

Leptosynapta minuta (Becher, 1906) (Echinodermata, Holothuroidea), a new record for Belgian marine waters

Claude Massin¹, Ward Appeltans², Gert Van Hoey³, Magda Vincx³ and Steven Degraer³

¹ I.R.Sc.N.B., Section Malacologie, Rue Vautier 29, B-1000 Brussels, Belgium

² Flanders Marine Institute, Pakhuizen 45-52, B-8400 Ostend, Belgium

³ Ghent University, Marine Biology Section, Campus De Sterre, s8, Krijgslaan 281, B-9000 Ghent, Belgium

Corresponding author : C. Massin : claude.massin@naturalsciences.be

ABSTRACT. *Leptosynapta minuta* Becher, 1906 is described for the first time from Belgian marine waters. This brings a new order (Apodida), family (Synaptidae), subfamily (Leptosynaptinae) and genus (*Leptosynapta*) to the Belgian holothuroid fauna. A morphological description of the specimens, the habitat characteristics and all literature records with a distribution map of *L. minuta* is given.

KEY WORDS : Apodida, *Leptosynapta minuta*, new record, Belgium, distribution.

INTRODUCTION

Until now only four holothuroid species were known from Belgian marine waters (MASSIN, 1988; MASSIN & DE RIDDER, 1989), all belonging to the order Dendrochirotida. The holothuroid fauna in adjacent countries is much richer (VANDEN BERGHE & APPELTANS, 2003), including seven apodid species in France of which at least five also occur in the North Sea (MADSEN & HANSEN, 1994; HANSSON, 2001), at times very close to the Belgian border (VAN DAMME & HEIP, 1976). This supposed absence of apodids from Belgian marine waters is surprising because European apodids are known to live in sandy sea beds (KOEHLER, 1924; MORTENSEN, 1927; CHERBONNIER, 1953; PICTON, 1993), the dominant biotope along our coast. The present record fills this gap.

MATERIAL AND METHODS

The sampling station where *Leptosynapta minuta* was found is situated on the northern side of the Kwintebank (51° 18,65; 2° 40,75 (WGS84)), in the Flemish bank area. This station was investigated during a sampling expedition on 13 February 2003, using the research vessel 'Zeeleeuw'. The sample was taken with a Van Veen grab (sampling surface area : 0.1026 m²) and sieved after fixation (with 8% formaldehyde-seawater solution) through a sieve of 1mm mesh. For granulometric analyses the dried sediment was first sieved through a 1 mm mesh-size sieve. The mass percentage relative to the total sediment sample was determined for the sediment fractions larger than 1 mm. The sediment samples smaller than 1 mm were further analysed using a LS Coulter particle size analyser and sediment fractions were expressed as vol-

ume percentage of the 0-1 mm fraction. Median grain-size was determined based on the 0-1 mm fraction.

Five pieces of holothuroid origin were found and examined. These are now held in the collections of the Royal Belgian Institute of Natural Sciences under code IG 30055.

