

Notes on the ecology of the Asian medicinal leech *Hirudinaria manillensis* (Hirudinea: Hirudinidae)

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With 1 figure

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An unidentified blood-sucking jawed leech was discovered in a sample of imported annelids at the Leech Farm ZAUG in Biebertal (Germany). The species shows the following characteristics: length of adult animals 130–140 mm, width 10–13 mm, fully extended up to 200 mm long. Dorsal colour dark brown with longitudinal stripes of black and orange pigmentation, ventral side red-orange. Jaws monostichodont with salivary papillae, caudal sucker large, gonopores separated by five annuli; five pairs of eyes. Locus typicus: Dominican Republic, flooded grasslands; most leeches were found attached to the belly and legs of cows, where they suck blood. This leech was found to be identical with the taxon *Hirudinaria manillensis* Lesson, 1842, also known as the Asian medicinal leech.

1 Introduction

During the first half of the nineteenth century, the commercial trade in medicinal leeches (*Hirudo medicinalis* Linnaeus, 1758 and related species) became a major industry. European leech gatherers typically collected their "blood-sucking worms" by wading in natural, shallow ponds and allowing *Hirudo*-individuals to attach themselves to their legs. As many as 2500 leeches per day could be harvested in this way so that the medicinal leech became almost extinct in Europe (Herter 1968, Sawyer 1986). When the natural supply was largely exhausted, leech farms were established in France and Germany. To feed the cultivated blood-sucking annelids, elderly horses were driven into the water systems; the mammals usually died of blood loss.

At the commercial leech farm ZAUG in Biebertal, Germany, in a sample of imported annelids from the Caribbean, individuals were discovered that superficially resemble the medicinal leeches *H. medicinalis* Linnaeus, 1758 and *H. verbana* Carena, 1820, species that are maintained and bred in Europe in artificial warm-water ponds (Kutschera 2004, 2006). A detailed investigation of these semiaquatic hirudineans revealed that these annelids are identical with the poorly characterized Asian medicinal leech *Hirudinaria manillensis* Lesson, 1842. In this report we describe this taxon and give a short account of its natural habitat and feeding behaviour.

2 Material and Methods

In February 2005 Mr. A. Knecht collected about 30 large leeches that he had discovered in flat freshwater ponds at the Northern coast of the Dominican Republic (close to the town Nagua). Two weeks later (March 2005) these annelids arrived alive in the Leech Farm at Biebertal (Germany), where the animals were maintained in freshwater aquaria. Ten living leeches were investigated in the laboratory of the Institute of Biology (University of Kassel, Germany) and thereafter preserved in 70 % ethanol. Single jaws were prepared under a dissecting microscope, stored in ethanol and analyzed by fluorescence microscopy.

Feeding experiments were carried out with individuals that were relatively flat, indicating that the crop was only partially filled with blood. Morphological features, including annulation, colour pattern, eye number and structure of the skin were all examined in the laboratory on mature live and preserved (70 % ethanol) specimens.

3 Results

Identification. All specimens investigated were unequivocally identified as belonging to the genus *Hirudinaria*, Whitman, 1886 (Syn.: *Poecilobdella*, Blanchard, 1893), that is characterized as follows: large, cylindrical or dorsoventrally flattened blood-sucking leeches, jaws monostichodont with salivary papillae, median longitudinal furrow on ventral side of the upper lip, South-East Asia. Type species: *Hirudinaria javanica*, Wahlberg, 1856; Congenitor: *Hirudinaria manillensis*, Lesson 1842 (Soos 1969, Sawyer 1986).

External morphology. The length of mature leeches at rest is 130–140 mm with a greatest width of 10–13 mm. Fully extended leeches can reach a length of 200 mm. The shape of the body is similar to that of European medicinal leeches (*Hirudo medicinalis*, *H. verbana*) and the "cattle leech" *Limnatis nilotica* (Richardson, 1969), but, under laboratory conditions, *H. mallinensis* is less agile than these blood suckers. The colour of the body is brown with black and orange, interrupted longitudinal stripes. Ventral surface orange, with a pair of black marginal stripes (Fig. 1 A, B). Male and female gonopores are separated by 5 annuli; head with 5 pairs of eyes. On the ventral side of the upper lip a conspicuous, narrow furrow is apparent (Fig. 1 C). Within the oral sucker, three jaws with numerous monostichodont teeth are present (Fig. 1 D) that are characterized by several rows of large, drop-like salivary papillae. Based on these features (and a mitochondrial DNA-sequence-analysis, with reference to data of Borda & Siddall, 2004, unpublished results) these leeches were identified as the Asian medicinal leech *Hirudinaria manillensis* Lesson, 1842, also known as the "buffalo leech".

