

**New species, taxonomist's delight and faunist's plight.
On the variation range in *Loxosomella vivipara* Nielsen, 1966
(Entoprocta: Loxosomatidae)**

P. Emschermann

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P. Emschermann, Biologisches Institut III der Universität Freiburg, Am Mühlebuck 3, D79249 Merzhausen, (peter.emschermann@biologie.uni-freiburg.de).

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In rich samples of the solitary entoproct *Loxosomella vivipara* Nielsen, 1966, from the Caribbean Sea an unexpected variability of zooid shape could be observed. In most features this species cannot be properly distinguished from *L. leptoclini* Harmer, 1885. The identity of both these species is assumed.

Introduction

The Entoprocta Nitsche, 1870, or Kamptozoa Cori, 1929, are a small animal class with only two orders, Solitaria Emschermann, 1972, and Coloniales Emschermann, 1972. The latter order with two suborders, Astolonata (family: Loxokaypodidae Emschermann, 1972) and Stolonata (families: Pedicellinidae Emschermann, 1972, and Barentsiidae Emschermann, 1972). The Solitaria consist of one single family only: the Loxosomatidae Mortensen, 1911, with the genera *Loxosomella* Mortensen, 1911, *Loxomespilon* Bobin & Prenant, 1953, *Loxosoma* Keferstein, 1863, and *Loxostemma* Nielsen, 1966. A quite recently established new genus, *Loxocorone* Iseto, 2002, is not based on reasonable generic characters, and must be rejected. At present Iseto agrees with the author (pers. comm., September 2002).

In general, solitary entoprocts are characterized by their intensive asexual propagation by buds, which develop orolaterally on either side of the calyx wall, and later on detach and settle nearby, so forming crowded populations on their substrate. The Loxosomatid genera, according to their buds and adult morphology, even in young individuals, can be distinguished quite reliably by the anatomy of their stalk. In *Loxosoma* and *Loxostemma* the stalk at its base ends in a muscular sucker sometimes surrounded by a ring of unicellular glandular cells. The stalk of *Loxosomella*, settling on different invertebrate hosts as well as on different inorganic solid substrates, has a more or less elongated foot with a glandular groove which allows the animals to glide over the substrate (*Loxocalyx* type, Mortensen 1911), or which after settling degenerates and so irreversibly fixes the animal to the substrate (*Loxosomella* Mortensen, 1911). But in several cases the persistence of the foot gland or its degeneration is a question of specific variability. Nielsen (1964) referred to some more basic developmental features between *Loxosomella* types. He laid emphasis on different situations of the fixing point of the buds (the navel) to the parental animal, either at the most distal tip of the foot of the bud (*Loxosomella*) or the proximal aboral part of the stalk just below the calyx (*Loxomitra*

type). In particular most solitary species usually show very rarely striking species characters, which can be observed in all specimens of a local population (cf. Nielsen, 1989, Emschermann, 1993).

During the last five decades increasingly new solitary entoproct species from all over the world have been described. Creation of new species and even of new genera often is based on weak arguments, *e.g.* more or less obvious differences of zooid shape between specimens originating from the same location or from comparable ecological conditions and/or the assumed preference for a definite settling substrate. In two cases the description of a 'new species' has been based on the examination of one single living specimen only, each having been detected in grab-samples and detached from its original substrate (Salvini-Plawen, 1968). In such cases any knowledge on the variability of the 'new species' is missing. In many Loxosomatids striking specific characters, which are expressed in every specimen and independent of its age and growth conditions, are wanting. Reliable identification of a Loxosomatid specimen and, even more, the description of a new species requires an intensive examination of a sufficient number of specimens in different developmental states (buds, larvae, and the average shape of adults) from the same and, if possible, adjacent locations. Important species characters often are not expressed in every specimen at any time (Nielsen, 1966, 2010; Emschermann, 1993). New species have been described from new localities (cf. Krylova, 1985, Salvini-Plawen, 1968) without any critical comparison with well known similar species from other parts of the world (Emschermann, 1993). The describer of a new species should be requested to examine the type material of similar species deposited in accessible collections, and – if possible – to contact their genuine describer. To establish a 'new species' based on one single specimen only should be avoided. To enrich our knowledge on the distribution of a definite species with respect to its biogeography is certainly more valuable than invention of new names.

