Lauterbornia 52: 163-169, D-86424 Dinkelscherben, 2004-12-30

Feeding behaviour and reproductive biology of the semiaquatic leech *Trocheta haskonis* (Hirudinea: Erpobdellidae)

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With 5 figures

Keywords: Trocheta, Hirudinea, feeding behaviour, reproductive biology
Schlagwörter: Trocheta, Hirudinea, Ernährungsverhalten, Vermehrung, Lebenszyklus

The life cycle of *Trocheta haskonis* Grosser 2000 is outlined. Observations on feeding behaviour and reproduction were made on animals kept in aquaria at room temperature. Adult leeches spend most of their time on land (moist earth) where they hunt for earthworms. The prey organisms are swallowed whole or in parts. In captivity, young leeches were sometimes eaten by adults. Copulation by means of reciprocal transfer of pseudospermatophores is described. Cocoons are deposited into the moist soil. Juvenile leeches hatch four weeks later and thereafter crawl into the water where they feed on small oligochaetes and insect larvae.

1 Introduction

Leeches of the genus *Erpobdella* are widely distributed throughout freshwater habitats in Europe. In rivers receiving moderate amounts of organic pollutants, the type-species *E. octoculata* often occurs in high population densities. This is due to the fact that these agile predators preferentially feed on *Chironomus* larvae and *Tubifex* worms, prey organisms that thrive in these aquatic environments. The feeding strategies, population dynamics and life cycles of *E. octoculata* and related species have been analysed in detail (Elliott & Mann 1979, Sawyer 1986, Kutschera 1983, 2003, Kutschera & Wirtz 2001).

Erpobdellid leeches of the genus *Trocheta* are larger and less common than *E. octoculata* and its other four European relatives *E. testacea, E. nigricollis, E. monostriata, E. vilnensis*. Hartley (1962) described the life cycle of a British population of *Trocheta subviridis* and refered to an earlier report on *T. bykowskii* published by Mann (1959). These studies were corroborated and extended by Kutschera (1986), who analysed a German population of *T. bykowskii* (later identified as *T. pseudodina*, see Nesemann & Neubert 1999) in detail.

Four years ago, Grosser (2000) described a new, unusually large *Trocheta* species that he had found in flood plains along of the river Elbe (Germany). In

this report we document aspects of the feeding behaviour and reproductive biology of this uncommon leech.

2 Materials and Methods

Leeches were collected by hand from the underside of roots and stones in water-filled submerged sinks (flooded areas) along small streams of the river Elbe (Upper Saxony, Germany). Most specimens were found during early spring (February/March) in the years 2000 to 2003 at the *locus typicus* of *T. haskonis* Grosser, 2000. Some animals were maintained in trays of rainwater in aquaria at room temperature (18–22 °C). The containers (Volume: 20 L) were equipped with stones, roots and a land area (sand/earth); the depth of the water was ca. 5 cm.

Feeding experiments were carried out with juvenile and adult *T. haskonis* that were starved for 5 to 7 days. During periods of observation and documentation, the leeches were placed in large petri dishes (diameter: 20 cm), half filled with rainwater (depth ca. 2 cm). As prey organisms, *Tubifex* sp., *Chironomus* sp., earthworms (*Lumbricus terrestris, L. castaneus*), and dead fish (*Gasterosteus aculeatus*) were offered.

All observations and experiments were repeated at least three times with different leeches.

3 Results

Hungry *Trocheta haskonis* generally "circumnavigate" their environment. If the leech contacts one of its prey-species, the predator grasps its victim and attempts to swallow it. Since *T. haskonis* is jawless, it must suck in its prey whole. Juvenile leeches (20–40 mm in length) swallow *Tubifex* worms and chironomid larvae in a matter of seconds. We suggest that *Tubifex* and *Chironomus* are the major prey of young *T. haskonis* in the field, but proof for this assumption is currently lacking.

