

## TURBELLARIA FROM INTERTIDAL FLATS AND SALT-MARSHES IN THE ESTUARIES OF THE SOUTH-WESTERN PART OF THE NETHERLANDS

C. DEN HARTOG

Laboratory of Aquatic Ecology, Catholic University, Nijmegen

Keywords: Turbellaria, estuarine distribution

### Abstract

A list of 91 species of Turbellaria from intertidal flats and salt-marshes in the estuaries of the south-western part of the Netherlands is given.

The study of the marine Turbellaria in The Netherlands has been greatly neglected. Although this group may be represented by 150-200 species in the coastal waters, there are hardly any records from before 1960. During the years 1960-1965 I collected many species in the south-western part of The Netherlands. A part of these data has been published (den Hartog, 1963a, 1964a,b, 1965, 1966, a,b, 1968). A survey of the whole turbellarian fauna has not been compiled so far, because my sampling was very selective; in fact I studied mainly Turbellarians from salt-marshes and to a lesser extent from muddy and sandy intertidal flats. Sublittoral sampling was not carried out at all, and sampling in other habitats was extremely occasional.

The reasons that I present here my very incomplete species list, are that (1) the environment of the south-western part of The Netherlands will be changed fundamentally by the hydrotechnical works which are in execution, and this list may function as a historical document; (2) many of the species are recorded here for the first time for The Netherlands; (3) many of the species recorded have been described in the last 25 years, and their distribution is insufficiently known; four of them were recorded as Baltic 'endemics' still in 1974 by Karling; (4) many of the species are characteristic environmental indicators; (5) the stimulating effect the list may have to survey other

habitats or filling gaps. In order to make the list more valuable, I have added, in general terms, a description of the species distribution over the various salinity sections of the estuaries,\* and the type of habitat in which they were found. Further, I have indicated also the occurrence of the species in isolated brackish waters, which have lost their connection with the sea. I did not incorporate, however, species found in freshwater habitats, except for those found in the freshwater tidal area. A further restriction of the list is, that I have only incorporated species, collected, seen or identified by myself. I have refrained from adding species records, of which the material could not be checked.

### Species list

#### Order: Acoela

Representatives of this order have been found frequently, but remained for the greater part unidentified. The following species could be identified beyond doubt.

1. *Anaperus tvaerminnensis* (Luther, 1912).  
Sandy beach in the euhalinicum, Zoutelande.
2. *Mecynostomum auritum* (Schultze, 1851).  
On salt-marshes in the euhalinicum, the polyhalinicum and the mesohalinicum. Also in detritus-rich fine sand of intertidal flats. Rarely in isolated brackish waters.
3. *Philocelis karlingi* (Westblad, 1946).  
In salt-marsh creeks in the euhalinicum and the polyhalinicum.
4. *Philactinoposthia saliens* (von Graff, 1882).  
In salt-marsh creeks and on sand- and mudflats in the euhalinicum and polyhalinicum.
5. *Oligochoerus limnophilus* Ax & Dörjes, 1966.  
Sand flat in the freshwater tidal area.

\* A description of the hydrography of the area has been given by den Hartog (1963b) and Wolff (1973).

Order: Macrostromidae

6. *Microstomum lineare* (O. F. Müller, 1774).  
In the freshwater tidal area, in muddy creeks between the willow coppices.
7. *Microstomum* n.sp.  
Euhaline, intertidal sand flat. Springersgors, Goeree.
8. *Macrostomum balticum* Luther, 1947.  
On sandy mudflats and in salt-marshes in the euhalini-  
cum, the polyhalini- and the mesohalini- cum.
9. *Macrostomum distinguendum* (Papi, 1951).  
In the high-littoral belt among willow coppices and reed land in the freshwater tidal area.
10. *Macrostomum finlandense* (Ferguson, 1940).  
In the high-littoral belt among willow coppices in the fresh-  
water tidal area. Oude Maas.
11. *Macrostomum hamatum* Luther, 1947.  
Isolated brackish water ditch. Yerseke.
12. *Macrostomum hystricinum* Beklemischev, 1951.  
In salt-marshes in the euhalini- cum, the polyhalini- cum and  
the mesohalini- cum. Also in isolated brackish waters.
13. *Macrostomum pusillum* Ax, 1951.  
In salt-marshes in the euhalini- cum and the polyhalini- cum.  
Also on intertidal flats of detritus-rich fine sand.
14. *Macrostomum rostratum* (Papi, 1951)  
In the high-littoral belt among willow coppices and reed land  
in the freshwater tidal area.
15. *Macrostomum spirale* Ax, 1956.  
On salt-marshes and intertidal sand- and mudflats in the  
euhalini- cum, the polyhalini- cum and the mesohalini- cum.
16. *Macrostomum tenuicauda* Luther, 1947.  
In oligo- and mesohaline salt-marshes.