The number of species assumed as cosmopolitan or widely distributed is small in comparison with the number of 'new species' being described every year. Up to date about 120 Loxosomatid species are described, at least 20 of them from a couple of poorly preserved specimens and from one single locality only. The more recent original descriptions of at least ten additional species are insufficient or based on small differences such as the calyx/stalk ratio or the number of glandular cells around the tentacular rim. All together 18 species are mentioned to be cosmopolitan or widely distributed. Because of the scarcity of striking morphologic specific features (cf. Nielsen, 2010) and the general lack of genetic species characters often the locality or habitat is used as the main argument for a 'new species'. According to my valuation, after having compared all original species descriptions and every available type specimen (all together about 30% of the described species) probably only about 70% of all described names represent true species. So far nothing is known about possible hybridisation in mixed populations of different species on the same location or even on the same substrate.

Material and methods

The benthos collections of the Luymes Saba Bank Expedition consist of 142 samples, 24 of which contain entoprocts, all together five species only: about 2000 specimens of *Loxosomella vivipara* Nielsen, 1966 (fig. 1), the species in question here, and - to give an

idea of the entoproctan spectrum in the Saba Bank area - additionally one small colony each of *Barentsia matsushimana* Toriumi, 1951, and *Barentsia discreta* Busk, 1886, two specimens of the solitary *Loxosoma spatula* Nielsen, 1966, and a single stunted specimen of an undetermined *Loxosoma*.

Most samples, though fixed without previous narcotization in 4% formaldehyde/sea water, are in a sufficient preservation state in order to be well examined by the Nomarski-DIC microscopy.

All specimens in the samples without exception had been detached from their original settling substrates. But from sponge spiculae which are abundant in the sediment one can assume, that the Loxosomatids had settled mostly on sponges. About 10-50 specimens of each sample, according to its richness, have been examined microscopically and the main types have been documented by micrographs as well as by detailed hand-sketches not enclosed here.

Table 1. Samples of *Loxosomella vivipara* Nielsen taken during the 'Luymes' Saba Bank CICAR cruises 34 & 35, types refers to type 1-4 specimens mentioned below.

station	location	depth	sampling method	bottom	types
Stat. 44	17°27'N, 62°58'W	65m	grab	sand, foraminifera	1, 2
Stat. 46	17°30'N, 63°28'W	21m	diver	sand, stones, algae	1, 2, 3, 4
Stat. 55	17°30'N, 63°28'W	39m	diver, grab	sand, stones, algae	2, 3
Stat. 67	17°20'N, 63°15'W	20m	diver, grab	coral reef	3, 4
Stat. 69	17°23'N, 63°45'W	44m	diver, grab	sand, stones, algae	1, 2
Stat. 72	17°16'N, 63°42'W	41m	diver, grab	sand, mussels, algae	3, 4
Stat. 74	17°16'N, 63°33'W	23m	diver	coral reef	1, 2, 3, 4
Stat. 83	17°38'N, 63°27'W	19m	diver	rock, stones	2, 3
Stat. 84	17°33'N, 63°18'W	17m	diver	coral reef	1, 2, 3, 4
Stat. 87	17°27'N, 62°56'W	49m	grab	chalk stones	3
Stat. 88	17°29'N, 62°52'W	40m	grab	chalk grabble	1, 3
Stat. 89	17°24'N, 62°53'W	30m	grab	chalk grabble, algae	1, 3
Stat. 90	17°23'N, 62°53'W	32m	grab	chalk grabble, algae	3
Stat. 98	17°26'N, 63°17'W	22m	diver	sand, stones, algae	2
Stat. 99	17°26'N, 63°23'W	24m	grab	chalk pebbles, algae	1
Stat. 100	17°25'N, 63°27'W	24m	diver, grab	rock, pebbles, algae	1
Stat. 102	17°16'N, 63°21'W	16m	diver	coral reef	1, 2, 3
Stat. 111	17°12'N, 63°40'W	28m	diver	sand, single corals	1, 2, 3, 4
Stat. 115	17°12'N, 63°38'W	26m	diver	sand, single corals	1, 2
Stat. 121	17°29'N, 62°59'W	0-15m	diver	sand, seaweed, coral reef	1
Stat. 124	17°33'N, 63°22'W	24m	diver	rock, sand, single corals	1, 4
Stat. 126	17°33'N, 63°27'W	36m	diver	rock, sand, stones	1
Stat. 136	17°25'N, 63°33'W	34m	diver	sand, mussel shells	2
Stat. 142	17°27'N, 63°21'W	22m	diver	sand, stones, algae	1

