Pseudonotomastus southerni gen. nov. sp. nov. a new capitellid from the Celtic Sea

Lynda M. WARREN & Miles PARKER***

* Centre for Marine Law and Policy, Cardiff Law School, University of Wales
Cardiff, P O Box 427, Cardiff CF1 1XD, UK
** Department of the Marine, Fisheries Research Centre
Abbotstown, Castlenook, Co. Dublin, Ireland
Present address: Ministry of Agriculture, Fisheries and Food
17 Smith Square, London SW 1P 3JR, UK

ABSTRACT

A new genus and species of Capitellidae has been found in the Celtic Sea off the south coast of Ireland. The genus differs from other genera in having 11 thoracic segments, the first of which is achaetous, the second has capillary chaetae in the notopodia only and the remaining nine have capillary chaetae only. There are no capillary chaetae in the anterior abdominal segments. The type species, *P. southerni*, often shows a distinctive colour pattern.

RÉSUMÉ

***Pseudonotomastus southerni* gen. nov. sp. nov., un nouveau Capitellide en mer Celtique**

Un nouveau genre de Capitellidae a été trouvé en mer Celtique près de la côte sud de l'Irlande. Le genre diffère des autres genres de la famille par la présence de 11 segments thoraciques, dont le premier est achète, le deuxième n'a des soies capillaires que dans les notopodes, et les neuf restant ne possèdent que des soies capillaires. Il n'y a pas de soies capillaires dans les segments antérieurs abdominaux. L'espèce type, *P.southerni*, montre souvent une coloration distincte.

INTRODUCTION

Specimens of the capitellid described below were collected between 1974 and 1982 in the course of baseline and monitoring surveys off the coast of Cork, Ireland, in the Celtic Sea. They were taken from the vicinity of a disposal site for an industrial organic waste from a fermentation plant. Initially it was thought that the worm could be assigned to the genus *Notomastus*, which also occurs in the area, but, despite strong similarities in gross

WARREN, L.M. & M. PARKER, 1994. — *Pseudonotomastus southerni* gen. nov. sp. nov. a new capitellid from the Celtic Sea. *In*: J.-C. DAUVIN, L. LAUBIER & D.J. REISH (Eds), Actes de la 4ème Conférence internationale des Polychètes. *Mém. Mus. natn. Hist. nat.*, **162** : 299-306. Paris ISBN 2-85653-214-4.

morphology, the newly described capitellid can be readily distinguished by its thoracic chaetal formula. The unusual colouration displayed by some specimens (alternating brown and orange bands) is a more obvious, if less reliable, distinction and it was this that first drew our attention to the animal. It is by no means certain, however, that this colour pattern is a natural characteristic of the species. Capitellids usually lose colour in alcohol and appear uniformly pale cream or even colourless although occasionally red pigment spots may persist as, for example, in *Capitella* "punctate" described by HARTMAN (1961) (see WARREN, 1976). The distribution of the coloured bands in this species was reasonably consistent from specimen to specimen but we cannot be certain that it is a natural characteristic. It is possible that the industrial organic waste has resulted in some sort of chemical reaction, perhaps involving gland cells in the epidermis, that has caused a change in colouration. On the other hand, methyl green staining did not reveal any comparable patterns of gland cells either in banded or unbanded specimens.

Specimens were collected by 0.1m^2 grabs during a series of surveys extending from 1974 to 1982 (unpublished reports held by the Fisheries Research Centre, Dublin). Samples were fixed in the field using 4 % formalin and later sorted and transferred to 70 % alcohol. Specimens for examination under scanning electron microscopy (SEM) were air dried before coating with gold. Alcohol preserved worms were stained in a 1 % solution of methyl green in 70 % alcohol following Banse (1970).

Pseudonotomastus n. gen.

TYPE SPECIES. — *Pseudonotomastus southerni* n. sp.

DIAGNOSIS. — Thorax with 11 segments; peristomium and first segment achaetous; first chaetiger with capillary chaetae in notopodia only; following 9 chaetigers with capillary chaetae only in both rami; abrupt transition between thorax and abdomen.