Adult leeches are over 10 cm long when contracted and prefer earthworms over *Tubifex* and *Chironomus*. A typical feeding episode with the small earthworm species *Lumbricus castaneus* as prey organism is shown in Fig. 1 A–F. The leech grasps its prey in the mid-region and attempts to swallow it. Aided by muscular contractions of the pharynx, the earthworm is separated into two halves of unequal size. Finally, the leech swallows the smaller fragment of its prey organism. When a larger earthworm (*Lumbricus terrestris*) is offered to a mature hungry leech, the prey organism is rapidly attacked, but the predator is unable to overcome its prey (Fig. 2 A, B).

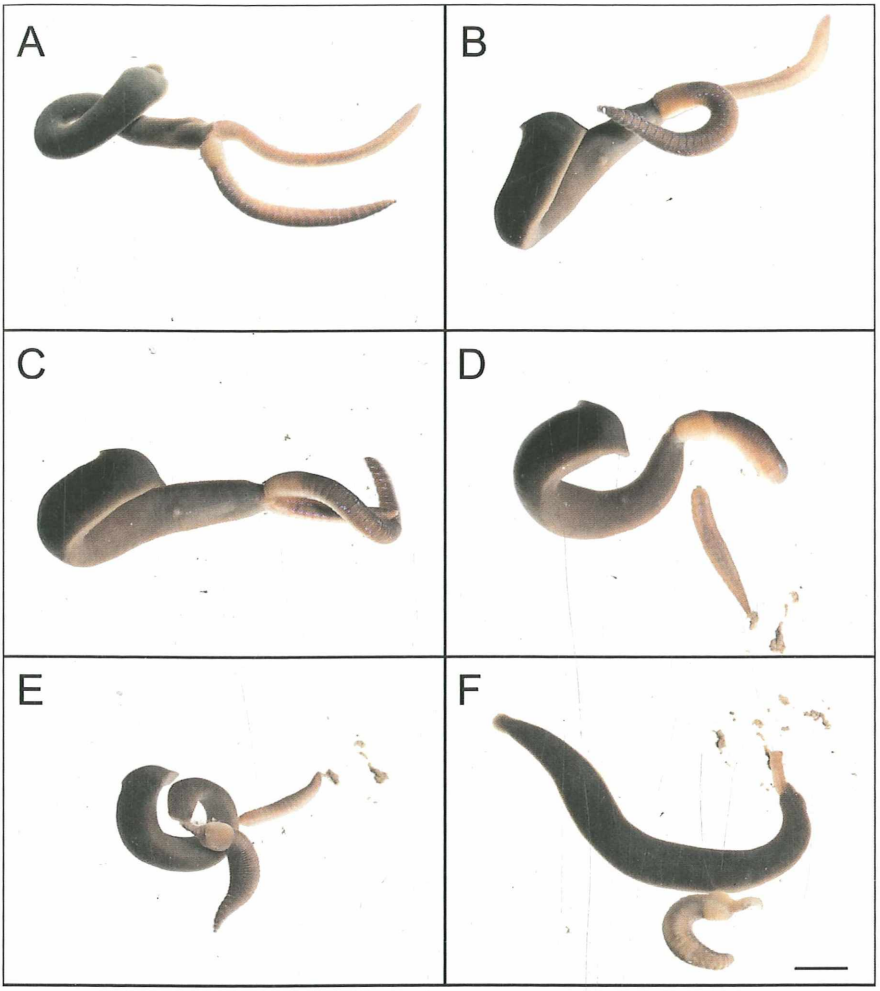

Fig. 1: Feeding behaviour of an adult *Trocheta haskonis*. The leech seizes an earthworm (*Lumbricus castaneus*) and attempts to swallow it (A–C). The prey organism is separated into two parts (D, E) and a fragment of the earthworm is swallowed (F). Bar = 1 cm

We frequently observed that adult hungry *T. haskonis* swallowed young conspecifics (length ca. 1–3 cm), i.e., cannibalism was regularly recorded in leech populations maintained in captivity.

