THE NON-POLYCHAETOUS ANNELIDS OF NORFOLK, ENGLAND, WITH ADDITIONAL NOTES ON POLYCHAETES.

by

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Résumé

L'auteur présente un inventaire des Archiannélides, Oligochètes et Hirudinées du Norfolk. Jusqu'à présent, il ne comprenait que quelques espèces banales dont la seule connue surtout de nos parages était la Sangsue *Pontobdella muricata*. Mais, grâce à l'œuvre de Kirkegaard (1969), à laquelle s'ajoutent quelques renseignements inédits de l'auteur, la liste des Polychètes du Norfolk est portée à 147 espèces. *Microphthalmus aberrans* est incontestablement, et *Polycirrus prismatica*, probablement, nouvelles pour les Iles britanniques. De plus, cinq (*Sthenelais limicola, Eteone lactea, Goniada maculata, Nerine bonnieri* et *Polycirrus medusa*) sont nouvelles pour le Norfolk. *Thelepus cincinnatus* est cité pour la première fois comme hôte de *Harmothoe lunulata* et une nouvelle localité est indiquée pour *Pectinaria belgica*. Enfin, les distributions de certaines espèces vis-à-vis de l'habitat ou des types d'eaux préférentiels sont discutées, ce qui permet de suggérer que certaines espèces de la Mer du Nord centrale, inconnues jusqu'ici dans le Norfolk, pourront vraisemblablement y être découvertes.

INTRODUCTION

The present paper completes the account (Hamond, 1962, 1966) of the marine and brackish-water annelids collected by the methods previously described (Hamond, 1967b, and refs.) in the Norfolk marine area (Hamond, 1969). Of the groups dealt with below, the only records by other workers not sofar considered are of marine polychaetes collected far offshore by Redeke & van Breemen (1904) and by Kirkegaard (1969), of the marine leech *Pontobdella* by Patterson (unpubl.), and of some brackish-water oligochaetes (Friend, 1912).

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ARCHIANNELIDA
(identified from Fauvel, 1927)

Dinophilus taeniatus Harmer.

Very common among small tufted algae (mostly brown or red algae, but a few green) in sheltered places in the bed of Morston Creek and its tributaries ; first appearing in October, it is most numerous from December to March inclusive, and has disappeared once more by the middle of May. The eggs are of the same bright colour as the worms themselves, and are laid adhering to one another in small heaps; spawning has been seen by me only in January (under artificial conditions), but probably occurs over a longer season.

Nerilla antennata O. Schmidt.

Under Wells Rocks from August to December, in greatest abundance in August ; in September 1966 enormous numbers were found in casual samples collected in the upstream end of the outflow which drains Abraham's Bosom (the brackish boating lake at Wells-next-the-Sea), and on 6.8.1967 about twenty were found in a 300 ml sample of a brown alga (probably *Dumontia* sp.) which was growing in the Strond Pool in Blakeney Harbour. The great majority of specimens contain gametes from August to October.

Protodriloides symbioticus Giard.

Common in clean sand in, and round the edges of, the Pit of Blakeney Harbour, as far east as the tip of the sandbank just north-east of the mouth of Morston Creek; spawning (described by Swedmark, 1954) not seen by me. Gray (1966 and earlier, as *Protodrilus*, but see Jouin, 1966) has used it extensively for experimental work.

OLIGOCHAETA

Enchytraeus albidus Henle.

Numerous among decaying *Ruppia* sp. in the Half Moon Pond, Cley-next-the-Sea, 5.10.1966.

Clitellio arenarius O.F. Müller.

Eight under rocks at West Runton, 2.8.1959 (J. Fisher).

Peloscolex benedeni d'Udekem.

Seven in about 2 litres of mud from the Fleet at Morston, 26.8.1962, with *Nereis diversicolor*.

HIRUDINEA

Pontobdella muricata (L.).