ETYMOLOGY. — The generic name derives from the superficial resemblance to *Notomastus* Sars, 1850.

Pseudonotomastus southerni n. sp.

MATERIAL EXAMINED. — Holotype, incomplete 48 mm long and 26 segments (BM(NH).ZB.1982.89), and 33 paratypes [BM(NH).ZB.1982.90-122] in 18 samples, all incomplete and including several abdominal fragments. Three paratypes were prepared for SEM. These specimens have been deposited in the British Museum (Natural History) as part of a collection of Irish polychaetes by the second author in 1983.

TYPE LOCALITY. — Celtic Sea, off Cork, Ireland. The holotype was collected at 8°20' W, 51°30' N; the remaining specimens in an area between 7°50' to 8°26' W, and 51°27' to 51°42' N.

ETYMOLOGY. — Named after Rowland SOUTHERN (1882-1935), sometime naturalist with the Fisheries Branch of the Department of Agriculture and Technical Instruction, the original antecedent of today's Fisheries Research Centre of the Irish Department of the Marine (GREENE, 1936). Southern wrote many papers on the annelids of Ireland, including one on the annelids of Dublin Bay (SOUTHERN, 1910) and the archiannelid and polychaete section of the Clare Ireland Survey (SOUTHERN, 1914). These were among the first, and remain among the most important, systematic analyses of the Irish polychaetes.

MORPHOLOGY. — The species has a robust appearance. No complete specimen has been recorded but it is estimated from the size and shape of the material available that the total length might be more than 150 mm. The body is divided into a muscular thorax with no clear parapodial ridges followed by a slightly thinner, tapering abdomen in which there are distinct parapodial ridges (Fig. 1c). The length of the thorax is about 8 to 10 mm and the width about 1.2 mm. There are distinct grooves running along the length of the abdomen in a dorso-lateral position in the space between the notopodia and neuropodia and less clear lateral and ventral grooves (Fig. 1a).

The prostomium is triangular in outline with a concave surface ventrally. It is surmounted by a prominent palpode (Fig. 1d). In some specimens the peristomium is drawn forward over the prostomium like a hood so that only the palpode is visible (Fig. 1c). Large nuchal organs were apparent in one specimen but were otherwise indistinct. Eyes were not detected.

The peristomium is a distinct ring about as wide as the following segments and considerably more prominent than the prostomium. There is a large eversible proboscis which is heavily papillated (Fig. 1d) although in some specimens the papillae are not easily visible because of proboscis has become flaccid in preservation.