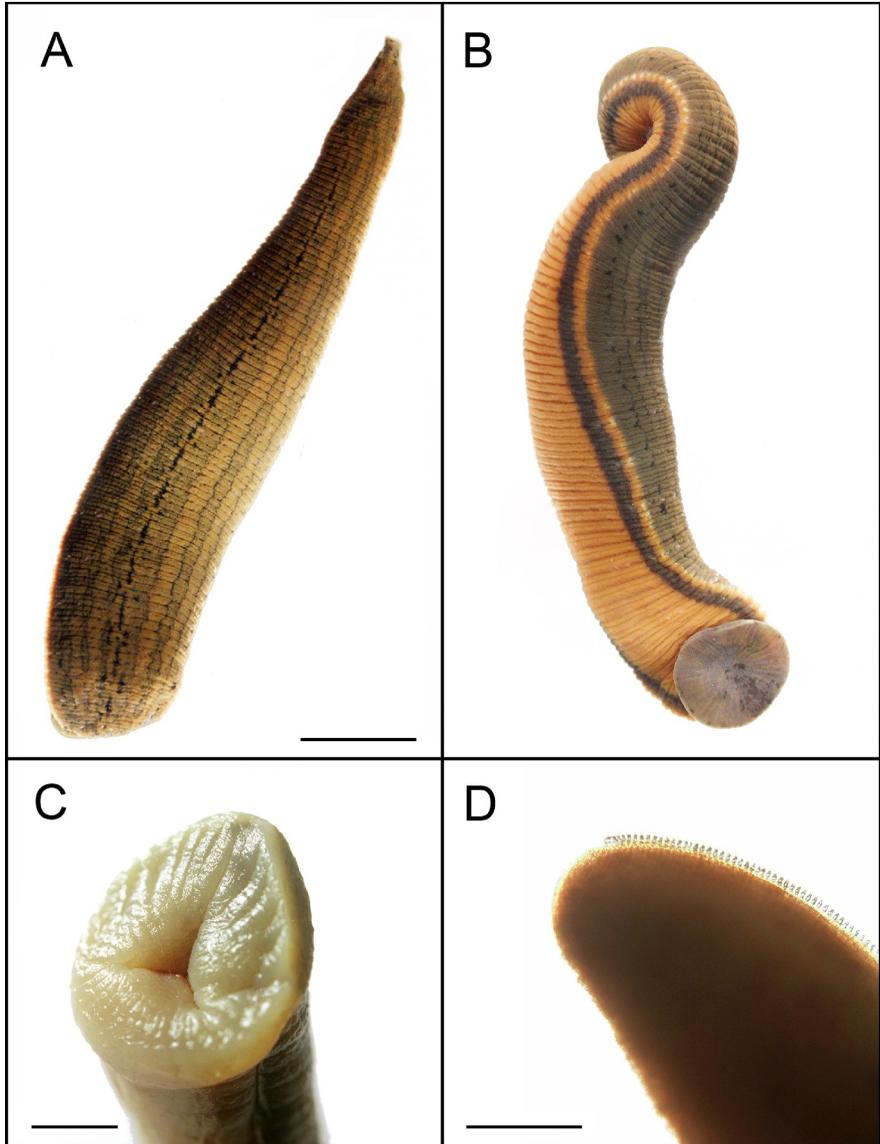


Fig. 1: Dorsal (A) and ventral (B) view of an adult live individual of *Hirudinaria manilensis*, Lesson 1842. Bar = 1 cm. The anterior sucker (mouth) of a preserved individual (70 % ethanol) is characterized by a furrow in the upper lip (C). Bar = 0.2 cm. Light micrograph of an isolated jaw, showing numerous monostichodont teeth (D). Bar = 100 μ m

Ecology. All leeches were collected in large, flat, stagnant freshwater ponds in the Dominican Republic, close to the town Nagua. The surface areas of these freshwater ecosystems are up to 250 ha; depth of the water 60–90 cm, temperature from 23 °C (January) to 28 °C (June); relative humidity of the air 80–90 %. These aquatic areas (flooded grasslands) are used by local peasants to maintain large herds of domesticated cows (*Bos* sp.). Most of the *H. manillensis*-individuals were observed attached to the legs and belly of cows, usually in the process of sucking blood. Hungry leeches also attack local humans. In freshwater lakes and streams of the surrounding areas no "Asian cattle leeches" were found, i.e., *H. manillensis* is restricted to this specific habitat. In the laboratory, these leeches attach to and pierce the skin of humans.

Since this species superficially resembles the "horse leech" (*Haemopsis sanguisuga* Linnaeus, 1758), an annelid that feeds on oligochaetes (Kutschera & Wirtz 2001), hungry *H. manillensis*-individuals were exposed to earthworms. No attack was observed, i.e., oligochaeta are ignored by this species (Fig. 1 A, B).

4 Discussion

The Asian medicinal leech was described by Lesson (1842) as *Hirudo manillensis* and thereafter assigned to the morphologically similar genus *Limnatis* (Soos 1969). In 1893, R. Blanchard established the new genus *Poecilobdella* for this taxon; eight years later, J. P. Moore described the leech discussed here as *Poecilobdella blanchardi*, Moore 1901. As discussed in detail by Sawyer (1986), the genus name *Hirudinaria*, established by Whitman (1886), has priority so that the valid taxon name is *Hirudinaria mallinensis* Lesson, 1842.

In a comprehensive multidisciplinary study, Sawyer et al. (1998) presented evidence that the Caribbean leech, widely known under the genus name *Caribeobdella*, described as *Poecilobdella blanchardi* by Moore in 1901, is identical with the taxon *Hirudinaria mallinensis*, Lesson 1842. This "buffalo"-annelid has been used as the medicinal leech in India and neighbouring countries of South-East Asia. Moreover, the authors have shown that the leech *H. mallinensis* is an introduced species from India that is now widely distributed in the Caribbean. These large, aggressive leeches arrived from ships that carried labourers from colonial India starting around 1845. On most of these ships leeches were on board for medicinal purposes (Sawyer et al. 1998).

The "Asian cattle leeches" described here are unequivocally identical with the taxon *Hirudinaria mallinensis* Lesson, 1842. This conclusion is based on morphological studies (Fig. 1 A–D) and mitochondrial DNA-sequence data (DNA-barcoding, unpublished results). These large blood-feeding annelids are currently maintained in freshwater aquaria at the leech farm in Biebertal (Germany). We consider it unlikely that this tropical warm-water leech is capable of

establishing populations in the wild in Germany, because the average temperature in this country is too low (in their natural habitat, the water temperature only rarely drops below 23 °C). However, it can not be excluded that single *H. manillensis*-individuals will escape from private aquaria during hot summers, and thereafter may be found in a freshwater ecosystem in Germany.

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