* Bold: predominant types

Results

Based on the zooid shape the Saba Bank samples show a wide variability. Regarding their general shape four main, partly extremely differently looking main specimen types could be distinguished, which are based on two striking characters, the larval

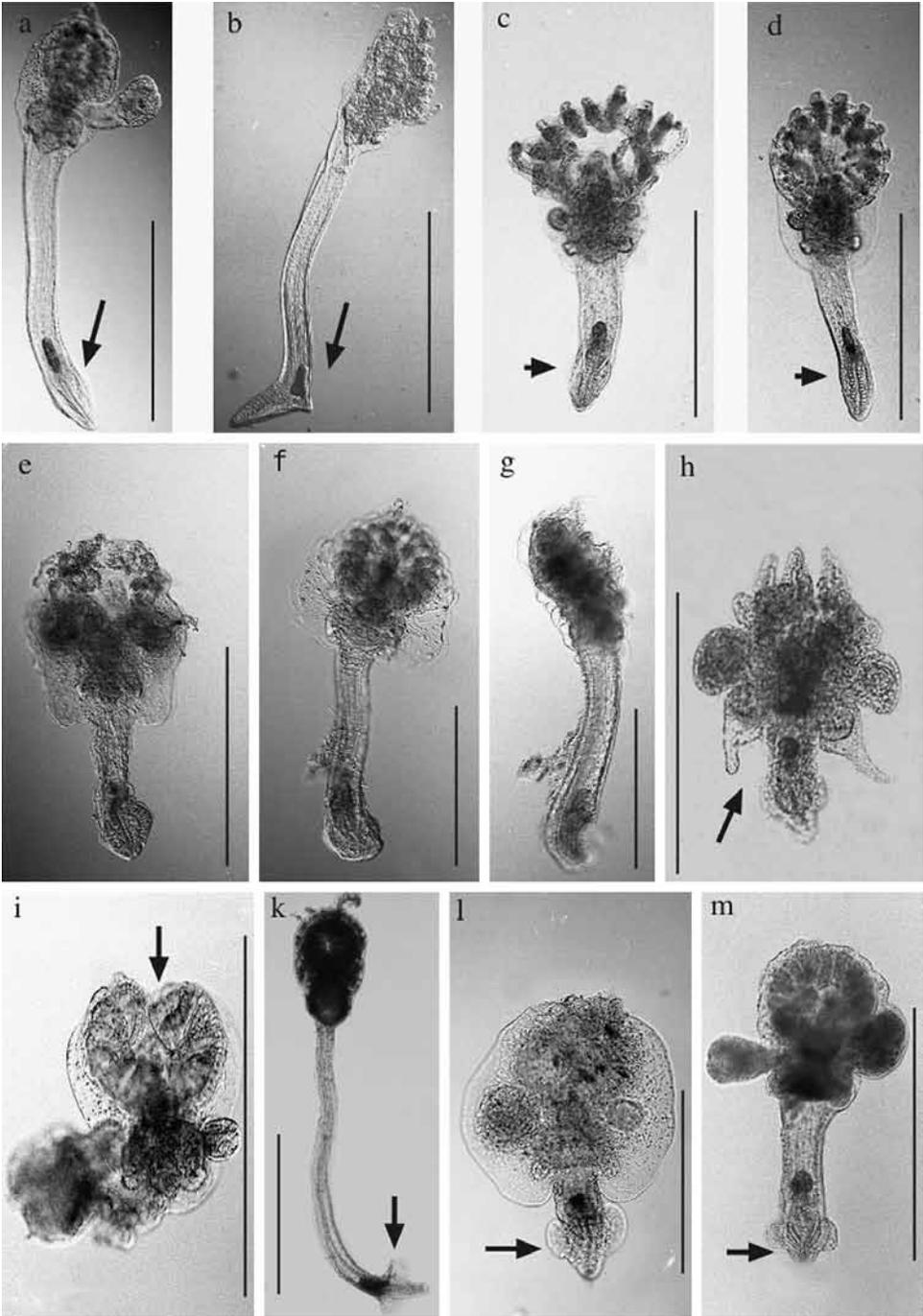
budding and the existence of a neck-gland. Type 1 (Table 1, fig. 1a-b), the dominating type, agrees most with Nielsen's description, though most of the specimens are lacking larvae and the neck gland; their size between 600 and 1400 μm . Type 2 (Table 1, figs 1k, 2i) differs from the preceding one by its wingless calyx, its extremely slender shape and by having a foot with distinct lateral wings (arrow), but many of these specimens possess a small neck-gland (Table 1, fig. 2i); their size between 600 and 1400 μm . Type 3 specimens (fig. 1c, d, m) generally are of smaller size, stout and considerably less flattened and mostly they lack the lateral wings at their calyx, but they frequently show distinct lateral wings at their foot; their size between 300 and 700 μm . Type 4 (Table 1, fig. 1e-i, l) represents the least common group, and is very variable in size and shape. The calyx is mostly extremely flattened like a pancake and often bizarre in outline, sometimes with basal lateral appendices at the calyx (fig. 1h, arrow) or with a bipartite tentacle crown (fig. 1 i, arrow), their foot with or without lateral wings (fig. 1e, l, m, arrows). In the brood pouches of some specimens typical budding larvae can be seen (fig. 1h, l; fig. 3a, d-e; b and c an isolated larva from specimen fig. 1h with clearly visible foot gland of an inside bud, arrow). The size of the type 4 specimens varies between 300 and 1000 μm .