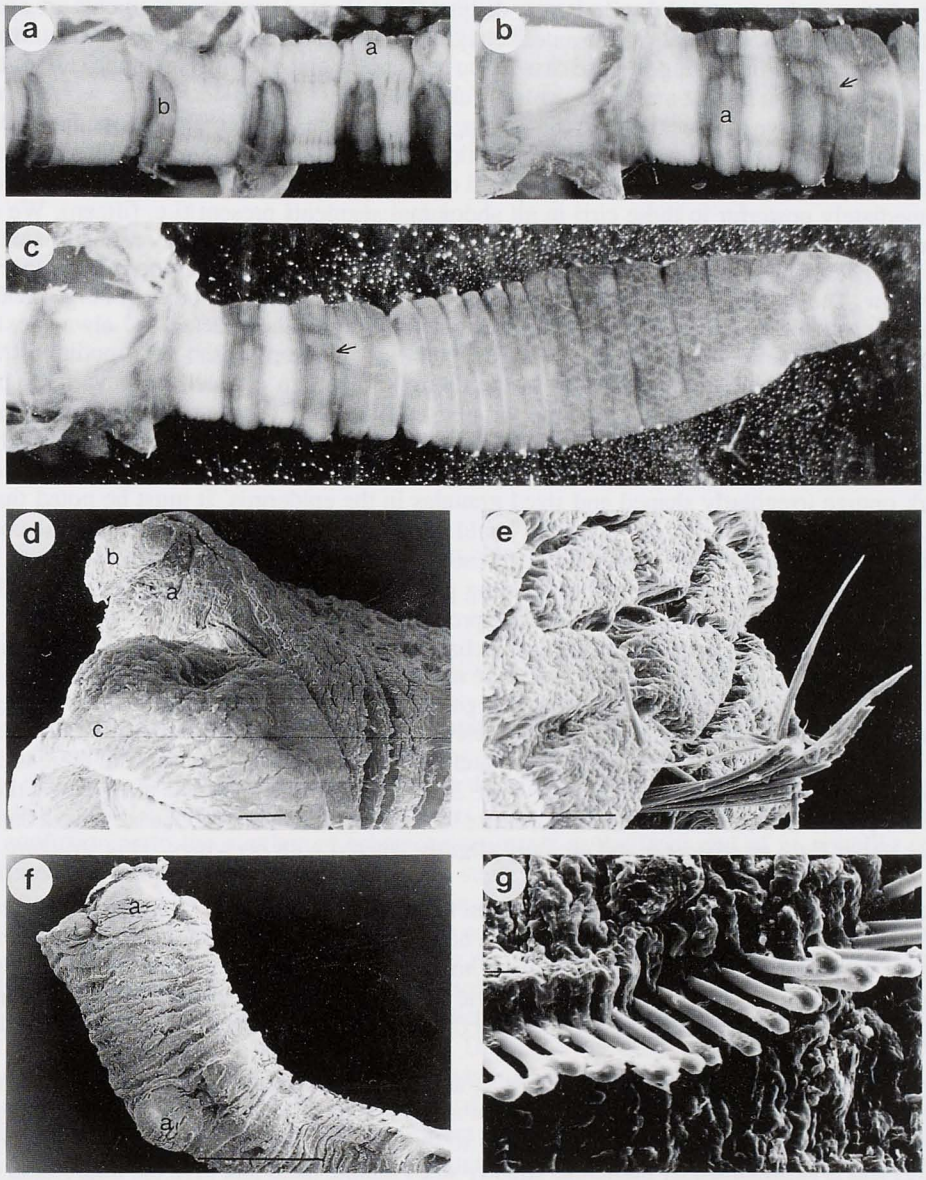

FIG. 1. — *Pseudonotomastus southerni* n. sp. a, anterior abdominal segments, dorsal view (a, notopodium, b, neuropodium). b, anterior abdominal segments, ventral view (arrow indicates boundary between thorax and abdomen, a - neuropodium). c, thorax and anterior abdomen (arrow indicates boundary between thorax and abdomen). d, prostomium and everted proboscis (SEM) (a, prostomium, b, palpode, c, proboscis, scale bar = 100 µm). e, thorax, showing reticulation and capillary chaetae (SEM) (scale bar = 100 µm). f, abdominal segments (SEM) (a - notopodia, scale bar = 1 mm). g, abdominal neuropodial hooks (SEM) (scale bar = 10 µm).

The thorax consists of 11 segments and can be divided into two regions separated by a transitional zone. Segments 1-4 are wide with few constrictions either between segments or on them so that the overall impression

is of a smooth rounded outline. The surface is, however, heavily reticulated (Fig. 1e). Segments 7-11 are slightly narrower. There are usually deep constrictions between segments and each segment is divided into two equal halves by a deep annulus. The outline is thus somewhat angular and truncated. The surface is smooth with only slight reticulations in some specimens. Segments 5 and 6 are transitional, the degree of reticulation and constriction varying from one specimen to another. There are no parapodial lobes or ridges on any thoracic segments.

The division between thorax and abdomen is very distinct (Figs 1b-c). Abdominal segments are about one and a half times as long as thoracic segments in the anterior region and become progressively longer further back. The parapodia are present as prominent ridges in the case of the neuropodia and a fleshy pad in the case of the notopodia (Figs 1a,b,f). The neuropodia almost meet mid-ventrally and extend around the sides of the worm terminating in a fleshy cirrus, which may have a branchial function, on the dorsal surface (Fig. 2). The notopodial pads coalesce so that in most specimens a single pad is visible situated mid-dorsally between the neuropodia (Figs 1a, 1f, 2). The lateral margins of the notopodia are drawn out into small cirri. In one specimen pores, presumably nephridial, are prominent immediately posterior to these cirri in all abdominal segments present (i.e. fifteen). We do not know why these pores are not obvious in other specimens but suggest that the differences may reflect sexual condition.