Moderately common on the Roker, *Raia clavata* (Yarmouth, A.H. Patterson, unpubl. ; Blakeney, Wells-next-the-Sea, and King's Lynn, own observations), which is by far the most numerous ray in the Norfolk area; one on a stingray (*Trygon pastinaca*) in a shrimptrawl about 100 metres offshore at Great Yarmouth, between Britannia Pier and Wellington Pier, on 8.9.1966 (P.G.W. Trett).

Hemibdella soleae van Beneden & Hesse.

Abundant on the dark sides of soles (*Solea vulgaris*) trawled within a few miles of Wells-next-the-Sea in June 1955 ; the biology is described by Llewellyn (1965).

POLYCHAETA

(a) new records for Norfolk waters

Microphthalmus aberrans (Webster & Benedict).

A single female, containing ova, among weeds and mud in the northern end of Abraham's Bosom on 15.9.1966 ; this is the first British record, and agreed well with the excellent figure by Rasmussen (1956, as *M.sczelkowi*, but see Westheide, 1967), and with Westheide's own description of *M. aberrans*.

Streptosyllis websteri Southern.

In sand (cf. Friedrich, 1938) on the floor of the Pit, where it never drains dry at low tide (i.e. permanently submerged). During August 1967, three specimens were taken on the 17th and ten on the 29th; of the ten, the largest was full of ova from behind the pharynx to the point where the tail had been broken off. These specimens agreed well with *websteri* as described in Fauvel (1923), but a larger material from the Pit might possibly show intergradations between this and

other supposed species (cf. also Banse, 1968); the colour was glistening translucent white, with yellowish gut and ova.

Proceraea prismatica (Fabricius).

Seven males and one female (figured by Hamond, 1967c) were taken in a plankton haul at the very surface, close to the Blakeney Overfalls Buoy, on 10.2.1967 when the sea-temperature (3.5°C., taken immediately after the haul) must have been very close to its annual minimum for that area (cf. Hamond, 1967a). The female had not ovulated, and was therefore presumed to be capable of mating; unfortunately the stolons, not being hardy in transit, were unable to give any mating reactions in the laboratory (Hamond, in press).

Although this species is common in the Arctic Wesenberg-Lund, 1947; Pettibone, 1963), the only two previous European records are both somewhat doubtful. That from the Firth of Clyde (Clark, 1960) is no longer extant ; the Danish specimen (Thorson, 1946, p. 39) is a poorly preserved female, in which sex the characters separating *prismatica* from *cornuta* are still too little known to enable me to decide which species this specimen belongs to, although it certainly belongs to one or other of them. From the very scattered temperature records in Thorson's paper, it is not possible to narrow down the water-temperature at the time of capture (11.11.1941, in the northernmost part of the Sound) to better than between about 0 and 4 °C., which would appear to be suitable for either species. The record from the Blakeney Overfalls Buoy is thus not merely the furthest south that *P. prismatica* has ever been found in the east Atlantic, but is the first definite British and North-European record of this species.

Goniada maculata Ørsted.

Since the Norfolk area as defined by me in 1969 includes the whole of the Lincolnshire coast, the record of this species from Gibraltar Point (see Hamond, 1966, p. 423) automatically becomes the first Norfolk record; none of the other species recorded from neighbouring counties (loc. cit.) deserve a place in our fauna list as yet. For offshore records of *G. maculata* in our area, see Table B ; it is extremely common over most of the central North Sea (Kirkegaard, pp. 62-64).

Sthenelais limicola (Ehlers).

Eteone lactea Claparède.

Nerine bonnieri Mesnil.

Polycirrus medusa Grube.

These four species must all be added to our fauna as a result of Kirkegaard's work (Table B).

(b) notes on previously recorded species

Harmothoe lunulata (Delle Chiaje).

Although not uncommon in Norfolk waters (Hamond, 1966), *H. lunulata* has never been found as yet commensal with *Thelepus cincinnatus,* even though the latter belongs to the same family (Terebellidae, keyed by Pearson, 1969) as the principal host of *H. lunulata* in Norfolk waters, *Lanice conchilega.* One *Thelepus* out of nine taken at D.53, and one out of seven at D.55, each had a single *Harmothoe* with it in its tube ; when removed from its tube the host tended to curl up into a spiral with its ventral surface inwards, and the *Harmothoe* showed a distinct preference for being embraced in the coils of the spiral, bending its own body into an arc with the ventral surface inwards so as to partly clasp the ventral surface of the host, the long axes of the two worms being at right angles to one another.