On average, and unrelated to type and habitat about 30% of all specimens examined with beady gland cells in changing numbers along the peritrial rim (fig. 3a, arrows). About 10% of all specimen types have a more or less developed neck-gland, which up to date has not been observed in any other Loxosomatid. In summary, independent of the type, about 4% of all specimens carried the typical budding larvae in their brood pouches (fig. 1e, h, l-m, asterisk; fig. 3a, d-e). In some samples gradual transitions in shape between all these types have been observed.

With respect to this considerable variability in shape (additionally to the more general features such as the flattened calyx, the persisting glandular foot and the proportionally large tentacle crown with 14-16 tentacles directed forwards even in its expanded state) the larval ability of forming precociously individual buds and, at least in several specimens in every group, the existence of a more or less extended pluricellular neck-gland have been valued as essential species characteristics. Nothing is known about the possibility that the observed types may represent genetically fixed strains of a single species.

Regarding the presence of the latter two main features mentioned above in every type of the Saba Bank specimens all of them – and possibly *Loxosomella leptoclini* (perhaps also *L. bocki* Franzén, 1967) – can be valued as belonging to the same and, probably, circum-Atlantic distributed species – *Loxosomella vivipara* Nielsen or *L. leptoclini* Harmer, it may be a question for shrewd taxonomists.