Several of the specimens show an unusual pattern of colour banding (Figs 1a-b). The basic colour in alcohol is pale creamy yellow. The pattern is most obvious on the abdomen where there are brown/orange bands around the neuropodial ridges sometimes extending into the immediate vicinity of the chaetae and always extending for a small way either side of the neuropodium. Dorsally the band usually stops at the neuropodial cirri but there is occasional light staining on the notopodial pad. In the thorax the pattern is much more variable but is usually darker on segments 7-11 and is often absent from the peristomium. The prostomium is never coloured. On the thorax the colour only occurs on the flat surfaces, i.e. the tops of the reticulations and the main body of the hind thorax. There is no colouration in the cracks and deep annuli. Under high power light microscopy the colouration appears as dark orange irregularly shaped and sized granules in the epidermis. It must be noted that this colour pattern is not present in all animals. Its presence could not be correlated with size or sexual condition. It is possible that the pattern is an artifact caused by differential staining by something in the sediment. Staining the worms with methyl green produced no obvious staining pattern. Colour was taken up evenly by the worms but was lost most rapidly from the prostomium and everted proboscis.

There are 10 thoracic chaetigers, all with capillary chaetae only. These are arranged in four bundles with the neurochaetae situated ventro-laterally and the notochaetae much closer together mid-dorsally. The first segment after the peristomium is achaetous. This is followed by a segment with notochaetae only. The remaining 9 segments have both noto- and neurochaetae thus giving the thoracic chaetal formula of 1 -, 2^{c}, 3-11C. The number and size of the capillaries increases posteriorly. On segments 2 and 3 they can be difficult to see and there are usually only 4 or 5 per bundle. By segment 11 there may be over 20 per bundle (Fig. 1e). In most cases the bundles on segments 7-11 are prominent whereas the anterior ones are less readily detected. The chaetae have a delicate, feather-like appearance under light microscopy and are only slightly tapered with no wings. This structure is confirmed under SEM.

Hooded hooks are the only type of chaetae found on the abdomen but, as no complete specimens have been examined, it is possible that other types may occur. The notopodial hooks are borne in bundles of between 30 and 36 in the first few abdominal segments, decreasing to about 25 hooks by abdominal segment 10. On the abdominal neuropodia hooded hooks are borne in a single row extending from the ventral surface around onto the dorsal surface of the worm and number in excess of 40 (Fig. 1g). There was little individual variation in chaetal numbers.

Both notopodial and neuropodial abdominal chaetae are small short-handled hooded hooks protruding only a short way from the body of the worm. The hoods are prominent and tight fitting, extending from about half way up the shaft and enveloping the main fang of the hook so that only the tip is visible. The main fang is long and pointed (Fig. 1g) and is surmounted by numerous equally-sized minute teeth that give the impression of a ridge.

None of the specimens is complete. The longest specimen exceeds 110 mm but most are no more than 40 mm. There are at least 26 abdominal segments.

ECOLOGY. — Little is known about the ecology of this species. The area from which these specimens were taken lies some 20 to 30 km south of the entrance to Cork Harbour, in 70-90 m depth of water. The area is characterised by mixed poorly sorted sediments, slightly coarser at shallower sites closer to shore and muddier offshore. Faunal density is generally low, of an "*Amphiura filiformis*" type assemblage (THORSON, 1957), with dominant polychaete species including *Lumbrineris gracilis*, *Spiophanes kroyeri* and *Owenia fusiformis*.

The centre of the collection area has been used since 1975 for the disposal of organic waste from a fermentation plant in Cork, but there were no obvious signs of organic enrichment in the sediment, or site-related perturbations in the faunal distribution. The samples collected in 1974 in any case pre-date the disposal operation.