Order: Lecithoepitheliata.

17. *Prorhynchus stagnalis* Schultze, 1851.  
In the high-littoral belt among willow coppices and reeds in  
the freshwater tidal area.

Order: Prolecithophora.

18. *Archimonotresis limophila* Meixner, 1938.  
In detritus-rich fine sand on tidal flats in the euhalini- cum.
19. *Pseudostomum quadrioculatum* (Leuckart, 1847).  
On muddy and sandy intertidal flats, as well as in salt-marsh  
creeks of the euhalini- cum and polyhalini- cum.

Order: Proseriata.

20. *Monocelis fusca* Oersted, 1843.  
On salt-marshes and on muddy sandflats in the euhalini- cum  
and the polyhalini- cum.  
This taxon is represented by a form with a long penis stylet  
and one with a very short one; the first mentioned form  
remained constant in culture. The ecological characteristics  
of both forms are similar.
21. *Monocelis lineata* (O. F. Müller, 1774).  
On intertidal mud- and sandflats, in salt-marshes and under  
stones of the dike slopes. Also in isolated brackish waters.
22. *Paramonotus hamatus* (Jensen, 1878)  
Sandflats and in a salt-marsh creek in the mesohalini- cum,  
Den Bommel.
23. *Promonotus schultzei* Meixner, 1943.  
In salt-marshes and on tidal sand- and mudflats in the euhali-  
ni- cum, the polyhalini- cum and the mesohalini- cum.
24. *Archilopsis unipunctata* (O. Fabricius, 1826).

On intertidal sand- and mudflats as well as in salt-marshes  
and in tidal reedswamps in the euhalini- cum, the polyhalini-  
cum, the mesohalini- cum and the oligohalini- cum.

25. *Minona baltica* Karling and Kinnander, 1953.  
In mesohaline salt-marshes.
26. *Coelogygnopora schulzii* Meixner, 1938.  
In salt-marshes in the euhalini- cum and the polyhalini- cum.  
Also under stones of the dike slopes, near high-water mark.

Order: Seriata.

27. *Planaria torva* O. F. Müller, 1773.  
In the freshwater tidal area.
28. *Dugesia lugubris* (O. Schmidt, 1860)  
In the freshwater tidal area.  
The related *D. polychroa* (O. Schmidt, 1862) may occur as  
well. During this investigation these two species were not  
separated.
29. *Polycelis tenuis* Ijima, 1884.  
In the freshwater tidal area.
30. *Polycelis nigra* (O. F. Müller, 1773).  
In the freshwater tidal area.
31. *Dendrocoelum lacteum* (O. F. Müller, 1773).  
In the freshwater tidal area.
32. *Uteriporus vulgaris* Bergendal, 1890.  
Very common on salt-marshes in the euhalini- cum, and the  
polyhalini- cum. rare in the mesohalini- cum; also under stones  
of the dike slopes, near high-water mark.

Order: Neorhabdocoela.

Suborder: Dalyellioida.

33. *Pseudograffilla arenicola* Meixner, 1938.  
In detritus-rich fine sand and mud of intertidal flats, and  
between algae on salt-marshes in the euhalini- cum, polyha-  
lini- cum and mesohalini- cum
34. *Provortex affinis* (Jensen, 1878).  
On intertidal sand- and mudflats in the euhalini- cum, slightly  
penetrating into the polyhalini- cum.
35. *Provortex balticus* (Schultze, 1851)  
On salt-marshes and intertidal sand- and mudflats in the  
euhalini- cum, the polyhalini- cum and the mesohalini- cum;  
also in isolated brackish-water bodies.  
This species is probably not homogeneous and needs further  
investigation.
36. *Provortex karlingi*, Ax, 1951.  
On sand- and mudflats and in salt-marshes in the euhali-  
ni- cum, the polyhalini- cum and the mesohalini- cum.
37. *Provortex pallidus* Luther, 1948.  
In salt-marshes in the mesohalini- cum and oligohalini- cum,  
rarely in more marine-estuarine sections. Also found in the  
high-littoral belt of the freshwater tidal area in willow cop-  
pices.
38. *Provortex psammophilus* Ax, 1951.  
On clean, intertidal sandflats in the euhalini- cum.
39. *Provortex tubiferus* Luther, 1948.  
On sand- and mudflats in the euhalini- cum and polyhalini- cum,  
also in salt-marsh creeks.
40. *Pogaina suecica* (Luther, 1948).  
In salt-marsh creeks and on intertidal flats with detritus-rich  
fine sand in the euhalini- cum.
41. *Fejdoskva halileimonia* Ax, 1960.  
On salt-marshes in the euhalini- cum and the polyhalini- cum.
42. *Baicalellia brevituba* (Luther, 1921)