Table 1 of Hamond (1966) was framed before *H. lunulata* had been found associated with *Thelepus;* accordingly, Table A shows

TABLE A.

Subtidal finds in the Norfolk area (other than by Kirkegaard, 1969) of *Harmothoe lunulata, Thelepus cincinnatus,* and *Lanice conchilega,* separately or together.

(1) *Thelepus* and *Harmothoe* taken in the same haul, without being observed in in the act of association.

Station	W. 27	D. 15	D. 17	D. 18	D. 22
Thelepus	4	ca. 30	few	6	13
Lanice	0	few	very many	0	0
Harmothoe	1	1	1	1	5

(2) Finds of *Harmothoe* without *Thelepus.*

Station	D. 20	D. 26	D. 45
Harmothoe	1	3	12
Lanice	0	abundant	abundant

(3) Finds of *Thelepus* without *Harmothoe.*

(a) (from Möbius, 1875):—

Thelepus was present at « Pommerania » stations 106, 108, 111, and 113. Möbius did not record *Lanice* or *H. lunulata* in our area, and never gave the number caught of any species.

(b) (own observations):—

Station	W. 26	W. 28	D. 4	D. 5	D. 6	D. 8	D. 9	D. 14	D. 23	D. 47	D. 54	D. 57
Thelepus	few	1	ca.20	ca.10	2	few	few	few	4	3	2	2

(4) Finds of *Lanice* without *Harmothoe*:

D.6	D.14	D.35
1	abundant	12 (see Hamond, 1966, p. 418)

where either or both of them have been taken in the Norfolk area (station list, Hamond, 1969). The *Thelepus* in Table A (3) probably harboured a few *Harmothoe* which were missed, since for a routine identification of *Thelepus* it is unnecessary to open the tube; as to

Table A (2), in the absence of all terebellids (Hamond, 1966, Table 7) at D. 20, I am unable to suggest a possible host. The record of *H. lunulata* from D.19 (Hamond, 1966, bottom of p. 432) is due to a mistake; this haul was discarded immediately after capture. It would be of great interest to see whether *Harmothoe* from *Lanice*-tubes was attracted to, or capable of living with, *Thelepus,* or vice versa; I have not been able to detect any morphological difference betwen *H. lunulata* from these two hosts.

Kirkegaard records *H. lunulata* ("probably from tubes of terebellids, where the species is known to be a commensal") from several stations just north of our area, at stn. 7569 with *Thelepus,* at stn.8035 with *Thelepus* and with *Trichobranchus roseus,* at stn. 7479 with *Lanice,* and at stns. 7596(6), 7745, 7881, and 8022, without any of these potential hosts. None of the "Dana" specimens were detected in the act of association.

Pectinaria belgica (Pallas).

One specimen in the trawl at 52°44' N.02°35'E., on sand at a depth of 50 metres, 11.3.1903 ("Wodan" stn. 18:Redeke, 1905). Depending on the substratum, this may have been *P. belgica* (muddy sand) or *P. koreni* (clean sand) ; as clearly shown by Kirkegaard's numerous records, substrate preference is the dominant factor in habitat selection by both these species and by *P. auricoma* (which also prefers muddy sand). If the "Wodan" specimen was correctly identified, the distribution of *P. belgica* within the Norfolk area closely parallels that of *P. auricoma,* and supports the idea that the sands of the outer area (Hamond, 1969, p. 211) are in general substantially muddier than the relatively clean sands of the inner area ; if, however, it was *P. koreni,* this idea is not contradicted owing to the presence, at many places in the outer area, of areas of clean sand.