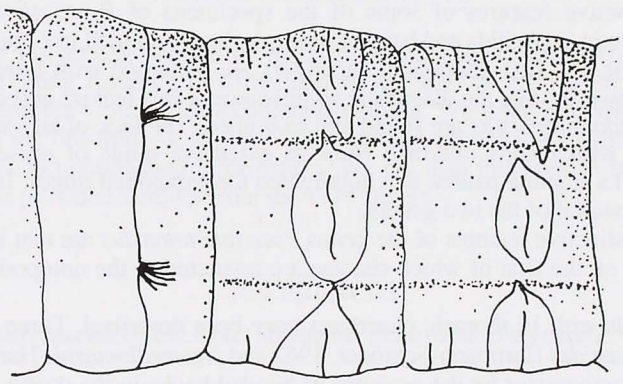

FIG. 2. — Dorsal view of last thoracic and first two abdominal segments. Width of first abdominal segment is 1.5 mm.

There are no obvious differences to distinguish sex. One abdominal fragment, presumed to belong to this species, contains small, rounded eggs.

DISCUSSION

The diagnosis of new genera, and even species, of capitellids is often not completely satisfactory because there are few suitable morphological characteristics and too few specimens to determine variations within a species.

We believe that the most reliable generic character is the number of thoracic chaetigers especially where, as in this case, the distinction between thorax and abdomen is clear. It should be noted, however, that there has been considerable confusion as to the number of achaetous segments at the front end of a capitellid (see WARREN, 1991). Sometimes the peristomium is regarded as pre-segmental; in other cases it is counted as an achaetous segment. On some occasions it has been referred to in both ways within a single paper. Often, also, figures illustrating species characteristics do not accord with the written description (see, for example, KIRKEGAARD, 1983 in which the description of *Paracapitella* refers to the peristomium as an achaetous segment but the drawing appears to indicate a peristomium and an achaetous first segment).

The number of thoracic chaetigers alone will not suffice to distinguish all genera and it is necessary to resort to characteristics of the chaetae and their distribution. This must be done with caution, however, as chaetal distributions, especially in the posterior thorax, change with age.

The overall body shape and the relative prominence of the prostomium and, if present, the palpode are known to be affected by fixation so that these characteristics are not reliable for diagnosis. It is worth noting, however, that the blunt-ended appearance in some specimens of *Pseudonotomastus*, caused by the peristomium being drawn forward like a hood, is reminiscent of *Notomastus* and unlike the appearance of other capitellids such as *Capitella* where the fusion of the peristomium prevents it from being drawn forward.

References to long- or short- handled hooded hooks occur in most descriptions of capitellid species. We describe those of *Pseudonotomastus* as being short-handled but we concede that this is a subjective observation and further note that the character might be affected by fixation. The detailed structure of the hook is of greater potential value for diagnosis although not usually for identification purposes because differences are only apparent under high magnification. The numbers of teeth above the main fang in *Pseudonotomastus* are too great for easy counting and we concluded that precise number counts could not be obtained with any degree of accuracy. Of greater importance

than the numbers of the teeth may be the fact that all the teeth are the same size unlike the case with some capitellid species where the central tooth is larger than the rest.

Because no complete specimens have been examined we cannot be certain that hooded hooks are the only chaetae on the abdomen. It is not uncommon among capitellids for there to be different types of chaetae on posterior abdominal segments.

One of the most distinctive features of some of the specimens of *P. southerni* is the colour banding. Pigmentation is not unknown in capitellids and has, for example, been recorded in *Capitellethus dispar* Thomassin, 1970 where the last thoracic and first abdominal chaetigers are patterned with brown rings made up of small pigment spots. We think, however, that the diagnostic significance of this feature will only become apparent when further populations of *Pseudonotomastus* are found and examined. The lack of any staining pattern with methyl green, however, contrasts with results obtained from an extensive range of museum material belonging to *Notomastus* which produced a staining pattern that highlighted the parapodial ridges. It is possible that this feature could be of use in sorting material of the two genera.

We conclude that the distinctive features of the genus *Pseudonotomastus* are that it has 11 thoracic segments, with 10 thoracic chaetigers on the first of which chaetae are restricted to the notopodia. All thoracic chaetae are simple capillary chaetae.

