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ON THE SUPPOSED SIMILARITY BETWEEN THE MOLLUSCA OF THE ARCTIC AND ANTARCTIC REGIONS.

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During the past year, whilst working out the Mollusca obtained by the "Southern Cross" in the Antarctic regions, I had occasion to compare the forms from that part of the globe with those from the Arctic regions, and I was interested to ascertain how far the supposed resemblance between these two assemblages was real or otherwise. I should mention that this subject has been more or less fully discussed by Professor D'Arcy Thompson, Dr. G. Pfeffer, and others, but not solely from the molluscan point of view. I therefore thought that a few remarks upon this subject might be of interest to the members of this Society. Sir John Murray, in the Transactions of the Royal Society of Edinburgh, vol. xxxviii, in his memoir upon the deep and shallow-water marine fauna of the Kerguelen region of the great Southern Ocean, has referred to this subject at some length, and has given a list of identical and closely allied species found in the extra-tropical regions of the northern and southern hemispheres and unknown hitherto within the tropics. This list includes invertebrates of all orders, but the Mollusca, with which alone we are at present concerned, are as follows :—

1. *Glomus nitens*, Jeff.
2. *Kellia suborbicularis* (Mont.).
3. *Mytilus edulis*, Linn.
4. *Dentalium keras*, Watson.
5. *Homalogyra atomus* (Phil.).
6. *Ianthina rotundata*, Leach.
7. *Natica* (*Lunatia*) *Groenlandica*, Beck.
8. *Odostomia Rissoides*, Hanley.
9. *Puncturella Noachina* (Linn.).
10. *Trochus* (*Margarita*) *infundibulum*, Watson.
11. ? *Doris tuberculata*, Cuvier.

Since these species have been quoted from the Reports on the Gastropoda and Lamellibranchiata of the "Challenger" Expedition by the Rev. R. Boog Watson and myself respectively, I have thought it advisable to re-examine each of them so as to establish the correctness of the identifications, and to make such observations upon the known distribution of the various species and genera as may tend to elucidate the occurrence of the forms in question in such remote localities.

1. Glomus nitens, Jeffreys.—This species was originally described from specimens dredged in 1,750 fathoms at the entrance of Davis Straits, also off the west and south of Ireland in 557–1476 fathoms. It was obtained by the "Challenger" in 1,900 fathoms off the Rio de la Plata. This identification was based on the examination and comparison of *a single specimen* from the latter locality. Although at the time considered to be the same as *G. nitens*, I do not now feel absolutely convinced of the identification. The comparison of a single example of such a minute form which is without any marked feature, is always unsatisfactory and inconclusive, and a recent re-examination of the shell in question seems to show that the concentric lines of growth are coarser than in typical examples. I should add that at the time when the Report on the "Challenger" Bivalves was written I had only a few poor representatives of the species for comparison. Since that time the British Museum has obtained a good series dredged by the "Porcupine" Expedition of 1869. I should further add that the genus is represented by a few very similar forms in the West Indian region, and also in deep water off Japan.

2. Kellia suborbicularis (Montagu).—A common British species recorded, on the evidence of two specimens, from Kerguelen Island. It is also known from Massachusetts (Gould), the Canary Islands, St. Helena (Smith), Port Elizabeth, Cape Colony (Sowerby), Mazatlan (Carpenter). Another species (*K. rotunda*, Deshayes), doubtfully separable from the present form, has been quoted from Queensland (Deshayes), New South Wales (Angas), Bass Straits (Smith), Cape Colony (Sowerby). Although it might be hazardous without a knowledge of the soft parts to declare that the two forms mentioned are certainly conspecific, I must say on the evidence of the shells alone I fail to perceive where the line of demarcation occurs. I imagine that difference in locality was the chief reason which induced Deshayes to separate his so-called species from the well-known European form.

Like the foregoing *Glomus nitens*, the present species offers no specially distinctive conchological characters which will separate it, *beyond doubt*, from other allied forms. The genus is cosmopolitan.

3. Mytilus edulis, Linn.—Since Sir John Murray quoted this well-known mollusc in his list of species from the extra-tropical regions of the northern and southern hemispheres, it has been cited from Cape Colony (Sowerby), Rio Grande do Sul and St. Catharina on the east coast of South America (Von Jhering). The South African locality may be erroneous, for the *M. meridionalis* of Krauss, said by Sowerby to be a variety of *edulis*, is monomyarian, and quite distinct from the common European shell, which is dimyarian. *M. edulis* has been quoted from New Zealand (Hutton, Smith, etc.), Great Barrier Island, Auckland Islands, Campbell Island (Hutton), Kerguelen Island (Smith). Also from California as *M. trossulus*, Gould, considered by Jeffreys and Dr. von Jhering synonymous with *M. edulis*.

From the foregoing remarks it is seen that this species has such an extensive distribution that its occurrence in Arctic and Antarctic seas is in no way surprising. The members of this genus also are

particularly adapted for a wide distribution ; being attached by a byssus to wood and other floating bodies, they would naturally be carried in all directions by ocean currents.

4. Dentalium keras, Watson.—Dredged by the "Challenger" in the North Pacific off Japan in 2,050 fathoms and in the South Pacific in 2,160 fathoms, but since recorded from the Gulf of Mexico in 1,568 fathoms. Both Dr. Watson and Dr. Dall agree in the identification of the tropical specimens with this species. Under these circumstances it must be removed from the list of species supposed to occur only in extra-tropical regions.