Order Apodida Brandt, 1835

Family Synaptidae Burmeister, 1837

Subfamily Leptosynaptinae Smirnov, 1989

Genus *Leptosynapta* Verrill, 1867

Leptosynapta minuta Becher, 1906

Figs 1 A-C; Map 1

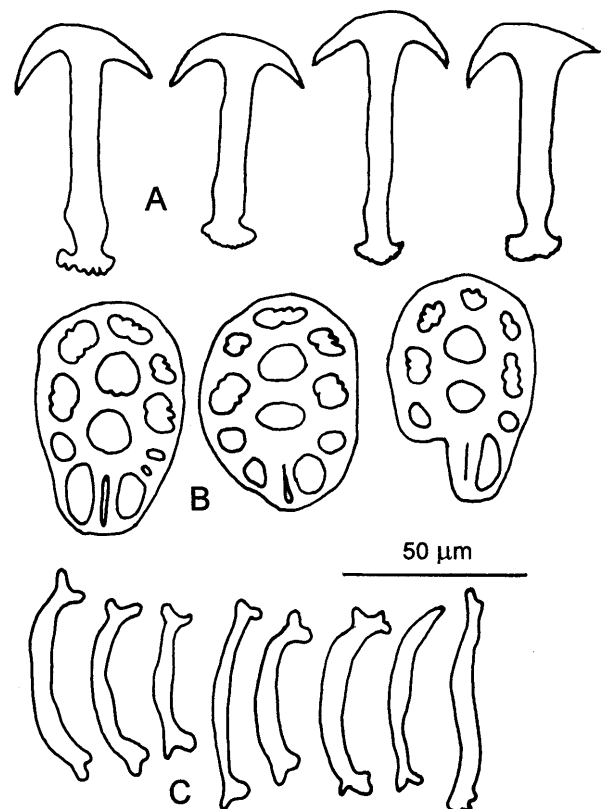


Fig. 1. – *Leptosynapta minuta* Becher, 1906. A : anchors from body wall; B : anchor plates from body wall; C : rods from tentacles.

Synapta minuta BECHER, 1906 : 507, text-Figs 1-3.

Leptosynapta minuta; H.L. CLARK, 1907 : 93; MORTENSEN, 1924 : 251; KOEHLER, 1924 : 272, pl. 15, Fig. 15; MORTENSEN, 1927 : 431, Fig. 262(4); MORTENSEN & LIEBERKIND, 1928 : 32, Fig. 62; HEDING, 1928 : 207; CHERBONNIER, 1951 : 13; CHERBONNIER, 1953 : 165, pl. 1, Figs A(a-l); CHERBONNIER, 1960 : 122, Figs 2(k-l); FIZE, 1960 : 505; MONNIOT, 1962 : 294, Figs 25(a-d); SWEDMARK, 1964 : 33; SWEDMARK, 1965 : 94; TORTONESE, 1965 : 103; CHERBONNIER & GUILLE, 1967 : 328; MONCHARMONT, 1968 : 513; SWEDMARK, 1971 : 45; SALVINI-PLAWEN, 1972 : 464, Figs 5 & 7; WILLIAMS, 1972 : 636; VAN DAMME & HEIP, 1976 : 44; TORTONESE, 1977 : 341; SALVINI-PLAWEN, 1977 : 75; TORTONESE, 1980 : 146; O'CONNOR, 1981 : 248; BESTEIRO & URGORRI, 1987 : 94; PÉREZ-RUZAFÁ et al., 1992 : 176; PICTON, 1993 : 84, textfig. (a); MADSEN & HANSEN, 1994 : 108, Figs 69-70, map 29; PANCUCCI, 1994 : 31; PANCUCCI, 1996 : 47, map 21; MCKENZIE, 1997 : 275; HANSSON, 2001 : 350; PICTON & MORROW, 2002 : <http://www.ulstermuseum.org.uk/marinelife/echinode/lept-min.htm>.

1. Morphology

The five pieces represent at least three adult specimens (three pieces have a tentacle crown). Specimens are in poor condition, whitish grey in colour and with adhering sand grains. The largest of the pieces with a tentacle crown is 2.9 mm long and 0.9 mm across. It has ten digitiform tentacles without lateral digits. The two other specimens with a tentacle crown (6 and 4 visible tentacles) are respectively 2.4 mm long x 0.6 mm across and 2.2 mm long x 0.6 mm across. The two remaining pieces are both 1.1 mm long x 0.4 mm across. Due to the very small size of the specimens no observation of internal anatomy was possible without destroying them. Hence, the presence or absence of juveniles in the coelomic cavity could not be ascertained.

