

THE POLYCHAETE *MAGELONA FILIFORMIS* SP. NOV. AND NOTES ON OTHER SPECIES OF *MAGELONA*

By DOUGLAS P. WILSON, D.Sc.

The Plymouth Laboratory

(Text-figs. 1 and 2)

As already mentioned (Wilson, 1958), a species of *Magelona* from clean sand near low water at Mill Bay, Salcombe, has not yet been described. This worm was first noticed in 1939; it is recorded in the 1957 edition of the *Plymouth Marine Fauna* as '*Magelona* sp.' and it is there mentioned that artificial fertilizations were made and larvae reared in April-September 1939, and that these larvae differed from those of the other two *Magelona* species from the Plymouth district (*papillicornis* F. Müller and *alleni* Wilson). The worm is still common in the same locality at Salcombe, in the same ground and often in the same spade-full as *papillicornis*, but it is not as abundant as the latter and probably not as abundant as it was when first seen in 1939. A very good low tide receding below datum is needed to collect it; it is easily overlooked on account of its fragility and fine thread-like appearance, mature females coloured pink by their contained eggs being more readily seen while digging than translucent immature worms or white males. Worms are difficult to collect whole, the tail end usually being left behind in the sand.

Until recently this worm had only been seen at Salcombe. Now, through the kindness of Mr A. D. McIntyre, specimens of a dwarf variety from inshore waters off the east coast of Scotland have also been studied and are discussed below.

The following description of the species is based on specimens collected at Salcombe in 1939 and recently. Some specimens were simply preserved in formalin, others narcotized in 7% magnesium chloride in tap water and fixed in Bouin's fluid used hot and then preserved in alcohol. Most of the drawings in Fig. 1 are from such fixed and preserved specimens mounted unstained in euparal.

Special thanks are due to Dr Olga Hartman, Allan Hancock Foundation, Los Angeles, for her continued interest in my worm since she first saw specimens in 1939, and for her helpful correspondence then and recently.