Fig. 1. *Loxosomella vivipara* Nielsen. Specimen types in the Saba Bank samples; scale bar 500 μm . a, b, slender type 1 specimens, with an unwinged foot (arrow); c, d, stout type 3 with an unwinged foot; e-i, l, type 4 specimens of largely different size and shape, in general considerably flattened, and with wing like lateral extensions of the calyx (f, g same specimen orally and laterally seen), h with bizarre lateral appendices (arrow), and i with a bipartite tentacle crown, l with a winged foot; e, h, l and m with larvae in their brood pouches; k, an extremely slender type 2 specimen with a distinct winged foot (arrow); m, stout type 3 specimen with a distinct winged foot. ►



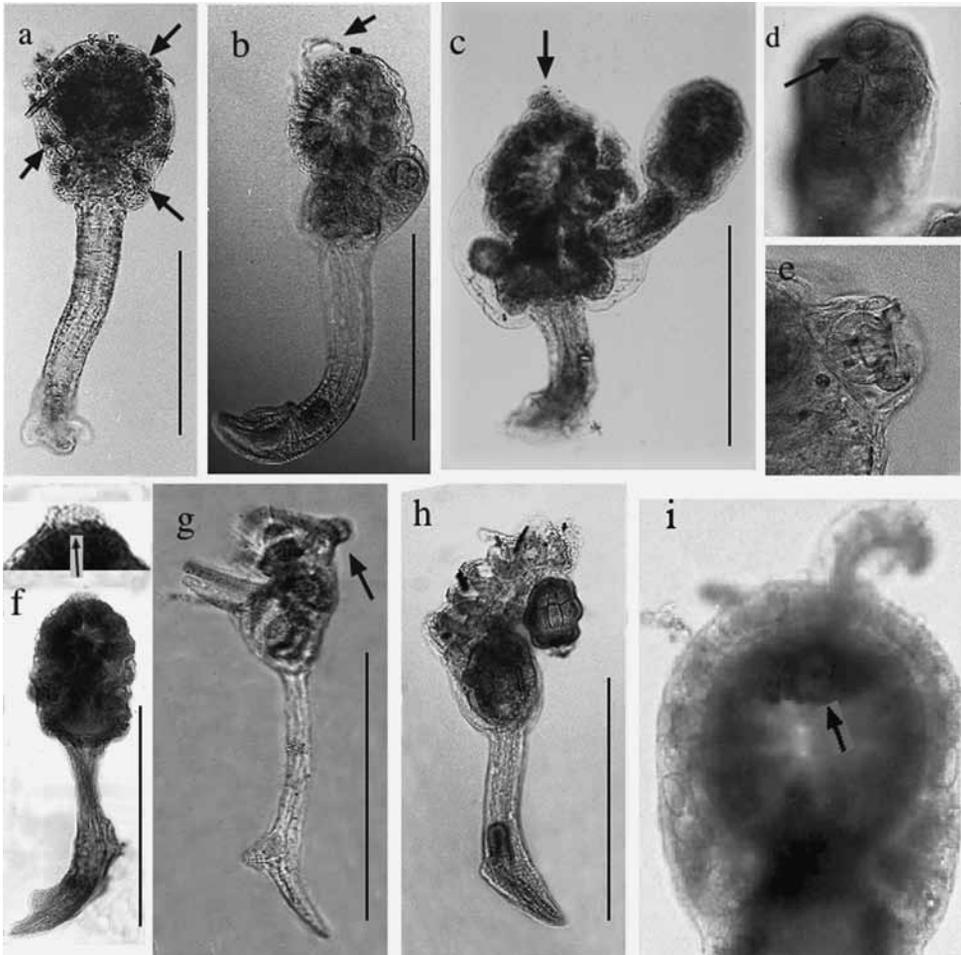


Fig. 2. Saba Bank specimens with glands, scale bar 500 μm . a, type 1 specimen with pearl like gland cells around the periatrial rim; b-i, different shapes of the neck-gland, b, type 3 specimen with an emptied neck-gland and unusually large foot; c, type 3 specimen with neck-gland (arrow) and also a bud with a neck gland (d - arrow-, and e, laterally seen in higher magnification); f, *Loxosomella leptoclini*, Harmer, 1885 (part of Harmer's type material from Naples; Brit. Mus. Nat. Hist, London, slide 88.8.24.6 labelled as 'type'). It resembles the large and winged-footed type of the Saba-Bank specimens with small neck-gland (inset, arrow); g, type 1 specimen in lateral view with medium sized protruding neck gland (arrow); h, type 3 specimen with an unusually large neck gland, seen laterally; i, the difficult to display small neck-gland of a type 2 specimen consisting of a ring of seven cells, same zooid as fig. 1k.