In the body wall there are anchors and anchor plates. Anchors (Fig. 1A) are $69.2 \pm 3.4 \mu\text{m} \times 37.5 \pm 2.5 \mu\text{m}$ (n=12). The arms and vertex are smooth and the stock is finely dentate. The axis presents a small swelling close to the stock. The anchor plates (Fig. 1B) are oval, $62.3 \pm 2.9 \mu\text{m} \times 44.2 \pm 2.8 \mu\text{m}$ (n=12), perforated by about 12 holes, and without a posterior bridge. The two central holes are generally smooth. The peripheral ones are smooth or serrated. If serrated they have between 1 and 5 very large teeth. There are three posterior holes, the central one very often reduced to a slit (Fig. 1B). Within the tentacles are small rods (Fig. 1C), 40-60 μm long, straight or slightly curved with forked extremities. Miliary granules are absent in body wall and tentacles.

2. Habitat characteristic

Coarse sandy sediment, with a median grain-size of 569 μm , characterise the sampling station. The dominant sand fraction (62.5%) is the coarse fraction (500-850 μm), followed by the medium fraction (250-500 μm) with 33.4%. The gravel fraction (>2000 μm) takes up 39.91% of the total mass, while the very coarse sand fraction (1000-2000 μm) takes up 31.18%. The sample was taken at a depth of 14 meters.

3. Distribution (map 1)

Germany (Helgoland : type locality), the Netherlands, Belgium, France (Roscoff, Banyuls, Marseille, Sète), Ireland (Galway), UK (Menai Bridge), Spain (Galicia), Italy (Leghorn, Napoli), Greece (N Evvoikos),? Northwest Africa.

This is the first record of *Leptosynapta minuta* in Belgian waters. It brings not only a new species record to the Belgian fauna but also that of the genus *Leptosynapta*, subfamily Leptosynaptinae, family Synaptidae and the new order Apodida.

DISCUSSION

The very small size (body length less than 1 cm) of the specimens, their digitiform tentacles without lateral digits, and their small anchors (50-75 μm long) and anchor plates (60-68 μm long), are all characteristic of the species *Leptosynapta minuta* Becher, 1906. The shape and size of the ossicles are similar to that described by MORTENSEN (1927) for specimens from Helgoland, by CHERBONNIER (1953) for specimens from Roscoff, by O'CONNOR (1981) for specimens from Galway, and by CHERBONNIER (1960) for specimens from Banyuls. All the other species belonging to the genus *Leptosynapta* have larger ossicles : longer than 120 μm and very often reaching 200-250 μm (HEDING, 1928).

Leptosynapta minuta is found amongst maerl (marine sediment made of branched calcareous red algae) and coarse gravel in areas dominated by strong currents (PICTON, 1993; PICTON & MORROW, 2002). In addition the species is often associated with "Amphioxus sand", coarse sand present in the Mediterranean (FIZE, 1960; MONNIOT, 1962; CHERBONNIER & GUILLE, 1967) as well as along the European Atlantic coast (BESTEIRO & URGORRI, 1987). These habitat characteristics can also be found on the northern side of the Kwintebank (BONNE, 2003), the Belgian location. The depth at which the present specimens originated (14 m) is consistent with most of the data available in the literature : 2-20 m depth (MORTENSEN, 1927; FIZE, 1960; CHERBONNIER, 1960; CHERBONNIER & GUILLE, 1967; MONCHARMONT, 1968; SALVINI-PLAWEN, 1972, 1977; O'CONNOR, 1981). Only VAN DAMME & HEIP (1976) and PANCUCCI (1994) recorded specimens at a greater depth (35 and 60 m, respectively).

Leptosynapta minuta has an extensive distribution pattern (see map1) and is often regarded as a locally abundant species (CHERBONNIER & GUILLE, 1967; SWEDMARK, 1971). The locality "Northwest Africa", recorded by MADSEN & HANSEN (1994), could not be traced and is therefore dubious. It is surprising that *L. minuta*, a species with a reduced dispersal capacity (no planktonic stage due to brooding) has such a wide distribution.