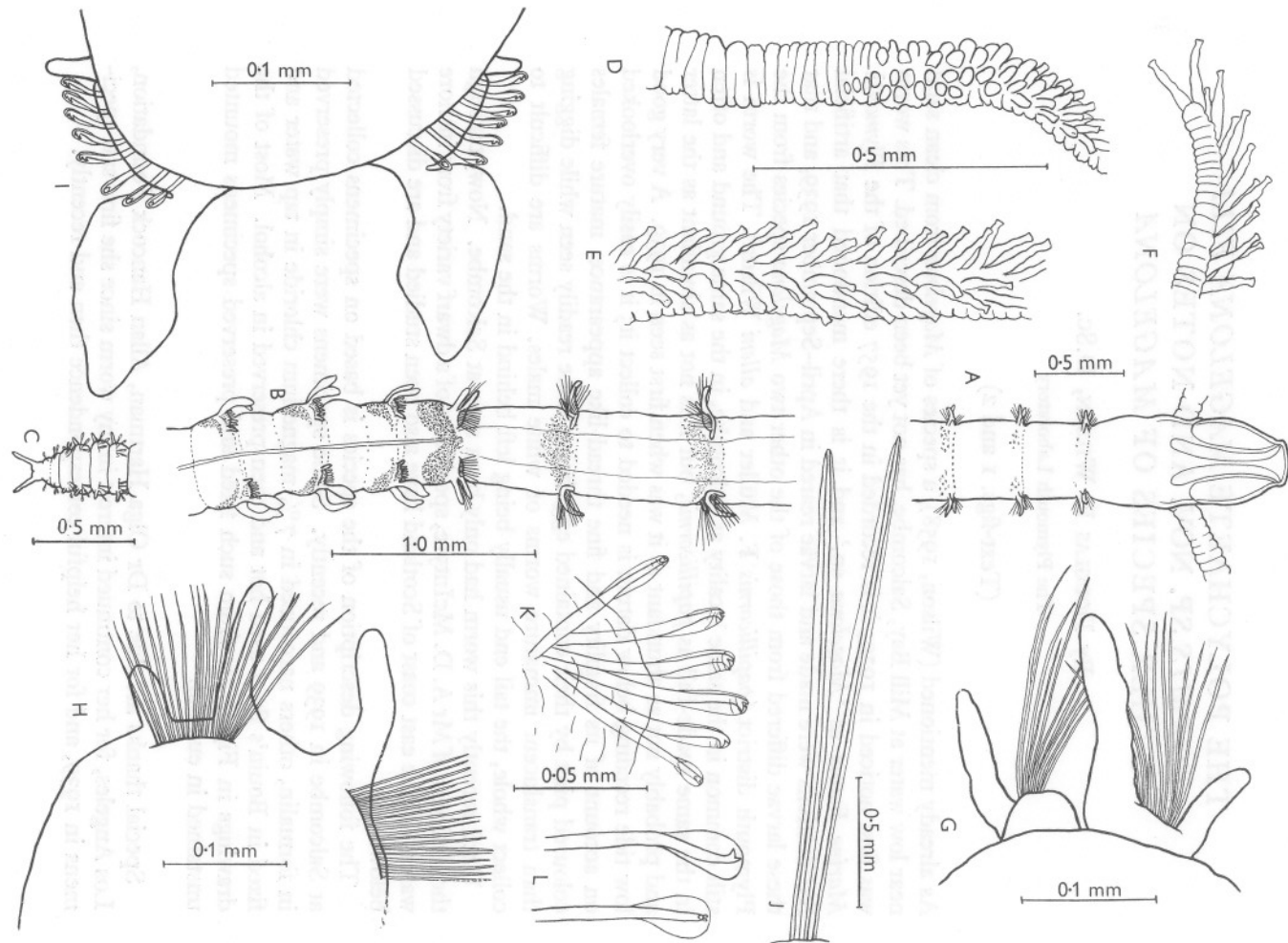


Fig 1. For legend see bottom of facing page.

Magelona filiformis sp.nov.

Adult specimens in the relaxed state reach lengths of more than 80 mm, possibly 100 mm, but are only about 0.3–0.5 mm wide. The width is fairly uniform for most of the body length except that the extreme posterior end tapers gradually to the anus, and there is a slight constriction at the ninth setiger. Total number of setigers in a complete specimen was 142; some individuals probably have more. Prostomium (Fig. 1A) eyeless, spatulate, longer than wide with two low dorsal longitudinal ridges; anterior border relatively wide, slightly convex and with corners or slight horns on each side. The everted proboscis is globular, longitudinally ridged. On either side of the mouth, below the postero-lateral corners of the prostomium, there arises a long slender tentacle roughly twice as long as the anterior region of the body (in narcotized and fixed specimens). A short proximal portion is transversely wrinkled and without papillae; for most of its length the tentacle carries on one face long capitate papillae arranged in two main rows (Fig. 1D–F), the other face being as wrinkled as the base.

The first nine pairs of parapodia carry only double-winged bristles (Fig. 1J); these wings are most readily seen in formalin preserved material examined in water. The first eight pairs of parapodia are all of similar structure (Fig. 1G), the notopodium with a short dorsal cirrus and a long ventral finger-like process above and below the fifteen (approximately) bristles, the neuropodium with a ventral finger-like cirrus of moderate length and approx. ten bristles. Segmental limits are difficult to observe, the anterior region being largely free from definite annulations. Slight grooving sometimes occurs immediately anterior to the parapodia but sections show that the septa are in advance of these grooves, usually no annulations marking their positions. The parapodia are situated towards the front end of each segment. Parapodia are spaced at progressively increasing distances apart from the first pair to the eighth, the hinder segments being markedly longer than broad. The limits of the ninth setiger are ill-defined externally and need to be worked out in sections. The ninth parapodia (Fig. 1H) are of special construction; the notopodium has an almost comb-like row of 25–30 fairly straight double-winged bristles and a ventral finger-like process of moderate length; the neuropodium has two finger-like processes, the dorsal moderately long the ventral short, and 25–30 curved double-winged bristles arising from a setal-sac anterior to the processes.