Five genera of capitellids with 10 thoracic chaetigers have been described. Three of these (i.e. *Mediomastus* Hartman, 1944, *Parheteromastides* Hartmann-Schröder, 1962 and *Neomediomastus* Hartman, 1969) may be readily distinguished from *Pseudonotomastus* by the presence of hooded hooks in the thorax. *Neonotomastus* Fauchald, 1972 and *Pseudoleiocapitella* Harmelin, 1964 both have an achaetous first segment followed by 10 thoracic chaetigers with capillary chaetae. In *Neonotomastus* the first thoracic chaetiger has capillary chaetae in the notopodia only whereas *Pseudoleiocapitella* has the first chaetiger complete. These genera may be distinguished from *Pseudonotomastus* by the presence of capillary chaetae in the first two abdominal segments.

Decamastus Hartman, 1963 is most like *Pseudonotomastus* in its chaetal formula but lacks the first achaetous thoracic segment. The type species, *D. gracilis*, has a full complement of capillary chaetae on all 10 thoracic chaetigers but *D. nudus* Thomassin, 1970 is distinguished by the absence of neuropodial chaetae on the first chaetiger.

Capitellethus Chamberlin, 1919, as typified by *C. dispar* (EHLERS, 1907) may be distinguished from *Pseudonotomastus* by the presence of 11 chaetigers with capillary chaetae, of which the first has only notopodial chaetae. There is no mention of an achaetous segment and it is possible that some confusion of segment counts might have occurred. (This certainly happened in FAUCHALD (1977) which lists *Capitellethus* as having 10 thoracic chaetigers). Apart from the different number of thoracic chaetigers, *Capitellethus* differs from *Pseudonotomastus* in having an indistinct boundary between the thorax and the abdomen and in having long hooks on the abdomen.

Despite similarities between *Pseudonotomastus* and both *Decamastus* and *Capitellethus*, the new genus is most like *Notomastus* Sars, 1850 and strongly resembles it in gross morphology, including the arrangement of the parapodial ridges and the shape of the thorax. *Pseudonotomastus* can be distinguished from *Notomastus* only by the presence of an extra thoracic chaetiger in *Notomastus*.

It is, perhaps, unwise to speculate on the affinities of this genus on the basis of so few data but the similarity with *Notomastus* is so striking as to merit comment. The specimens of *Pseudonotomastus* were collected with *Notomastus latericeus* Sars, sometimes in the same sample. *Notomastus* is a very large genus, subdivided by some into sub-genera.

The description of this new species as typical of a new genus raises some questions concerning diagnostic characters in capitellids. The number of thoracic chaetigers is one of the few reliable diagnostic features of capitellids and its usefulness presumably reflects genotypic characteristics that are susceptible to change. Some species have chaetae in both rami of all thoracic chaetigers; in others the first chaetiger has notopodial chaetae only. Similarly, *Decamastus nudus* is placed in the same genus as *D. gracilis* even though it lacks chaetae in the neuropodia of the first chaetiger. In this paper, the presence of a first chaetiger with chaetae restricted to the notopodia is regarded as being of generic significance. We made this decision for the following reasons. Intraspecific variation in the distribution of chaetae on the anterior thorax is unusual. Given our knowledge of the development of capitellids (see, for example, WILSON, 1933; RASMUSSEN, 1956) this is not surprising. The presence or absence of notopodia on the first chaetiger is, therefore, likely to be of significance. Until now this feature has been used both as a specific and a generic distinction without further explanation. In the absence of the detailed information necessary to reach a definitive decision on this point, we think that it is in order to use the feature as a generic character in order to prevent confusion. We accept that further knowledge may refute our

diagnosis and, indeed, we hope that by raising this issue here we may stimulate a thorough review of this feature in capitellids.

ACKNOWLEDGEMENTS

We are indebted to the Polychaete section of the British Museum (Natural History) and to the National Museum of Wales for providing research facilities and to the staff at the Electron Microscope Unit of the University of London Goldsmiths' College for technical assistance. We gratefully acknowledge the assistance of B.A. THOMAS in preparing the illustrations. M. PARKER gratefully acknowledges the assistance of the Fisheries Research Centre and access to unpublished information. We are also indebted to Ivor REES of the University College of North Wales who provided samples from the 1974 survey.