On salt-m:  
43. *Baicalellia*  
In salt-ma  
44. *Halammo*  
On muddy  
45. *Jensenia a*  
On a salt-i

Suborder: Ty

46. *Maehrent*  
On salt-m  
in isolated
47. *Westblad*  
On salt-m  
cum and p
48. *Coronheli*  
On salt-m  
fresh water
49. *Coronhel*  
On sandy
50. *Promesos*  
In salt-m  
euhalini- cum
51. *Promesos*  
On interti- cum.
52. *Promesos*  
On sand- euhalini- cum  
Rare on s:
53. *Promesos*  
On sand- cum and t
54. *Ptychope*  
(= *Ptycho*  
tog, 1964)  
On salt-rr  
halini- cum
55. *Ptychope*  
On salt-rr  
Also in w  
tidal area
56. *Ptychope*  
On intert  
euhalini- cum
57. *Lutheriel*  
In salt-rr  
mesohali- cum
58. *Proxenet*  
On intert  
polyhalin- cum
59. *Proxenet*  
In salt-m:
60. *Proxenet*  
In salt-m:
61. *Proxenet*  
On salt-i  
polyhalin- cum  
brackish
62. *Proxenet*  
Mainly in  
halini- cum

polyhalini-

lyhalinicum.  
ater mark.

ay occur as  
s were not

m. and the  
nder stones

l flats, and  
m. polyha-

m. slightly

lats in the  
halinicum;

eds further

e euhalini-

alini n.  
und in the  
illow cop-

olyhalini-

tritus-rich

inicum.

- On salt-marshes in the euhalinicum and the polyhalinicum.
- 43. *Baicaellelia subsalina* Ax, 1954.  
In salt-marsh creeks in the mesohalinicum. Den Bommel.
- 44. *Halammovortex macropharynx* (Meixner, 1938).  
On muddy sandflats in the euhalinicum and polyhalinicum.
- 45. *Jensenia angulata* (Jensen, 1878).  
On a salt-marsh in the euhalinicum. Kreekrakdam.

Suborder: Typhloplanoida.

- 46. *Maehrenthalia dubia* Ax, 1956.  
On salt-marshes in the euhalinicum and polyhalinicum; also in isolated brackish pools.
- 47. *Westbladiella obliquepharynx* Luther, 1943.  
On salt-marshes and on mud- and sandflats in the euhalinicum and polyhalinicum.
- 48. *Coronhelmis multispinosus* Luther, 1948.  
On salt-marshes bordering on sand dunes, and subjected to fresh water seepage in the euhalinicum and polyhalinicum.
- 49. *Coronhelmis* n.sp.  
On sandy intertidal flat in the euhalinicum. Noord Beveland.
- 50. *Promesostoma caligulatum* Ax, 1952.  
In salt-marshes and salt-marsh creeks, often on sand, in the euhalinicum and the polyhalinicum.
- 51. *Promesostoma gracilis* Ax, 1951.  
On intertidal flats with detritus-rich fine sand in the euhalinicum.
- 52. *Promesostoma marmoratum* Schultze, 1851.  
On sand- and mud flats, and in salt-marsh creeks in the euhalinicum, the polyhalinicum and the mesohalinicum. Rare on salt-marshes.
- 53. *Promesostoma rostratum* Ax, 1951.  
On sand- and mudflats in the euhalinicum, the polyhalinicum and the mesohalinicum.
- 54. *Ptychopera hartogi* Ax, 1971.  
(= *Ptychopera tuberculata* (von Graff, 1882) sensu den Hartog, 1964b):  
On salt-marshes and mudflats in the euhalinicum, the polyhalinicum and the mesohalinicum.
- 55. *Ptychopera spinifera* den Hartog, 1966.  
On salt-marshes in the mesohalinicum and oligohalinicum. Also in wet grassland in the reach of the tides in the freshwater tidal area.
- 56. *Ptychopera westbladi* (Luther, 1948).  
On intertidal sand- and mudflats and on salt-marshes on the euhalinicum and the polyhalinicum.
- 57. *Lutheriella diplostyla* den Hartog, 1966.  
In salt-marshes in the euhalinicum, polyhalinicum and mesohalinicum.
- 58. *Proxenetes bilioi* den Hartog, 1966.  
On intertidal mud- and sandflats in the euhalinicum and the polyhalinicum.
- 59. *Proxenetes britannicus* den Hartog, 1966.  
In salt-marshes in the euhalinicum and polyhalinicum.
- 60. *Proxenetes cisorius* den Hartog, 1966.  
In salt-marshes in the euhalinicum and polyhalinicum.
- 61. *Proxenetes deltoides* den Hartog, 1965.  
On salt-marshes and sandy mudflats in the euhalinicum, polyhalinicum and mesohalinicum. Also in isolated brackishwater pools.
- 62. *Proxenetes stabellifer* Jensen, 1878.  
Mainly in salt-marsh creeks in the euhalinicum and the polyhalinicum.