The parapodia of the long posterior region from the tenth setiger backwards are all similar with rather widely separated noto- and neuropodia (Fig. 1, I), each with a foliaceous lamella on a short stalk and a row of hooks on a torus dorsal or ventral to it, and a short dorsal or ventral cirrus. The lamellae are approximately equal in size and are slightly larger on anterior than on posterior segments. The hooded hooks each have one large tooth surmounted by two smaller teeth (Fig. 1K, L). The hoods appear larger and more widely spread in formalin preserved material examined in water (Fig. 1L) than in fixed specimens mounted in euparal (Fig. 1K). At the anterior end

Legend to fig. 1

Fig. 1. *Magelona filiformis* sp.nov. A, dorsal view of prostomium and first three setigers; B, dorsal view of body in the region of setigers 7 to 12; C, dorsal view of anal extremity; D, E and F, proximal, middle and extreme distal portions of a tentacle showing arrangement of capitate papillae; G, 6th parapodium; H, anterior view of 9th parapodium; I, 13th parapodium; J, emergent portions of two adjacent bristles, from a formalin preserved specimen examined in water; K, some hooded hooks from a specimen mounted in euparal, the full lengths of the shafts not being drawn; L, lateral and front views of hooded hooks from a formalin preserved specimen examined in water.

of the posterior region the intersegmental grooves are ill-defined; they appear to lie mid-way between the parapodia (Fig. 1B). Farther back segmental limits are more clearly visible and in passing back along the body of the worm there is a gradual transformation in the position of the parapodia which come to lie at the posterior end of each segment, which except when contracted or swollen with genital products are markedly longer than broad. The last few segments have incompletely developed parapodia. There are two anal cirri (Fig. 1C).

Living specimens are in general colourless with a transparent body wall through which the gut, pale pink in the anterior region, transparent in the mid region and brownish posteriorly, is seen. In mature specimens pink ova or creamy-white sperm showing through the body wall colour the region of the body in which they lie, that is most of the posterior region except for some of the anterior segments. In a mature specimen swollen genital segments give a moniliform appearance to the worm. Careful examination reveals a pattern composed of patches of epithelia cells with brownish yellow intracellular granules. The dorsal aspect of this pattern is indicated in Fig. 1A and B. The granules occur dorsal to and a little behind the parapodia, reaching their greatest density on a few segments just in front of and behind the transition region between the eighth and tenth setigers, there being a particularly large and dense patch of granular cells just behind each ninth parapodium. On the ventral surface there are more of these cells with granules, at the bases of the parapodia from about the fourth pair and in groups mid-ventrally anterior to the parapodia, and there is again concentration in the region of the ninth parapodia. Farther back they form a thin interrupted band on each side of the mid-ventral line and there are prominent longitudinally elongate patches on the sides of the segments, forming on each side of the worm an almost continuous band of brownish pigment interrupted only at the parapodia.

The following characters in combination are sufficient to distinguish *filiformis* from all other known species: (1) the presence of small prostomial horns; (2) the structurally modified ninth parapodium in which the dorsal cirrus is absent and the bristles are similar to those in front; (3) the finger-like processes of all anterior region parapodia, the first eight pairs with dorsal and longer ventral cirri and the notopodium with an even longer process below the bristles; (4) the widely separated and approximately equal sized foliaceous lamellae of the tenth and succeeding setigers.

The typical form is known only from sand (fairly clean to rather muddy) near E.L.W.S.T., Mill Bay, Salcombe, south Devon, in the same ground with *M. papillicornis* F. Müller. It lives in fragile tubes, which may be no more than the walls of burrows lined with a secretion to which sand grains adhere. A minute form (see below) is found in muddy ground off the north-east coast of Scotland.

The above description and drawings are based on several specimens from Salcombe. A specimen has been chosen as the holotype and deposited in the British Museum (Natural History) and given the number 1959.4.2.1. It is a complete worm of 142 setigers in two portions, the last few segments having broken off during preservation. Both portions are mounted in euparal. Other specimens have also been deposited and given the paratype numbers 1959.4.2.2/10.