Discussion

Difficulties with a proper description of a Loxosomatid species.

The description of a presumed new species is not a value for itself. It often hides exact knowledge of a possibly bipolar or even worldwide distribution of any marine

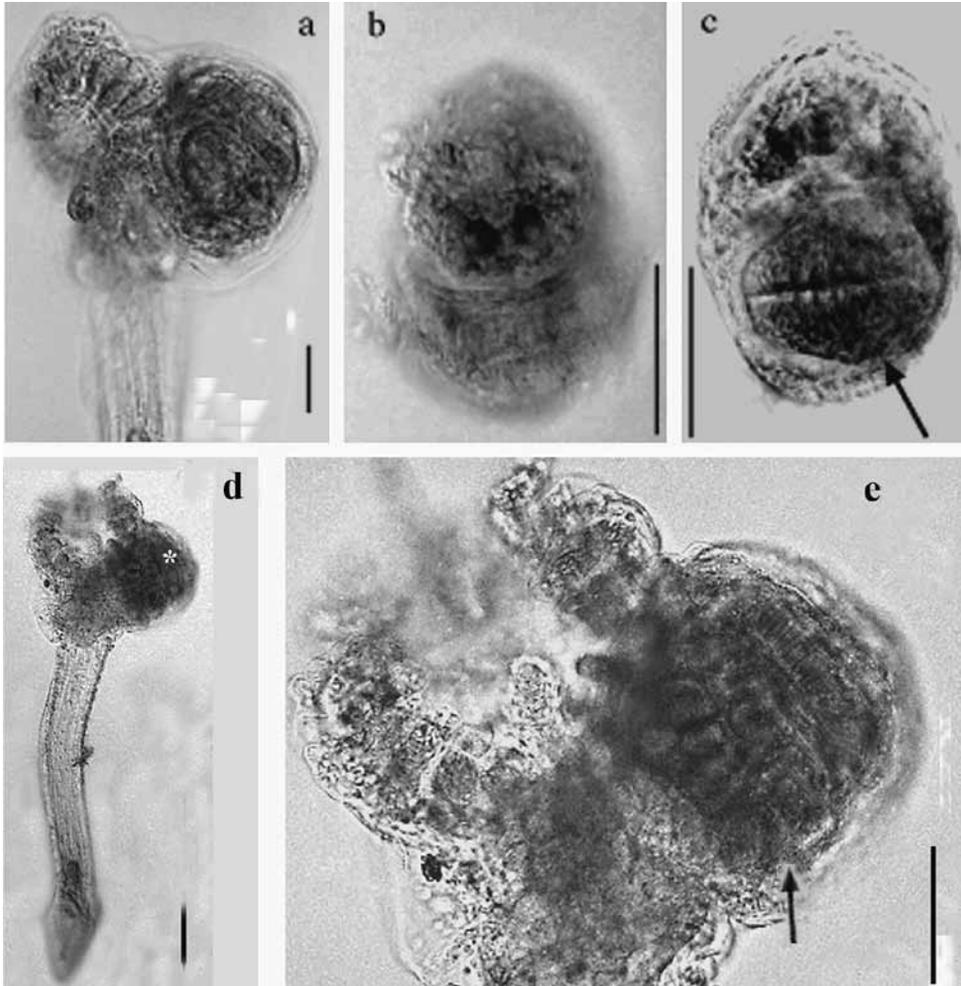


Fig. 3. Budding larvae in the brood pouch; scale bar 100 μ m. a, type 3 specimen with budding larva in its brood pouch; b, c, larva with bud (arrow) dissected from the type 4 specimen fig.1, h, seen orally with the larval eyespots (b) and seen laterally with the clearly visible foot gland of the bud (c arrow); d, type 1 specimen with larva in its brood pouch (asterisk), e, same specimen in higher magnification, clearly visible the footgland of the internal bud (arrow).

animal species. For numerous descriptions of 'new species' of Loxosomatids better knowledge of the variation range of the species in question possibly would be helpful, for in many cases only one single species hides behind several different names.