Note on Redeke & van Breemen (1904)

Of the total of eight polychaete species recorded by these authors, all were found at one more stations within our area. *Tomopteris helgolandica* (their, p. 127) is no doubt correctly identified, and, of the benthonic species (their, p. 145), *Thelepus cincinnatus, ?Sabellaria spinulosa,* and *Pomatoceros triqueter,* are all probably so. *Their Spirorbis* sp. may have been *S. spirillum,* but they give no details; their alleged *Serpula vermicularis, ?Placostegus tridentatus,* and *?Vermilia* sp. are probably all mistakes for *P.triqueter,* with or without *Hydroides norvegica,* since both Kirkegaard's findings and my own indicate that these are the two overwhelmingly dominant serpulids (especially *P. triqueter*) in the central and south-western North Sea, in which area the genera *Placostegus* and *Vermilia* are entirely unknown. Finally, Redeke & van Breemen identified many of their tubicolous polychaetes from empty tubes, which is probably why they themselves queried three of their species.

Note on Kirkegaard (1969)

This extremely valuable and important survey is based on a large number of grab samples by the "Dana", of which a few lie within the Norfolk area (Table B). The positions of these stations are shown,

TABLE B.

« Dana » stations (Kirkegaard, 1969) lying within the Norfolk area, with the polychaetes taken at each.

Station	Latitude	Longitude	Depth (m)	Numbers of specimens of each species
7963	53°59'N.	01°40'E.	34	1 *Nephthys caeca*, 1 *N. hombergi*, 1 *Goniada maculata*, 2 *Magelona papillicornis*, 1 *Owenia fusiformis*.
8373	53°30'N.	03°00'E.	28	2 *Spiophanes bombyx*, 1 *Lagis koreni*, 1 *Lanice conchilega*.
9418[1]	52°48'N.	02°25'E.	48	1 *Nerine bonnieri*, 1 *Polycirrus medusa*, 3 *Ophelia borealis*.
9418[2]	52°48'N.	02°25'E.	48	1 *Sthenelais limicola*, 1 *Nephthys cirrosa*, 1 *Goniada maculata*, 2 *Scoloplos armiger*.
9419	52°32'N.	01°52'E.	29	1 *Eteone lactea*.

or can be found, on fig. 1 of Hamond (1969) ; the polychaetes found at them bring the number of Norfolk species to 147, of which I have not personally seen 16. The following discussion attempts to assess the likelihood, based on Kirkegaard's records, of further species being found in the Norfolk area.

No less than 25 species (Table C) are shown in Kirkegaard's

TABLE C.

Species which, although not yet known from Norfolk waters, may in future be found there (see text); nomenclature and substrate types as in Kirkegaard (1969).

	Fine sand	Coarse sand	Muddy sand	Clayey sand	Sandy clay	Muddy clay
Harmothoe antilopes				X		
Harmothoe longisetis			X	X	X	
Nemidia torelli			X	X		
Sigalion mathildae	X					
Ophiodromus flexuosus			X	X		
Nephthys incisa					X	
Glycera rouxi			X		X	
Glycinde nordmanni	X					
Lumbriconereis gracilis			X	X	X	
Drilonereis filum			X		X	
Aonides paucibranchiata		X		X		
Laonice cirrata				X		
Magelona alleni				X		
Magelona rosea			X			
Chaetozone setosa	X	X	X	X	X	
Brada villosa					X	
Diplocirrus glaucus					X	X
Scalibregma inflatum	X ?			X	X	
Nicomache lumbricalis			X	X	X	
Myriochele oculata	X ?	X	X	X	X	X
Ampharete arctica			X	X	X	
Lysilla loveni			X	X		
Terebellides stroemi			X	X	X	
Trichobranchus roseus			X	X		
Chone infundibuliformis	X		X			
Total 25 spp.	6 spp.	3 spp.	15 spp.	16 spp.	13 spp.	2 spp.

charts and appendices as approaching our northern boundary very closely without overstepping it. Of the substrates in Table C, it is doubtful whether muddy clay occurs here at all; clayey sand and sandy clay are rare (almost entirely in the northeast corner of our area), and the muddy sand is definitely more common in the outer area (see above, under *Pectinaria belgica*). However, various kinds of fairly clean sand (analogues of Kirkegaard's fine sand and coarse sand) are very widespread near the Norfolk coast and throughout the Wash, and, if the species found in these substrates by the "Dana" are genuinely absent in the latter areas, some other factor(s) must be at work. If the "Dana"'s very detailed coverage of the Dogger Bank had been extended to (say) the Wash, instead of stopping short almost exactly on the northern boundary (54°00) of the Norfolk area, the knowledge of our fauna would have been greatly enriched and the justification of any particular line as an arbitrary boundary to the Norfolk area would have rested on much firmer foundations; as things are, I see no reason at present to redefine the limits of the Norfolk marine area.