Magelona filiformis sp.nov. **minuta** var.nov.

McIntyre (1958) has recorded as *M. rosea* Moore, a small magelonid from muddy sand off the north-east coast of Scotland, it being particularly abundant in the Aberdeen coastal area (at one station 26 were found in $\frac{1}{8}$ m²). It was also present in his bottom samples from St Andrews Bay and to a lesser extent from Smith Bank. At my request Mr A. D. McIntyre kindly supplied me with some of his specimens (preserved in formalin). The immediate impression was of their small size and transparent tissues, in these respects recalling to mind large magelonid larvae from the plankton, but they had, of course, been obtained from grab hauls in muddy sand. A typical specimen of 60 segments incomplete posteriorly was 15 mm long and varied in width from 0.20 to 0.30 mm. For comparison 60 segments of a Salcombe worm measured 38 mm long and varied in width from 0.30 to 0.50 mm. Close examination has shown these North Sea worms to agree in structural detail with the much larger *filiformis* specimens from Salcombe, in fact except for size they cannot be separated from them. Mr McIntyre has himself compared them with Salcombe specimens and with tracings from my drawings and he is in agreement with this. He informs me that he has never had any larger specimens than these very small ones, although his collections have been made throughout the year, and he has never had them from the shore or from water of a depth of less than 10 m. These small worms begin to appear with *papillicornis* (which is found in shallower water) at depths a little greater than 10 m; they were common at one station at 18 m and were found down to 59 m. It would appear therefore that these worms are genuinely a small variety and not merely young ones. Unfortunately I have not been able to satisfy myself that genital products are present in any of the specimens I have seen (collected January, April and July), but as they were incomplete posteriorly it is just possible that genital segments had been lost or the products were shed during preservation.

On these small transparent worms the pigmented patches of intracellular granules show up strikingly; by reflected light against a dark background the pigment is yellow rather than brownish yellow, but it follows exactly the pattern already described for the Salcombe worms.

Specimens of this dwarf variety have also been deposited in the British Museum (Natural History).

COMPARISON WITH OTHER KNOWN SPECIES

It has become the practice to divide the genus *Magelona* into two convenient groups, those with prostomial horns and those without. The latter includes *papillicornis* F. Müller, 1858; *obockensis* Gravier, 1906; *rosea* Moore, 1907; *pitelkai* Hartman, 1944a; *californica* Hartman, 1944b; an unnamed species

near *californica* mentioned by Hartman (1951); *alleni* Wilson, 1958. The horned species include *cincta* Ehlers, 1908 (see Wilson, 1958); *pacifica* Monro, 1933; *japonica* Okuda, 1937, and *japonica* var. *koreana* Okuda, 1937; *cornuta* Wesenberg-Lund, 1949; *cerae* Hartman & Reish, 1950. By virtue of its small horns *filiformis* would thus be included in this latter group; parapodial characters clearly separate it from *cincta*, *pacifica*, *japonica*, *japonica* var. *koreana*, and *cerae*. Parapodial characters separate it also from *cornuta*, some notes on which follow.

There remains the doubtful species *longicornis* Johnson, 1901, described by Johnson from two imperfect specimens collected at West Seattle in 1899. It is difficult on the basis of Johnson's incomplete description and poor figures (when he wrote only one other species was known, namely *papillicornis*, and he was easily able to separate his worms from that) to point to clear-cut distinctions between his species and *filiformis*. He mentions that the proboscis lacks corrugations (grooved in *filiformis*) and that the hooks are bidentate (tridentate in *filiformis*). Hartman (1944*b*, pp. 318-19) has discussed *longicornis*; she points out that 'it is not certain whether the prostomium has frontal horns' and discusses an ambiguity concerning the setae. Her conclusion is that *longicornis* be 'regarded as a species *incertae sedis*'. In a private letter (from which she very kindly allows me to quote) she describes the species as unrecognizable, mentioning that there are at least five recognizable species in the north eastern Pacific (excluding Okuda's two species from Japan) and that 'which one of these (if any) might be *M. longicornis* of Johnson from Washington, would be sheer guess, since Johnson left no types and the published account is useless. There may be specimens, so labelled, in the U.S. Nat. Mus. but they can hardly be regarded as type specimens.'