It is surprising that *L. minuta* had not previously been reported from Belgian waters despite the huge sampling efforts over the last 30 years, both by macrobenthic (Van Veen grab) and meiobenthic (Reineck) sampling techniques. Probably, the post-sampling treatments used for macro- and meiobenthic samples caused the loss of *L. minuta* since, during sieving (alive) of macrobenthic samples, the species (width < 1mm) can easily pass through



Distribution of *Leptosynapta minuta* Becher, 1906.

the 1 mm sieve. Perhaps the species can only be found in samples which are fixed before sieving, a procedure not followed for samples taken in coarse sandy areas (VAN HOEY et al., 2004). Meiobenthic samples, on the other hand, are treated with Ludox and centrifuged in order to separate the organisms and the sediment, as described in GIERE (1993). Specimens of *L. minuta* are probably overlooked with such sampling techniques (except for a single specimen in the study of VAN DAMME & HEIP, 1976) because they (1) cling to the sand grains or (2) have a different specific gravity compared to other meiobenthic taxa (e.g. Nematoda, Copepoda).

DE RYCKE (1982) and DENECKER (1983) did report on the presence of holothuroid juveniles in Belgian marine waters but it was not possible to check whether these juveniles represented *L. minuta* as their material is no longer extant.

Data on the behaviour of *L. minuta* is scarce and somewhat contradictory. Everyone agrees that it is a brooding species, but opinions are divided regarding its position within the sand. According to CHERBONNIER (1953 : 167) it does not crawl on the trivium as other synaptids but is positioned vertically in the sediment with the anus up. On the contrary, O'CONNOR (1981 : 248) reported "the animal lies on or within the sediment in a horizontal position. The calcareous ring is set in an oblique angle, allowing the tentacles to move over the substrate". Similarly, PICTON (1993 : 84) mentioned that "the animal moves among

the coarse particles in which it lives by crawling and wrapping its arms around the pieces of gravel or maerl". According to SWEDMARK (1964 : 33) the tentacles are strongly adhesive and help to move in the interstices.

These observations were most probably made using dredged specimens and not *in situ*. If this is the case it is not surprising to observe contradictory behaviours, which can be attributed to activities of disturbed animals.

ACKNOWLEDGEMENTS

The authors want to thank I. Moulart for the analysis of the macrobenthos samples within the framework of the MSc Marine and Lacustrine Sciences thesis "Macrobenthos sampling accuracy : On board-sample"; the crew of the research vessel 'Zeeleeuw' for their help during the sampling campaign; D. Schram for the analysis of the sedimentological samples; E. Vanden Berghe from the Flanders Marine Data and Information Centre for plotting the map; V. Galloway for improving the English and two anonymous reviewers for their constructive comments.

REFERENCES

1. BECHER, S. (1906). Eine brutpflegende Synaptide der Nordsee. *Zool. Anz.*, 30 : 505-509, Figs 1-3.
2. BESTEIRO, C. & V. URGORRI (1987). Contribucion al conocimiento de la fauna mesopsammia de las 'Arenas de *Amphioxus*' en Galicia. *Thalassas*, 5(1) : 91-95.

