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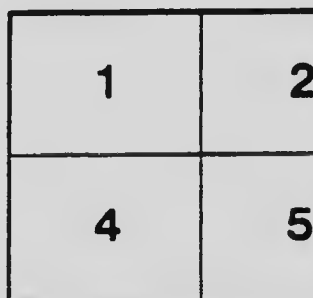
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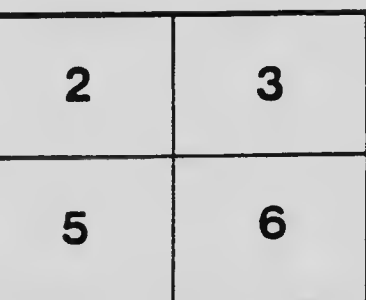
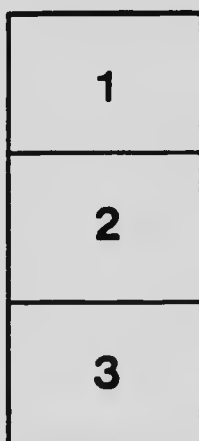
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REPORT
OF THE
CANADIAN ARCTIC EXPEDITION
1913-18

VOLUME IX: ANNELIDS PARASITIC WORMS,
PROTOZOANS, ETC.

PART J: POLYCHAETA (supplementary)

By J. H. ASHWORTH

SOUTHERN PARTY---1913-16

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OTTAWA
F. A. OWLAND
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1914

Issued Sept 29, 1924

Report of the Canadian Arctic Expedition, 1913-18.

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1924

Issued Sept 29, 1924



The Rediscovery of *Arenicola glacialis* Murdoch, with Observations on its Characters and on its Status

By J. H. Ashworth, D.Sc., F.R.S.

Professor of Zoology, University of Edinburgh

In the Report of the Canadian Arctic Expedition, 1913-18, Dr. Ralph V. Chamberlin recorded (Vol. IX, Part B, pp. 20n-21n, 1920) a single specimen of *Arenicola marina* which was taken from the stomach of a sculpin (*Cottus* sp.¹) caught in about two fathoms of water, Station 49b, in Bernard harbour, Northwest Territories, on 17th June, 1916.

The only other specimens of the genus *Arenicola* recorded from the arctic shores of northwest America are the examples of *A. glacialis* Murdoch, obtained by the International Polar Expedition to Point Barrow, Alaska, and preserved in the collection of the Smithsonian Institution.

The list of synonyms given under *Arenicola marina* by Dr. Chamberlin includes *A. glacialis*, an indication that he had overlooked the accounts (Ashworth, 1910, 1912) in which the latter species was held to be distinct. There was the possibility that the specimen recorded from Bernard harbour might prove to belong to the species *glacialis*, and in any case a specimen of *Arenicola* from the area in question was of considerable interest from the point of view of distribution. I asked Dr. Chamberlin to allow me to examine it, and I have to thank him for so freely placing it at my disposal.

Examination showed that the specimen differs from *A. marina* and agrees with *A. glacialis*, and this example becomes of some importance, as it provides the second record only of the species.

The original specimens of *A. glacialis* consisted of five picked up on the beach (12th Sept., 1882) at Cape Smyth, Alaska, after a fresh westerly gale, and two mutilated ones taken from the gullet of an eider duck which had been diving on one of the sandy patches in about three fathoms. Murdoch's description (1885, 1885a) of the specimens, and his diagnosis of the new species which he founded to receive them, gave little information, except that the worms were closely allied to *A. marina* and that they had only eleven branchiferous segments (there are thirteen in *A. marina*). He also remarked on the nature of the gill—each being formed of "a cluster of about fifteen simple cirri"—but he gave no figures and no account of the internal organs. This insufficient description left the status of *A. glacialis* in doubt; some authors not being satisfied with the characters as given regarded *A. glacialis* as a synonym of *A. marina*, and others placed *glacialis* under *A. cristata*, which also has eleven branchiferous segments.

I had the privilege of examining the type specimens from which I drew up an account (1910) of the principal characters—external and internal—which indicated that *A. glacialis* is a valid species, and in this and in a subsequent publication (1912) figures of the distinctive features and an adequate diagnosis were for the first time provided.