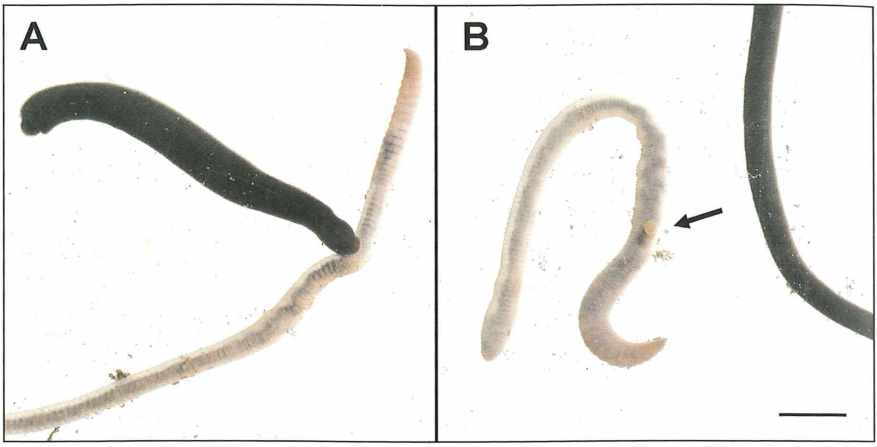

Fig. 2: Adult *Trocheta haskonis* that sucks on the body of an earthworm (*Lumbricus terrestris*) (A). A few seconds later, the predator leaves its prey and a wound (arrow) is visible (B). Bar = 1 cm

Dead fish (*Gasterosteus aculeatus*) are ignored by hungry *T. haskonis*, but *Erpobdella octoculata*, starved for the same period of time, rapidly started to feed on the decaying body of this aquatic vertebrate (Fig. 3).

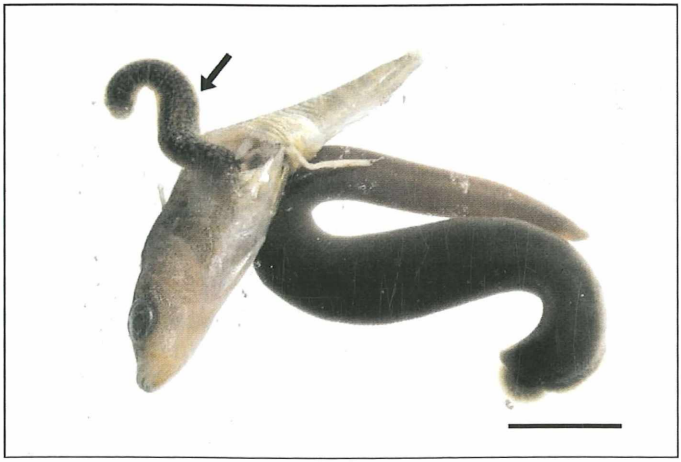

Fig. 3: The semiaquatic leech *Trocheta haskonis* does not attack a dead fish (*Gasterosteus aculeatus*), whereas the aquatic leech *Erpobdella octoculata* creeps into the body and feeds on the fluids of the vertebrate (arrow). Bar = 1 cm

The reproduction in the natural habitat is unknown. In aquaria sexually mature *T. haskonis* (with a visible clitellum) proceeded to copulate in the shallow water (depth: 2–5 cm). Two leeches would attach to each other and transfer one pseudospermatophore (length ca. 15 mm) that is inserted into one of the two accessory genital pores on the ventral side of the partner (Fig. 4). Two days later, the attached spermatophores disappeared from the body of the annelid.

About four weeks after reciprocal transfer of the pseudospermatophore (usually 1–2 per leech) the animals started to deposit cocoons into moist soil. The egg-capsules of *T. haskonis* are variable in shape and size (Fig. 5): flat cocoons are about 11 x 7 x 3 mm (largest length measured so far: 14 mm). However, isodiametric cocoons (7 x 7 x 7 mm) were also deposited, but only some of the egg-capsules displayed this unusual shape. The cocoons contain 3–8 eggs, from which about five juvenile leeches hatch ca. 4 weeks after cocoon production.