In the British Museum (Natural History) there is a tube of specimens labelled *Magelona longicornis* 1924.5.5.58/62 and I am indebted to the Museum for the loan of this. The inside label indicates that the worms were collected on Pleasant Beach, Seattle, and were determined by F. A. Potts (who probably collected them). This tube contained one nereid worm and five *Magelona*; three of the latter are *papillicornis* or a closely allied species, while the remaining two agree with Johnson's imperfect description and may possibly be the species he saw. An examination of these two worms shows the following features: a prostomium horned a little more prominently than in *filiformis*: proboscis lightly grooved longitudinally; foliaceous, not finger-like, lobes below the notopodial bristles; ninth parapodia with foliaceous lobes, dorsal cirri but no ventral cirri; lamellae of tenth and succeeding setigers foliaceous, dorsal and ventral approximately equal in size and apparently not stalked but springing from broad bases; hooks definitely bidentate, the main tooth being surmounted by a single smaller tooth. In almost all these points these specimens differ from *filiformis*. The two specimens are both incomplete posteriorly; one is of about 30 setigers and measures approximately 23 mm

long and has widths of about 1.0 and 1.5 mm in the anterior and posterior regions respectively.

Fauvel (1936, p. 63) has identified as *Magelona rosea* Moore a worm from the Atlantic coast of Morocco, but his figures and description of it do not agree with Moore (1907, pp. 201-4, pl. XVI). Fauvel, for instance, draws a markedly horned prostomium, whereas Moore shows a rounded frontal margin. Fauvel's worm cannot from his figures and description be identified with any known species. *M. rosea* has been recorded by Southern (1914, p. 105) from Killary Harbour, Ireland, largely it would seem because the setae of the ninth setiger tapered to a point. Moore himself confirmed the identification from specimens sent by Southern. Eliason (1920, p. 52) records three fragments of the same species from the Öresund. It is desirable that these records be checked in the light of modern knowledge of the genus.

COMPARISON WITH *MAGELONA CORNUTA* WESENBERG-LUND

M. filiformis bears some resemblance to *M. cornuta* Wesenberg-Lund (1949, p. 328 and fig. 36) from the Gulf of Iran. As in that species each posterior parapodium bears two large foliaceous lamellae of equal size and the anterior parapodia as drawn in Wesenberg-Lund's figure appear to be similar to those of *filiformis*. Both species have frontal horns, but those of *cornuta* are much more pronounced. Moreover, *cornuta* is decidedly larger than *filiformis* and is differently coloured, and the hook as shown in Wesenberg-Lund's figure and description ('a blunt bidentate tip') would appear to be of an aberrant type for the genus. However, normal *Magelona* hooks have a similar appearance to that shown in her drawing when they are seen in partial front view. Normally they do not arise from papillate processes as indicated by Wesenberg-Lund's artist, but are arranged in transverse rows dorsally and ventrally. To check these details and to enable a better comparison to be made between what appeared to be two closely similar species I have, through the kindness of Dr Wesenberg-Lund, examined her type specimen of *cornuta*. This has enabled me to add to and amend the original description.

Fig. 2A is a drawing of the eighth parapodia of *cornuta* seen *in situ* in dorso-lateral view, the view presented by the specimen as it lies in a dish. These parapodia seem to be similar to all those anterior to them, more doubtfully so to the ninth parapodia. One of the latter had been removed for the purpose of the original description and the other is difficult to examine in detail without spoiling the specimen. In order to avoid further damage to the specimen I have done no more than examine the parapodia *in situ*, or in microscopical preparations of them loaned to me by Dr Wesenberg-Lund. Examination *in situ* is difficult, but by critically positioning a spot-light most details can be made out. In the eighth and anterior parapodia the notopodial bristles arise between a minute dorsal cirrus and a foliaceous lamella of very transparent

tissue. On the eighth setiger this lamella is clearly visible on the right side of the worm but on the left it is seen nearly edge-on (see Fig. 2A). The neuropodial bristles spring between two finger-like processes the lower one being the ventral cirrus; in Fig. 2A these are clearly indicated on the left side.