Nielsen (1966), after a very thorough investigation of living samples from Florida waters presented a detailed description of his new species *Loxosomella vivipara*. As considerable specific features of this species he emphasises: *Long slender zooids with a calyx as long as the stalk ... oro-aborally distinctly flattened and with thin, transparent wings at either side, being not yet developed in younger buds;sometimes scattered sensory bristles along*

the edge of the wings and at their upper end a pair of sensory papillae (not displayed in his figures); ... around the atrium (in any specimen?) a row of 6-12 transparent (glandular?) cells; ... 12-16 tentacles; ... in some specimens on the back side of the anus a peculiar pluricellular (glandular?) organ (neck-gland); ... the epithelial cells of the stalk arranged in 8 longitudinal rows;... the foot small, slender, lacking lateral wings and with a big gland, which extends up into the lower part of the stalk.... The species can be distinguished from other similar species, e.g. *L. alata* Barrois, 1877, *L. raja* Schmidt, 1876, and *L. thethyae* Salensky, 1877 by the lack of wing like expansions of the foot and the presence of thin, lateral wings on the calyx... (In this context Nielsen did not mention *L. leptoclini* Harmer, 1885).

Some of these features are valid for other *Loxosomella* species too. But the most striking character of *Loxosomella vivipara* is its modified larval development. Instead of the normal metamorphosis the young larva itself, at either side, produces precociously individual buds and then degenerates without undergoing metamorphosis. Such a precocious budding previously had been described only by Jägersten (1964) for the larva of an undetermined Loxosomatid species from the Bahamas and by Harmer for the larva of his new species from the Mediterranean, *Loxosoma (Loxosomella) leptoclini* Harmer, 1885. Simultaneously with Nielsen, Franzén described from the Pacific Gilbert Islands a *Loxosomella* showing larval budding, *Loxosomella bocki* Franzén, 1967. This species is similar to the type 3 Saba specimens of *L. vivipara*, but Franzén, with 50 specimens examined, did not mention the existence of a neck-gland.

Harmer with *L. leptoclini* as well as Nielsen with *L. vivipara* mentioned an enigmatic pluricellular gland organ on the backside of the calyx ('apical cells', here: neck-gland) and both of them have observed in some specimens two conspicuous lateral sensory papillae at the upper side of the calyx. In the Saba Bank samples only in a few specimens of type one of stat. 88 such lateral sensory papillae are developed. Similar lateral sensory papillae can be seen in other Loxosomatids too, e.g. in *Loxosomella claviformis*, Hincks 1880, in *L. antarctica* Franzén, 1973 (Emschermann, 1993), and in *L. antedonis* Mortensen, 1911.

Concluding remarks

In 1972 the author has found in a dredge sample from sandy bottoms in the Adriatic near Rovinj, SW of Sveti Ivan, 35 m, a couple of similar looking Loxosomatids (cf. Emschermann, 2007, Abb. 403 B, p. 304) from which he was able to raise laboratory cultures for half a year - with good success but by asexual propagation only (culturing conditions: in natural north sea water at $17^{\circ}\text{C} \pm 0,5^{\circ}\text{C}$ in 50 ml glass vessels on a slow motion laboratory shaker, 17:7 hours light/dark rhythms and fed by cultured *Cryptomonas* suspensions). Though under about 500 asexually produced cultured specimens neither larvae nor traces of the neck gland could be observed. In every other feature these specimens totally agreed with Nielsen's original description of *Loxosomella vivipara*. Thus the author assumes this species also to be *L. vivipara*, but further investigation of the entoproct fauna in this area would be desirable.

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