- 63. *Proxenetes intermedius* den Hartog, 1966.  
On sandy and muddy intertidal flats in the euhalinicum.
- 64. *Proxenetes karlingi* Luther, 1943.  
On salt-marshes and in salt-marsh creeks, also on intertidal flats in the euhalinicum, the polyhalinicum and the mesohalinicum. Also in isolated brackish waters.
- 65. *Proxenetes minimus* den Hartog, 1966.  
In salt-marshes in the euhalinicum, the polyhalinicum and the mesohalinicum.
- 66. *Proxenetes monotubulus* den Hartog, 1966.  
In salt-marshes, at very high level, in the euhalinicum.
- 67. *Proxenetes pratensis* Ax, 1960.  
In salt-marshes in the euhalinicum.
- 68. *Proxenetes puccinellicola* Ax, 1960.  
In salt-marshes in the euhalinicum and the polyhalinicum.
- 69. *Proxenetes quadrispinosus* den Hartog, 1966.  
In salt-marsh creeks and on sandy mudflats in the euhalinicum.
- 70. *Proxenetes segmentatus* den Hartog, 1966.  
On sandy mudflats in the euhalinicum.
- 71. *Proxenetes simplex* Luther, 1948.  
(incl. *P. augustus* Ax, 1951).  
On intertidal sand- and mudflats, rarely on the salt-marshes in the euhalinicum and the polyhalinicum. Sometimes in isolated brackish waters.
- 72. *Proxenetes trigonus*, Ax, 1960.  
On intertidal flats with detritus-rich fine sand in the euhalinicum.
- 73. *Proxenetes unidentatus* den Hartog, 1965.  
On salt-marshes, often at very high level, in the euhalinicum and the polyhalinicum.
- 74. *Messoplana elegans* (Luther, 1948).  
On intertidal flats with detritus-rich fine sand in the euhalinicum.
- 75. *Messoplana geminata* den Hartog, 1966.  
On intertidal flat with detritus-rich fine sand in the euhalinicum. Kattendijke.
- 76. *Haloplanella minuta* Luther, 1946.  
On intertidal flats with detritus-rich fine sand in the euhalinicum.
- 77. *Haloplanella obtusituba* Luther, 1946.  
On intertidal sand- and mudflats in the euhalinicum and the polyhalinicum.
- 78. *Thalassoplanella collaris* Luther, 1946. => H. *Deunvalg*?  
In shell grit near high water mark. Kattendijke.
- 79. *Casirada subsalsa* Luther, 1946.  
On sandy salt-marshes, bordering on dunes, subjected to freshwater seepage, in the polyhalinicum.
- 80. *Dochmiotrema limicola* von Hofsten, 1907.  
In an isolated brackish water pool, Noord Beveland.
- 81. *Anthopharynx vaginatus* Karling, 1940.  
On salt-marshes and on muddy sand flats in the euhalinicum and the polyhalinicum.

Suborder: Kalyptorhynchia.  
Various representatives of this order have not yet been identified. The following species have been found with certainty.

- 82. *Gyratrix hermaphroditus* Ehrenberg, 1831.  
Holeuryhaline species, once found on a salt-marsh, but common in slightly brackish and freshwater ponds and ditches.
- 83. *Acrorhynchides robustus* (Karling, 1931).