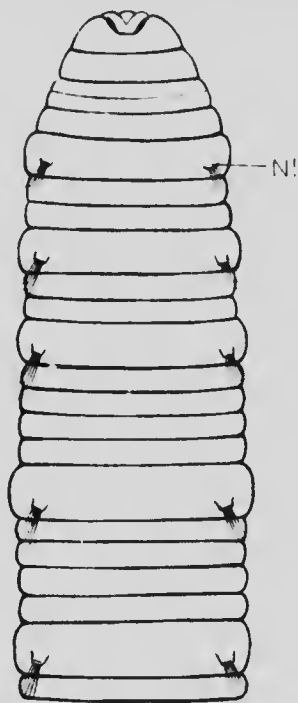
The characters of the species were stated (1912) as follows:

"Caudate *Arenicola* with seventeen chaetiferous segments; eleven pairs of small gills, the first situated on the seventh segment; the gill-axes are very short and bear at their distal ends few branches, each of which is either simple or divides dichotomously once or twice, the finger- or thumb-shaped gill-filaments forming clusters at the end of each axis; the

¹ Now determined to be *Myoxocephalus scorpioides* Fabr. (E. Johansen, Part A, Vol. VI of this series, now in preparation.)

median lobe of the prostomium is small, the lateral ones are well developed, but not markedly dilated and not folded at their anterior ends; neuropodia are clearly visible in each chaetiferous segment, those of the posterior branchial segments are long dorso-ventrally and almost reach the mid-ventral line; six pairs of nephridia, which open on the fourth to the ninth segments; one pair of conical oesophageal glands; a pair of small septal pouches; a pair of statocysts, opening to the exterior, and each containing numerous statoliths composed of sand grains."

The specimen from Bernard harbour affords a welcome opportunity of checking most of the characters given in this diagnosis. The worm is 75 mm. in length, but the hind-body or "tail" is obviously incomplete, being represented



A. glacialis, anterior portion, dorsal aspect. x 1. N₁, first neuropodium.

by a portion only 4 mm. in length exhibiting about seven annuli and a torn posterior surface. There are seventeen chaetiferous segments, the last eleven of which bear gills, which, however, are badly preserved, most of the gill-filaments having disappeared. Of the few gills which remain one (the right one on the fifteenth chaetiferous segment) was removed for examination. It consists of a short basal lamina from the distal margin of which ten axes are given off. These divide for the most part dichotomously and the resultant filaments (eleven in number on the longest axis) are elongate, but their elongation is almost certainly due in part to maceration. The length of the longest axis from its base to the tip of the terminal filament is 5 mm., while in the type specimens the longest axis is not more than 2 mm. in length.

The prostomium is fully exposed and corresponds exactly in the proportions of its parts with the published figures.

The annulation agrees with that shown in the accompanying diagram, which was drawn from one of the types.

The notopodial chaetae are in better condition than those of the type which I examined, the great majority of the latter being imperfect at their tips. Fully formed chaetae from the Canadian specimen are a little more than 3 mm. long, and well preserved ones exhibit along one side of their distal portion for a distance of about one sixth the length of the chaetae a narrow lamina, but this does not reach the tip of the chaetae and its maximum width is not more than 6μ . On the margin opposite the lamina, and all round the terminal portion of the chaetae, are fine spines closely pressed to the shaft. The chaetae are similar to those of *A. marina*, except that the lamina is not so well developed and the spines are rather more slender than in most examples of *A. marina*; but specimens of the latter from different localities exhibit some variation in the spines of their chaetae.

The neuropodia are elongate in the posterior segments; owing to a certain amount of maceration their crotchets have fallen out and are not available for examination.

The nephridia correspond in number and in position with those of the type. The funnel of the first nephridium lies on the anterior face of the third septum. The funnels are not in good preservation, but they are apparently similar to those of *A. marina*. In Fig. 47 (1912) the funnel of the first nephridium should have been shown directed forwards and not medially.

The oesophageal glands—a single pair—are elongate cones about 7 mm. in length.

The septal pouches are about 2 mm. long and resemble those of *A. marina*. They are rather wider than those of the type specimen shown in Fig. 47 (1912); they give the impression by their wrinkled surface that the wall is somewhat contracted, whereas those of the type figured appear to have been more fully extended.

The three septa which cross the coelom at the anterior border of the first, third and fourth chaetiferous segments of all species of *Arenicola* are well developed in this specimen.

The left antero-dorsal wall of the peristomium was excised and cut into serial sections for a study of the statocyst. The lumen of the statocyst is conical about $160 \times 150 \times 90\mu$ in its three greatest diameters, and is continued into a tube which leads to the exterior. The lumen of the tube is narrow; in section it is an oval slit whose shorter diameter at one point is reduced to 1μ . The statoliths (about 50 in number) are small sand-grains, the largest 25μ in diameter. Most of the grains are naked, but a dozen have a distinct envelope of secreted material, a common condition in statocysts of *Arenicola* in which the connection of the tube with the exterior has become obstructed.