REFERENCES

BANSE, K., 1970. — The small species of *Euchone* Malmgren (Sabellidae, Polychaeta). *Proc. biol. Soc. Wash.*, **83** : 387-408.

CHAMBERLIN, R.V., 1919. — The annelida polychaeta. *Mus. Comp. Zool. Harvard, Mem.*, **48** : 1-514.

EHLERS, E., 1907. — Neuseeländischen Anneliden II. *Abh. K. Ges. wiss. Göttingen, Math.-Phys. Kl. n.F.*, **3** : 1-80.

FAUCHALD, K., 1972. — Benthic polychaetous annelids from deep water off western Mexico and adjacent areas in the eastern Pacific Ocean. *Allan Hancock Monogr. mar. biol.*, **7** : 1-575.

FAUCHALD, K., 1977. — The polychaete worms. *Natural History Museum of Los Angeles County, Science Series*, **28** : 1-190.

GREENE, A.C., 1936. — Rowland Southern, Obituary. *J. Cons. Perm. Int. Explor. Mer.*, **11** : 3-6.

HARMELIN, J.G., 1964. — Étude de l'endofaune des mattes d'herbières de *Posidonia oceanica* Delib. *Rec. Trav. Stn. Mar. Endoume*, **51** : 43-105.

HARTMAN, O., 1944. — Polychaetous annelids from California, including the descriptions of two new genera and nine new species. *Allan Hancock Pacif. Exped.*, **10** : 239-310.

HARTMAN, O., 1961. — Polychaetous annelids from California. *Allan Hancock Pacif. Exped.*, **25** : 1-226.

HARTMAN, O., 1963. — Submarine canyons of Southern California Pt. III. Systematics: Polychaetes. *Allan Hancock Pacif. Exped.*, **27** : 1-93.

HARTMAN, O., 1969. — *Atlas of the Sedentariate Polychaetous Annelids from California.* Allan Hancock Foundation, California, 812 pp.

HARTMANN-SCHRÖDER, G., 1962. — Zweiter Beitrag zur Polychaetenfauna von Peru. *Kieler Meeresforsch*, **18** : 109-147.

KIRKEGAARD, J.B., 1983. — Bathyal benthic polychaetes from the north east Atlantic Ocean, south west of the British Isles. *J. mar. biol. Ass. UK*, **63** : 593-608.

RASMUSSEN, E., 1956. — The reproduction and larval development of some polychaetes from the Isefjord, with some faunistic notes. *Biol. Meddr.*, **23** : 1-84.

SARS, M., 1850. — Beretning om en i Sommeren 1849 foretagen zoologisk Reise i Lofoten og Finmarken. *Nyt Mag. Naturvid*, **6** : 121-211.

SOUTHERN, R., 1910. — The marine worms (Annelida) of Dublin Bay and the adjoining district. *Proc. R. Irish Acad.*, XXVIII, B, **6** : 215-246.

SOUTHERN, R., 1914. — Clare Island Survey, Part 47, Archiannelida and Polychaeta. *Proc. R. Irish Acad.*, XXXI, **47** : 1-160.

THOMASSIN, B., 1970. — Contribution à l'étude des polychètes de la région de Tulear (S. W. de Madagascar). III. Sur les Capitellidae des sables coralliens. *Rec. Trav. Stn mar. Endoume* suppl., **10** : 71-101.

THORSON, G., 1957. — Bottom communities (sublittoral or shallowshelf). *In*: J.W. HEDGPETH (ed.), *Treatise on Marine Ecology and Palaeoecology, vol 1, Ecology*. Geological Society of America : 461-534.

WARREN, L.M., 1976. — A review of the genus *Capitella* (Polychaeta, Capitellidae). *J. Zool., Lond.*, **180** : 195-209.

WARREN, L.M., 1991. — Problems in capitellid taxonomy. The genera *Capitella*, *Capitomastus* and *Capitellides* (Polychaeta). *Ophelia* suppl., **5** : 275-282.

WILSON, D.P., 1933. — The larval stages of *Notomastus latericeus* Sars. *J. mar. biol. Ass. UK*, **18** : 511-518.