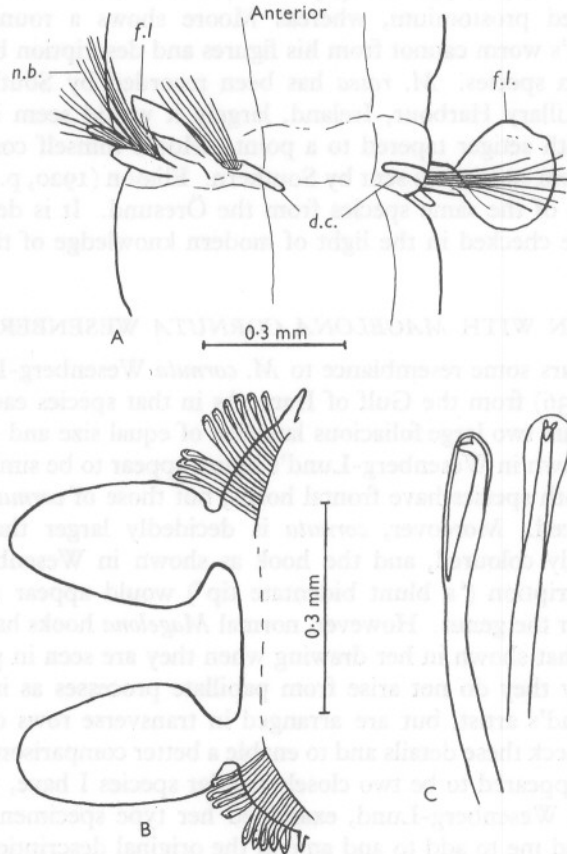


Fig. 2. *Magelona cornuta* Wesenberg-Lund. Some details from the type specimen. A, semi-dorsal view of the eighth pair of parapodia, with the worm heeled over to the right and showing more of the left parapodium than of the right. *d.c.*, dorsal cirri; *f.l.*, foliaceous lobe below notopodial bristles; *n.b.*, neuropodial bristles with finger-like process above and ventral cirrus below. B, a parapodium of about the fifteenth setiger. C, hooded hooks in lateral and front views.

In two features therefore these anterior parapodia differ from those of *filiformis* which has a finger-like process below the notopodial bristles and not a foliaceous lamella, and which lacks the upper of the two neuropodial processes of *cornuta*. These parapodial differences clearly separate the two species.

The posterior parapodia of the two species are very much alike (compare

Figs. 1, 1 and 2B), as already mentioned. The hooded hooks of *cornuta* are arranged in short transverse rows (about ten hooks to a row) dorsally and ventrally and do not arise from papillate processes (see above). The hooks (Fig. 2C) are tri-dentate; in front view two minute teeth above the main tooth are clearly visible. In partial front view they do look similar to Wesenberg-Lund's figure. A minute dorsal and ventral cirrus at the extremity of each row of hooks can be seen with careful illumination. The large lamellae are extremely transparent.

SUMMARY

A *Magelona* first found at Salcombe in 1939 is described as a new species and given the specific name *filiformis*. It is distinguished from all other species of the genus by its parapodial characters and from some species by its small prostomial horns. So far it has been obtained in its typical form only at Salcombe.

A markedly dwarf variety from inshore waters off the east coast of Scotland is given the variety name *minuta*. Formerly recorded by Mr A. D. McIntyre, who found it, as *M. rosea* Moore it is structurally identical with *filiformis* from Salcombe but differs from it by being very much smaller when adult.

M. filiformis is compared with other species of *Magelona*, in particular *longicornis* Johnson which is shown to have been imperfectly established, and with *cornuta* Wesenberg-Lund, the original account of which is amended and expanded following a re-examination of the type specimen.

