdellida*) in den Einzugsgebieten von der Oberen Donau und des Rheins unter besonderer Berücksichtigung der Fauna Österreichs. In *Lauterbornia* (forthcoming).
- Ramanandan, S.K.; Ramachandran, P.; and Janardadan, K.P., 1989. '*Trypanoplasma ompoki* sp. n. from Freshwater Fishes in Kerala, India, with Observations on Its Vector-Phase Development and Transmission'. In *Acta Protozoologica* 28 (3/4): 293-302.
- Rundle, S.D.; Jenkins, A.; and Ormerod, S.J., 1993. 'Macroinvertebrate Communities in Streams in the Himalaya, Nepal'. In *Freshwater Biology* 30, 169-180.
- Sawyer, R.T., 1986. *Leech Biology and Behaviour, Vol II Feeding Biology, Ecology and Systematics*. Oxford.

Singhal, R.N.; Davies, R.W.; and Shah, K.I., 1985. 'The Taxonomy and Morphology of the Leeches (Hirudinoidea: Glossiphoniidae) Parasitic on Turtles from the Beas River (India) Including Descriptions of Two New Species and One Redescription'. In *Zoologischer Anzeiger* 215 (3/4): 147-155.

Sharma, C.K., 1990. *Geology of Nepal Himalaya and Adjacent Countries*. Kathmandu: Sangeeta Sharma.

Sharma, S., 1996. 'Biological Assessment of Water Quality in the Rivers of Nepal'. Ph.D. Thesis, Department of Hydrobiology, University of Agriculture, Forestry and Renewable Natural Resources, Vienna.

Yadav, U.R. and Mishra, P.N., 1982. 'Studies on the Freshwater Leeches (Annelida: Hirudinea) of Kathmandu Valley, Nepal'. In *Journal of Natural History Museum*, Vol. 6 (4): 119-123.