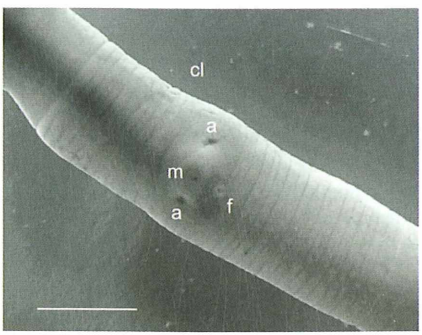

Fig. 4: Ventral view of the clitellar region of a sexually mature specimen of *Trocheta haskonis*. a = accessory genital pores, cl = clitellum, f = female gonopore, m = male gonopore. Bar = 0,5 cm

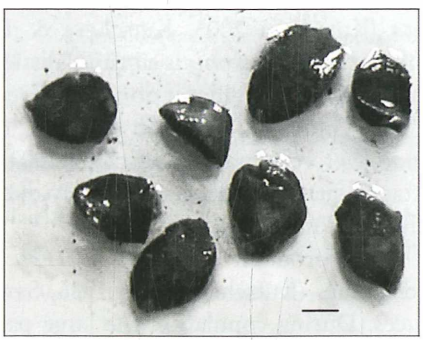

Fig. 5: Cocoons of *Trocheta haskonis*, collected in moist earth and placed into rain water. Bar = 0,5 cm

In captivity, the juveniles crawled into the water where they fed on oligochaeta and *Chironomus* larvae. A few weeks after cocoon deposition the adult leeches senesced and died.

4 Discussion

Trocheta haskonis is a large and rare leech of the family Erpobdellidae. Mature contracted worms are 8–12 cm long and capable of extension up to 22 cm. Like the related species *T. subviridis*, this leech is a semiaquatic annelid that has amphibious tendencies. Adult *T. haskonis* spent part of the year in moist soil where these large animals apparently forage for earthworms. In aquaria imma-

ture leeches rarely leave the water, i.e., they appear to be aquatic predators that inhabit flat stones.

In contrast to the more widely distributed taxa *T. subviridis* and *T. bykowskii*, the species studied here has so far only been found along creeks and streams of the river Elbe in the Federal State of Saxony-Anhalt (eastern part of Germany). Mature leeches inhabit submerged regions (sinks) in the vicinity of running streams that display extreme variations in water levels and frequently dry out during the summer. It is likely that these "earth-leeches" burrow deeply into the soil where they survive the dry and hot season. However, more field studies are required to support this hypothesis.

In this study we have documented that adult *T. haskonis* swallow parts of earthworms, with a preference for prey organisms that are up to ½ the size of the predator. Juvenile leeches of the same species are also eaten, at least in animal populations kept in captivity. Cannibalism has been documented in the medicinal leech (*Hirudo medicinalis*), but not in the common species *E. octoculata* (Kutschera 2003, Kutschera & Roth, unpublished results). Our report shows that *T. haskonis* is a cannibalistic annelid, with a strong tendency to swallow small conspecifics if no alternative prey organisms are available.

The common freshwater species *E. octocolata* feeds on the bodies of dead fish and other vertebrates (Kutschera 2003). In contrast, *Trocheta haskonis* does not attack aquatic vertebrates, possibly due to the fact that this species is adapted to life in the moist soil.

The reproductive biology of *T. haskonis* is similar to that of related erpobdellid leeches (Kutschera 1983, 1986, Sawyer 1986), with two remarkable differences. During copulation the large pseudospermatophores are not fixed to an arbitrary region of the body of the partner, but placed on a pre-formed accessory male gonopore on the ventral side of the clitellum (Fig. 4). This may be an adaptation to a mode of reproduction (transfer of sperm) in flat water or on land (moist soil), because the usual hypodermic insemination in other aquatic members of the Erpobdellidae appears to be dependent on the pressure of the surrounding water (U. Kutschera, unpublished results). More observations on *T. haskonis* are required to confirm this hypothesis. Second, the egg capsules of *T. haskonis* are invariably deposited on land (moist soil) and not in the water. This mode of terrestrial cocoon deposition of an erpobdellid leech, documented here with populations kept in aqua-terraria, is remarkable and reminiscent to that of the semiaquatic hirudinid species *H. medicinalis* and *Haemopis sanguisuga*, which place their egg capsules into the soil (Kutschera & Wirtz 2001).

In summary, the results of this report document that *T. haskonis* has evolved special adaptations for life in moist earth that deserve further studies, especially in the natural habitat of this rare giant leech.

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Received: 2004-05-19