REFERENCES

- EHLERS, E., 1908. Die bodensässigen Anneliden aus den Sammlungen der deutschen Tiefsee-Expedition. *Wiss. Ergebn. 'Valdivia'*, Bd. 16, Lf. 1, pp. 1-167.
- ELIASON, A., 1920. Biologisch-Faunistische Untersuchungen aus dem Öresund V. Polychaeta. *Acta. Univ. lund.*, Bd. 16, No. 6, 103 pp.
- FAUVEL, P., 1936. Contribution à la faune des Annélides Polychètes du Maroc. *Mém. Soc. sci. nat. Maroc*, No. 43, pp. 1-143.
- GRAVIER, C., 1906. Contribution à l'étude des Annélides Polychètes de la Mer Rouge. *Nouv. Archiv. Mus. Hist. nat., Paris*, Sér. 4, T. 8, pp. 123-236.
- HARTMAN, O., 1944a. Polychaetous annelids from California including the description of two new genera and nine new species. *Allan Hancock Pacif. Exped.*, Ser. 1, Vol. 10, pp. 239-307.
- 1944b. Polychaetous annelids. Part VI. Paraonidae, Magelonidae, Longosomidae, Ctenodrilidae, and Sabellariidae. *Allan Hancock Pacif. Exped.*, Ser. 1, Vol. 10, pp. 311-89.
- 1951. The littoral marine annelids of the Gulf of Mexico. *Pub. Inst. mar. sci. Univ. Tex.*, Vol. 2, pp. 7-124.
- HARTMAN, O. & REISH, D. J., 1950. The marine annelids of Oregon. *Ore. St. Monogr. Zool.*, No. 6, 64 pp.
- JOHNSON, H. P., 1901. The Polychaeta of the Puget Sound Region. *Proc. Boston Soc. nat. Hist.*, Vol. 29, pp. 381-437.

MARINE BIOLOGICAL ASSOCIATION, 1957. *Plymouth Marine Fauna*, 3rd ed.

MCINTYRE, A. D., 1958. The ecology of Scottish inshore fishing grounds. 1. The bottom fauna of east coast grounds. *Mar. Res. Scot.*, 1958, No. 1, 24 pp.

MONRO, C. C. A., 1933. The Polychaeta sedentaria collected by Dr C. Crossland at Colón, in the Panama Region, and the Galapagos Islands during the expedition of the S.Y. *St George*. *Proc. zool. Soc. London*, 1933, Pt. 4, pp. 1039-92.

MOORE, J. P. 1907. Descriptions of new species of spioniform annelids. *Proc. Acad. nat. Sci. Philad.*, Vol. 59, pp. 195-207.

MÜLLER, F., 1858. Einiges über die Annelidenfauna der Insel Santa Catharina an der brasilianischen Küste. *Arch. Naturgesch.*, 24 jahr., Bd. 1, pp. 211-20.

OKUDA, S., 1937. Spioniform polychaetes from Japan. *J. Fac. Sci. Hokkaido Univ.*, Ser. 6 (Zool.), Vol. 5, pp. 217-54.

SOUTHERN, R., 1914. Clare Island Survey. Archannelida and Polychaeta. *Proc. R. Irish Acad.*, Vol. 31 (2), Pt. 47, 160 pp.

WESENBERG-LUND, E., 1949. Polychaetes of the Iranian Gulf. *Dan. sci. Invest. Iran*, Pt. 4, pp. 247-400.

WILSON, D. P., 1958. The polychaete *Magelona alleni* n.sp. and a re-assessment of *Magelona cincta* Ehlers. *J. mar. biol. Ass. U.K.*, Vol. 37, pp. 617-26.

REFERENCES

BRANDEGE, W. A., 1905. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 31, 1-117.

BRANDEGE, W. A., 1906. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 32, 1-117.

BRANDEGE, W. A., 1907. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 33, 1-117.

BRANDEGE, W. A., 1908. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 34, 1-117.

BRANDEGE, W. A., 1909. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 35, 1-117.

BRANDEGE, W. A., 1910. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 36, 1-117.

BRANDEGE, W. A., 1911. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 37, 1-117.

BRANDEGE, W. A., 1912. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 38, 1-117.

BRANDEGE, W. A., 1913. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 39, 1-117.