Too much reliance should not, however, be placed on a survey of this sort when attempting to forecast the possible occurrence of any given species in our area, for the following reasons.

(1). The grab used was selective, unable to pick up large stones or rocks (Kirkegaard, p. 136), and possibly discriminating against branching organisms such as hydroids, since so very few hydroid-haunting species were found (e.g. *Eusyllis blomstrandi,* Kirkegaard, p. 40) and then only in small numbers, although it was at its best when sampling mud or sand. This performance-spectrum is almost exactly the converse of that shown by my own oyster-dredge, which picked up stones shells and hydroids well, but which allowed a high proportion of the sand and mud to escape.

(2). Anyone going solely by Kirkegaard's distributional maps of *Eteone flava, Nereimyra punctata, Sphaerodorum gracilis, Dorvillea kefersteini, Nerinides cantabra* and *N. tridentata* (which I suspect are identical), *Pherusa plumosa, Pectinaria belgica, Branchiomma bombyx, Sabella penicillus,* and *Hydroides norvegica,* might easily believe that none of these species was likely to be found in the Norfolk area, whereas in fact they all occur there, though none of them is at all numerous anywhere except for *Nerinides* in clean sand intertidally. However, of the "Dana"'s species the following appear to be the least likely to occur in Norfolk waters, owing to their preferences for more or less deep water with a limited range of water-temperature and for a bottom of mud or clay; *Panthalis oerstedi, Nephthys paradoxa,* all the *Maldanidae,* all *Lumbriconereis* spp. (except *L. gracilis,* Table C), *Spiochaetopterus typicus* and *Myxicola infundibulum.* Nevertheless, *Myxicola* is found close inshore at Plymouth; *Euclymene* and *Maldane* might possibly be able to live here in a suitable substrate, given their apparent affinity for *Sagitta elegans*-water; also, there was nothing in the literature earlier than Kirkegaard's paper to suggest that such species as *Harmothoe antilopes* or *Ampharete arctica* were able to exist in the southwestern North Sea. At the moment there is not enough information to make an informed guess about any "Dana" species not discussed above (other than those in Tables B and C); any one of them might occur here on a suitable substratum but, as prev-

iously shown (Hamond, 1969), the substrata off the Norfolk coast are not known in detail except in the Blakeney-Wells area, within which the coverage has unavoidably been very uneven.

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Summary

An annotated list is given of the Norfolk marine and brackish-water archiannelids, oligochaetes, and hirudineans, based on more or less casual records; none of these species are unusual in any way in the present context, and the only one previously found on the Norfolk coast was the skate-leech *Pontobdella muricata.*

Notes are also given on some polychaetes recorded by Redeke & van Breemen (1904), by Kirkegaard (1969), and by myself since my last paper on Norfolk polychaetes (Hamond, 1966). *Microphthalmus aberrans* is certainly, and *Proceraea prismatica* probably, new to the British Isles; *Sthenelais limicola, Eteone lactea, Goniada maculata, Nerine bonnieri* and *Polycirrus medusa* are all new to Norfolk, from the marine and brackish-water areas of which there are now known 147 species of polychaete. *Thelepus cincinnatus* is recorded for the first time as a host for *Harmothoe lunulata,* and a new record is given for *Pectinaria belgica.* Finally, the distributions of various species are discussed in relation to their apparent preferences for certain substrata or types of water, and an attempt is made to suggest which of the central North Sea species, as yet unknown from the Norfolk area, may in future be found there.

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