- 5 On salt-marshes, in salt-marsh creeks, but also on sandy mudflats in the euhalinicum, the polyhalinicum and the mesohalinicum.
- 5 84. *Parautelga bilioi* Karling, 1964.  
In salt-marshes in the euhalinicum.
- 5 85. *Zonorhynchus semiascatus* Karling, 1956.  
On intertidal flat with detritus-rich fine sand and on salt-marshes in the euhalinicum.
- 5 86. *Placorhynchus o. octaculeatus* Karling, 1931.  
On salt-marshes and intertidal mudflats in the euhalinicum, the polyhalinicum and the mesohalinicum; also in isolated brackish ponds.
- 5 87. *Placorhynchus o. dimorphus* Karling, 1947.  
In isolated, slightly brackish, former estuary, Brielse Meer.
- 5 88. *Prognatorhynchus canaliculatus* Karling, 1947.  
On salt-marshes and on sandy mudflats in the euhalinicum and the polyhalinicum.
- 5 89. *Psittacorhynchus verweyi* den Hartog, 1968.  
On intertidal flats with detritus-rich fine sand in the euhalinicum.
- 5 90. *Carcharodorhynchus subterraneus* Meixner, 1938.  
On salt-marsh bordering on sand dunes, and subjected to freshwater seepage, in the polyhalinicum.

Order: Polycladida.

91. *Notoplana atomata* (O. F. Müller, 1774)  
On mudflats and under stones of the dike slopes in the euhalinicum and the polyhalinicum.

## References

- Ax. P. 1971. Zur Systematik und Phylogenie der Trigonostominae (Turbellaria, Neorhabdocoela). Mikrofauna des Meeresbodens 4: 141-220.
- Bilio, M. 1966. Charakteristische Unterschiede in der Besiedlung finnischer, deutscher und holländischer Küstensalzweiden durch Turbellarien. Veröff. Inst. Meeresf. Bremerhaven Sonderband 2: 305-318.
- Hartog, C. den. 1962. De Nederlandse platwormen, Tricladida. Wetensch. Meded. K.N.N.V. 42: 1-40.
- Hartog, C. den. 1963a. The distribution of the marine Triclad *Uteriporus vulgaris* in the Netherlands. Proc. Koninkl. Ned. Akad. Wetenschap., C66(2): 196-204.
- Hartog, C. den. 1963b. The Amphipods of the Deltaic region of the rivers Rhine, Meuse and Scheldt in relation to the hydrography of the area. Part 1. Introduction and Hydrography. Neth. J. Sea Res. 2: 29-39.
- Hartog, C. den. 1964a. Proseriate Flatworms from the Deltaic Area of the rivers Rhine, Meuse and Scheldt I-II. Proc. Koninkl. Ned. Akad. Wetenschap., C67(1): 10-34.
- Hartog, C. den. 1964b. A preliminary Revision of the Proxenetes Group (Trigonostomidae, Turbellaria) I-III. Proc. Koninkl. Ned. Akad. Wetenschap., C67(5): 371-407.
- Hartog, C. den. 1965. A Preliminary Revision of the Proxenetes Group (Trigonostomidae, Turbellaria) IV-V. Proc. Koninkl. Ned. Akad. Wetenschap., C68(2): 98-120.
- Hartog, C. den. 1966a. A Preliminary Revision of the Proxenetes Group (Trigonostomidae, Turbellaria) VI-X. Proc. Koninkl. Ned. Akad. Wetenschap., C69(2): 97-163.
- Hartog, C. den. 1966b. A preliminary Revision of the Proxenetes Group (Trigonostomidae, Turbellaria) Supplement. Proc. Koninkl. Ned. Akad. Wetenschap., C69(5): 557-570.
- Hartog, C. den. 1968. An analysis of the Gnathorhynchidae (Neorhabdocoela, Turbellaria) and the position of *Psittacorhynchus verweyi* nov. gen. nov. sp. in this family. Proc. Koninkl. Ned. Akad. Wetenschap. C71(4): 335-345.
- Hartog, C. den. 1974. Salt-marsh Turbellaria. In N.W. Riser & M. P. Morse (ed.): Biology of the Turbellaria. McGraw-Hill, New York: 229-247.
- Karling, T. G. 1964. Über einige neue und ungenügend bekannte Turbellaria Eukalyptorhynchia. Zool. Anz. 172: 159-183.
- Karling, T. G. 1974. Turbellarian fauna of the Baltic proper Identification, Ecology and Biogeography. Fauna fennica 27: 1-101.
- Wolff, W. J. 1973. The estuary as a habitat. An analysis of data on the soft-bottom macrobenthos of the estuarine area of the rivers Rhine, Meuse and Scheldt. Zoöl. Verh. Leiden. 126: 1-242.