BRANDEGE, W. A., 1914. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 40, 1-117.

BRANDEGE, W. A., 1915. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 41, 1-117.

BRANDEGE, W. A., 1916. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 42, 1-117.

BRANDEGE, W. A., 1917. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 43, 1-117.

BRANDEGE, W. A., 1918. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 44, 1-117.

BRANDEGE, W. A., 1919. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 45, 1-117.

BRANDEGE, W. A., 1920. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 46, 1-117.

BRANDEGE, W. A., 1921. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 47, 1-117.

BRANDEGE, W. A., 1922. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 48, 1-117.

BRANDEGE, W. A., 1923. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 49, 1-117.

BRANDEGE, W. A., 1924. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 50, 1-117.

BRANDEGE, W. A., 1925. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 51, 1-117.

BRANDEGE, W. A., 1926. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 52, 1-117.

BRANDEGE, W. A., 1927. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 53, 1-117.

BRANDEGE, W. A., 1928. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 54, 1-117.

BRANDEGE, W. A., 1929. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 55, 1-117.

BRANDEGE, W. A., 1930. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 56, 1-117.

BRANDEGE, W. A., 1931. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 57, 1-117.

BRANDEGE, W. A., 1932. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 58, 1-117.

BRANDEGE, W. A., 1933. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 59, 1-117.

BRANDEGE, W. A., 1934. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 60, 1-117.

BRANDEGE, W. A., 1935. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 61, 1-117.

BRANDEGE, W. A., 1936. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 62, 1-117.

BRANDEGE, W. A., 1937. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 63, 1-117.

BRANDEGE, W. A., 1938. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 64, 1-117.

BRANDEGE, W. A., 1939. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 65, 1-117.

BRANDEGE, W. A., 1940. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 66, 1-117.

BRANDEGE, W. A., 1941. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 67, 1-117.

BRANDEGE, W. A., 1942. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 68, 1-117.

BRANDEGE, W. A., 1943. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 69, 1-117.

BRANDEGE, W. A., 1944. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 70, 1-117.

BRANDEGE, W. A., 1945. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 71, 1-117.

BRANDEGE, W. A., 1946. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 72, 1-117.

BRANDEGE, W. A., 1947. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 73, 1-117.

BRANDEGE, W. A., 1948. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 74, 1-117.

BRANDEGE, W. A., 1949. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 75, 1-117.

BRANDEGE, W. A., 1950. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 76, 1-117.

BRANDEGE, W. A., 1951. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 77, 1-117.

BRANDEGE, W. A., 1952. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 78, 1-117.

BRANDEGE, W. A., 1953. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 79, 1-117.

BRANDEGE, W. A., 1954. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 80, 1-117.

BRANDEGE, W. A., 1955. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 81, 1-117.

BRANDEGE, W. A., 1956. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 82, 1-117.

BRANDEGE, W. A., 1957. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 83, 1-117.

BRANDEGE, W. A., 1958. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 84, 1-117.

BRANDEGE, W. A., 1959. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 85, 1-117.

BRANDEGE, W. A., 1960. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 86, 1-117.

BRANDEGE, W. A., 1961. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 87, 1-117.

BRANDEGE, W. A., 1962. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 88, 1-117.

BRANDEGE, W. A., 1963. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 89, 1-117.

BRANDEGE, W. A., 1964. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 90, 1-117.

BRANDEGE, W. A., 1965. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 91, 1-117.

BRANDEGE, W. A., 1966. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 92, 1-117.

BRANDEGE, W. A., 1967. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 93, 1-117.

BRANDEGE, W. A., 1968. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 94, 1-117.

BRANDEGE, W. A., 1969. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 95, 1-117.

BRANDEGE, W. A., 1970. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 96, 1-117.

BRANDEGE, W. A., 1971. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 97, 1-117.

BRANDEGE, W. A., 1972. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 98, 1-117.

BRANDEGE, W. A., 1973. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 99, 1-117.

BRANDEGE, W. A., 1974. The polychaete annelids of the Gulf of Mexico. *Proc. U.S. Geol. Surv.*, 100, 1-117.