The specimen from Bernard harbour thus conforms fully to the diagnosis drawn up from the fragile types, except that the gill-axes are longer than those of the type specimens, but this is due in part to post-mortem maceration and elongation. The discovery of this example of *A. glacialis* extends the range of the species a thousand miles east of the only previously known locality, and suggests the inference that the species occurs along the whole stretch of the arctic shore of northwest America. It would be interesting to know how much further eastwards *A. glacialis* extends and whether its distribution overlaps that of *A. marina*. The nearest localities from which the latter species has been recorded are to the east—the west coast of Greenland (e.g., Godhavn, Umanak, Prøven) and Rigolet, Labrador, while to the west the nearest definite locality¹ is Cape Ragozin in the Kara Sea, where a single specimen of *A. marina* was obtained (Wirén, 1883).

¹ Grube (1851) recorded under the name *A. marina* a single specimen collected by Middendorf during his journey "in den nussersten norden und osten Sibiriens," but no definite locality was given. Grube stated that this example was about two inches in length and possessed only eighteen chaetiferous segments and twelve pairs of gills. These numbers are not normal for any species of *Arenicola*, and the worm may have been an example of *A. marina* or of *A. pusilla* with one segment less than usual, or of *A. glacialis* with one segment more than usual. The specimen is not preserved in the Berlin Zoological Museum (where much of Grube's material is to be found), and enquiries for it elsewhere have been fruitless, so that it is impossible to state to which of the three species named this specimen really belongs.

Examination of the Canadian specimen of *A. glacialis* serves to emphasize the close structural agreement of this species with *A. marina*. The only differences of importance between them are in regard to the number of their chaetiferous segments—19 in *marina*, 17 in *glacialis*, and of their gills—13 pairs in *marina*, 11 in *glacialis*. The gill axes of this specimen are more elongate than those of the types and in this respect they approach those of the bushy type of *A. marina*. The two species appear to exhibit differences in the proportions of their prostomial lobes and in the shape of their neuropodial crotchets, but these are slight and are based on the examination of very few examples of *glacialis*, so that it is not advisable to lay too much stress upon these.

It is interesting to note that while the Canadian specimen of *A. glacialis* approaches in the character of its gill the littoral variety of *A. marina*, it agrees in the annulation of the region between the second and third chaetiferous annuli with the laminarian variety of *A. marina* which has pinnate gills. Examination of well preserved examples of *A. glacialis* would show how far the funnels of the excretory organs agree with those of *A. marina*, and young examples would be useful for the comparative study of the chaetae, especially of the neuropodia.

The present position of our knowledge of *A. glacialis* would seem to be best summed up by the statement that this species has been derived from *A. marina*—from which it is apparently a comparatively recent offshoot—by a reduction in the number of chaetiferous segments¹ and of gills. If this should prove to be the only difference, the question as to whether *A. glacialis* is a distinct species or only a variety would require consideration. In 1903 I had to consider a similar though simpler case in the species *A. assimilis*, which is represented by a *forma typica* with twenty chaetiferous segments and thirteen pairs of gills, the first on the eighth segment, and by a form with nineteen segments and thirteen pairs of gills, the first on the seventh segment, but otherwise their characters are identical. Although these differ in this constant and striking manner, I decided that it would be better to regard the second form as a variety—*var. affinis*—rather than as a distinct species. The difference between *A. marina* and *A. glacialis* is, however, a matter of two segments¹ and indicates a greater divergence, affording more justification for specific distinction, and I suggest that as *A. glacialis* has been described as a separate species it may be retained as such; it is a convenient designation for those specimens of the genus with seventeen chaetiferous segments and eleven pairs of small gills, which up to the present have been obtained only on the arctic shore of northwest America.

¹ One of the type specimens of *A. glacialis* possesses an eighteenth neuropodium on both sides but not a corresponding notopodium or gill.

¹ The number of chaetiferous segments in *A. marina* is rarely other than nineteen, and when there is a departure from the normal there is a much greater tendency for the development of an additional chaetiferous segment than for the suppression of one. Out of some thousands of specimens which I have examined during the past twenty-eight years, only three have been found to have one segment less than the normal: in one of these the gill, the notopodium and the neuropodium of the last (eighteenth) segment are missing on one side.

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