3. BONNE, W. (2003). *Benthic copepod communities in relation to natural and anthropogenic influences in the North Sea*. PhD-thesis, University of Ghent.
4. CHERBONNIER, G. (1951). Inventaires de la faune marine de Roscoff. Echinodermes. *Trav. Stat. Biol. Roscoff, N.S.* 2 suppl. 4 : 1-15.
5. CHERBONNIER, G. (1953). Recherches sur les synaptés (holothuries apodes) de Roscoff. *Trav. Stat. Biol. Roscoff*, 90 : 163-186.
6. CHERBONNIER, G. (1960). Complément à la faune échinodermique des Pyrénées-Orientales. *Vie Millieu*, 11(1) : 118-123.
7. CHERBONNIER, G. & A. GUILLE (1967). Complément à la faune des échinodermes de la mer de Banyuls. *Vie Millieu*, 18(2) : 317-330.
8. CLARK, H.L. (1907). The Apodous Holothurians : a Monograph of the Synaptidae and Molpadiidae, Including a Report on the Representatives of these Families in the Collections of the United States National Museum. *Smithson. Contr. Knowl.*, XXXV (1723) : 1-231 + 13 pls.
9. DENECKER, J. (1983). *Echinodermata van de Zuidelijke Bocht van de Noordzee. Onderzoek naar soortensamenstelling en verspreiding*. Maandwerk 2e Licentie Dierkunde, R.U.G.
10. DE RYCKE, R. (1982). *Macrofauna en interstitiële anneliden van vijf zandbanken in de Belgische Kustwateren*. Licentiaatverhandeling, R.U.G.
11. FIZE, A. (1960). Sur les fonds à *Amphioxus* de la plage de Sète. *Vie Millieu*, 11 : 505-506.
12. GIERE, O. (1993). *Meiobenthology : the microscopic fauna in aquatic sediments*. Springer Verlag, Berlin : 273.
13. HANSSON, H.G. (2001). Echinodermata. In : COSTELLO, M.J., C. EMBLOW & R. WHITE (eds), *European Register of Marine Species. A check-list of the marine species in Europe and a bibliography of guides to their identification*. Patrimoines naturels, Vol 50 : 336-351, Publ. Sci. Mus. Natn. Hist. Nat. Paris
14. HEDING, S.G. (1928). Synaptidae. *Vidensk. Meddl. Dansk nat. For. Kobenhavn*, 85 : 1-323 + Pls II & III.
15. KOEHLER, R. (1924). Les Echinodermes des mers d'Europe. In : G. DON (ed.), *Encyclopédie Scientifique, Bibliothèque de Zoologie*, DOUIN, Paris, 2 vols.
16. MADSEN, F.J. & B. HANSEN (1994). *Echinodermata Holothuroidea. Marine Invertebrates of Scandinavia*. 9, Scandinavian University Press, Norway : 143.
17. MASSIN, C. (1988). Note sur deux holothuries nouvelles pour la faune belge. *Bull. Inst. r. Sci. Nat. Belgique, Biologie*, 58 : 71-74.
18. MASSIN, C. & C. DE RIDDER (1989). Les échinodermes de Belgique. In : WOUTERS, K. & L. BAERT (eds), *Invertebraten van België, Invertébrés de Belgique : Verhandelingen van het Symposium "Invertebraten van België" = Comptes rendus du Symposium "Invertébrés de Belgique" = Proceedings of the Symposium "Invertebrates of Belgium"*. Brussel, 25-26 november 1988. Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussel : 395-402.
19. MCKENZIE, J.D. (1997). Echinodermata. In : HOWSON, C.M. & B.E. PICTON (eds), *The species directory of the marine fauna and flora of the British Isles and surrounding seas*. Ulster Museum Publication, 276 : 287-295. The Ulster Museum, Belfast, UK.
20. MONCHARMONT, U. (1968). Rinvenimento di due oloturoidi (Apoda) rari : *Leptosynapta minuta* (BECHER, 1906) e *Trochodota venusta* (SEMON, 1887) nel Golfo di Napoli. *Pubbl. Staz. Zool. Napoli*, 36(3) : 513-514.
21. MONNIOT, F. (1962). Recherches sur les graviers à *Amphioxus* de la région de Banyuls-sur-Mer. *Vie Millieu*, 13 : 231-322.
22. MORTENSEN, Th. (1924). *Pighude (Echinodermer)*. Danmark's Fauna 27, Kobenhaven : 274.
23. MORTENSEN, Th. (1927). *Handbook of the echinoderms of the British Isles*. Oxford University Press, London : viii + 471.
24. MORTENSEN, T. & I. LIEBERKIND (1928). Echinodermata. In : GRIMPE, G. & E. WAGLER (eds), *Tierwelt der Nord- und Ostsee*, 12(8), G. GRIMPE, Leipzig : 128.
25. O'CONNOR, B. (1981). Some echinoderms from the west coast new to the Irish fauna. *Ir. Nat. J.* 20(6) : 247-249.
26. PANCUCCI, M.A. (1994). New records of echinoderm species in Greek waters. *BIOS (Macedonia, Greece)*, 2 : 31-33.
27. PANCUCCI, M.A. (1996). *Faunae Graeciae. VI. The Echinodermata of Greece*. Hellenic Zoological Society, Athens : vi + 162.
28. PÉREZ-RUZAFÁ, A., C. MARCOS & J.J. BALLADO (1992). Holothurians (Echinodermata, Holothuroidea) de las islas Canarias. II. Ordenes Dendrochirotida, Elaspodida, Apodida y Molpadida. *Rev. Acad. Canar. Cienc.*, IV(3 & 4) : 163-185.
29. PICTON, B.E. (1993). *A Field Guide to the Shallow-water Echinoderms of the British Isles*. Immel Publishing, London : 96.
30. PICTON, B.E. & C.C. MORROW (2002). In : *Encyclopedia of Marine Life of Britain and Ireland* - <http://www.ulstermuseum.org.uk/marinelife/echinode/lepmin.htm>
31. SALVINI-PLAWEN, L.V. (1972). Zur Taxonomie und Ökologie mediterranen Holothuroidea-Apoda. *Helgoländer wiss. Meeresunters.*, 23(4) : 459-466.
32. SALVINI-PLAWEN, L.V. (1977). Caudofoveata (Mollusca), Priapulida and apode Holothurien (*Labidoplax*, *Myriotrochus*) bei Banyuls und im Mittelmeer allgemein. *Vie Millieu*, 27(1) sér. A : 55-81.
33. SWEDMARK, B. (1964). The interstitial fauna of marine sand. *Biol. Rev.*, 39 : 1-42.
34. SWEDMARK, B. (1965). Etude de la microfaune des sables marins de la région de Marseille. *Arch. Zool. exp. gén.*, 93 : 70-95.
35. SWEDMARK, B. (1971). A Review of Gastropoda, Brachiopoda, and Echinodermata in Marine Meiobenthos. In : HULLINGS, N.C. (ed.), *Proceedings of the First International Conference on Meiofauna. Smithsonian Contr. Zool.*, 76 : 41-45.
36. TORTONESE, E. (1965). *Fauna d'Italia. Echinodermata*. CALDERINI, Bologna, 422.
37. TORTONESE, E. (1977). Recenti acquisizioni e rettifiche intorno ai crinoidi, oloturoidi, ofiuroidi ed echinoidi del Mediterraneo, con particolare riguardo alla fauna italiana. *Atti. Soc. Ital. Sci. nat. Museo civ. Stor. Nat. Milano*, 118(3-4) : 333-352.
38. TORTONESE, E. (1980). Review of present status of knowledge of the Mediterranean Echinoderms. In : JANGOUX, M. (ed.), *Echinoderms Present and Past*, Proc. Europ. Coll. Echinoderms, Brussels, 3-8 Sept. 1979, A.A. BALKEMA, Rotterdam : 141-149.
39. VAN DAMME, D. & C. HEIP (1976). Het meiobenthos in de zuidelijke Noordzee. In : NIHOUL, J.C. & L. DE CONINCK (eds), *Projekt Zee eindverslag, 7. Inventaris van de fauna en flora*, Diensten van de Eerste Minister. Programmatie van het Wetenschapsbeleid, Brussel : 1-133.
40. VANDEN BERGHE, E. & W. APPELLTANS (2003). Data from TISBE, Taxonomic Information System for the Belgian coastal area, provided by Flanders Marine Institute (VLIZ) - <http://www.vliz.be/vmdcdata/tisbe/index.htm>
41. VAN HOEY, G., S. DEGRAER & M. VINCX. (2004). Macro-benthic community structure of soft-bottom sediments at the Belgian Continental Shelf. *Estuar. cst. Shelf Sci.* 59 : 599-613.
42. WILLIAMS, R. (1972). The abundance and biomass of the interstitial fauna of a graded series of shell-gravels in relation to the available space. *J. Anim. Ecol.*, 42(3) : 623-646.

Received: November 27, 2003

Accepted: December 10, 2004