5. Homalogyra atomus (Philippi). — British, Norwegian, Mediterranean, Madeiran, and from the Southern Ocean between Marion Island and Prince Edward Island in 140 fathoms. The identification of this species from the last-named locality rests upon the examination of "a single, slightly weathered specimen" dredged by the "Challenger." I have seen this atom, and although it certainly has very much the aspect of this species, and one cannot with certainty say that it is different, still, considering the condition of the specimen and its minuteness, one cannot equally declare that, beyond a doubt, it is conspecific. I can well imagine it to be merely the embryonic shell of some Gastropod which eventually attains much larger dimensions.

6. Ianthina rotundata, Leach. — In respect of distribution this species is scarcely worth consideration. Being pelagic throughout its existence, one would not be surprised to meet with it both north and south of the tropics. The same or allied forms have been met with everywhere in warm latitudes.

7. Natica (Lunatia) Groenlandica, Beck.—One specimen considered by Watson to belong to this well-known Arctic form was recorded by him from Heard Island in 75 fathoms. This is another instance in which one feels doubt about pronouncing with absolute certainty the correctness of the identification. Although very similar indeed to some examples of *N. Groenlandica*, still it differs from most of them in being imperforate. In this respect it agrees with *N. fartilis* of Watson, which was dredged at a neighbouring station in the Kerguelen region. Another feature common to both is the presence of a pale zone below the suture in the body-whorl. On comparing these specimens I cannot understand why Dr. Watson should have separated the Heard Island specimen from the rest. *N. fartilis*, being devoid of colour-markings, has much the aspect of both *N. Groenlandica* and *N. affinis*, also a northern form.

8. Odostomia rissoides, Hanley.—This well-known British species is quoted by Watson from between Marion Island and Prince Edward Island in 50–140 fathoms. The identification was based upon two specimens only, and Dr. Watson distinctly says, "I give this species on the authority of Dr. Gwyn Jeffreys." After a careful examination of the two shells in question I cannot agree with this determination. In the first place they exhibit only a faint trace of a columellar tooth

or fold, and they are of a different texture. It is one of those cases of uncertainty which arise through a very close resemblance, and which would probably be cleared up if we had a good series of specimens for comparison.

9. Puncturella Noachina (Linnæus).—This well-known northern form was obtained by the "Challenger" expedition at four stations in the Kerguelen region, also in the Straits of Magellan. Conchologically there seems to be no reason for separating the specimens obtained at these localities. The species has, however, such a wide range in Northern seas, the west coast of North America, Japan, etc., that its occurrence anywhere would not be surprising. Moreover, there are several not very dissimilar forms known from the West Indian region, and the genus occurs in all four quarters of the globe.

To quote another example of wide range in the genus I would refer to *Puncturella Asturiana* of Fischer, which is known from the Bay of Biscay, the West Indies, and off the west coast of Ceylon.

10. Trochus (Margarita) infundibulum, Watson.—A beautiful deep-water species from off Bermuda, 1,075 fathoms; off Marion Island in the Southern Ocean in 1,375 fathoms ("Challenger"); 100 miles eastward of the entrance to Chesapeake Bay, 1,685 fathoms (Dall); Gulf of Manaar, Ceylon, 738 fathoms ("Investigator").

Slight differences, as might be expected, are observable in the specimens from these localities, still not sufficient to give them distinct specific rank. It will be noticed that all are from great depths, where cases of very remarkable distribution have been shown to occur.

11. ? Doris tuberculata, Cuvier. — This well-known northern Nudibranch was quoted by myself from Kerguelen Island in the Report upon the Mollusca obtained by the "Transit of Venus Expedition" to that island, the identification resting upon the authority of Mr. P. S. Abraham, who at the time had been naming the species in the Museum collection. But a greater master in the study of the Nudibranchiata, Dr. Rudolf Bergh of Copenhagen, has since declared this form to be both generically and specifically distinct, and designated it with the name of *Archidoris Kerguelenensis*. This species was also found by the "Southern Cross" naturalists at Cape Adare, Victoria Land.

This concludes the discussion of the individual species under consideration, and I will now try to summarize the result.

In the first place six out of the eleven species are probably wrongly identified, namely, the *Glomus*, *Kellia*, *Homalogyra*, *Natica*, *Odostomia*, and *Doris*. Excepting in the case of the *Doris* the identifications were based upon either one or two specimens, and all, with the exception of the *Natica*, are very small and insignificant, without any striking features, so that it becomes quite impossible to decide their identification with any approach to certainty.

Of the remaining five species, whose determination appears to be admissible, the *Ianthina*, being pelagic, scarcely comes within the scope of the discussion, the *Mytilus* is almost cosmopolitan, the

Margarita, besides occurring in the north Atlantic and the Southern Ocean, has also been found in the Indian Ocean, likewise the *Dentalium* and *Puncturella* are both so widely distributed that their occurrence in deep water in intra-tropical latitudes is very probable.

Hence I think that in reality there is practically no identity between the northern and southern molluscan faunas. Moreover, putting aside specific identity, we do not discover any similarity from a generic point of view, for not one of the eleven genera quoted has a limited distribution; on the contrary, with the exception of *Glomus* and *Homalogyra*, of which we know comparatively little, all have practically a worldwide range.

In conclusion, I would also point out that I do not find any peculiar specific or generic identity in the published lists of Arctic and Antarctic Mollusca. Certain genera are usually considered boreal types, such as

Admete.
Trichotropis.
Bela.
Velutina.
Lamellaria.
Buccinum.
Trophon.
Liomesus.
Yoldia.
Cyprina.
Artarte.
Lyonsia.
Mya.
Cyrtodaria.
Saxicava, etc.

Now it is a suggestive fact that not one of these genera is exclusively restricted to the two regions under discussion. One or two are solely Arctic, and the rest, although having both northern and southern representatives, also occur at intermediate stations or have a considerably wide distribution.

On the other hand, it may be shown that certain Antarctic genera are restricted to that region and do not occur in the north, although met with in other parts of the world. Among these may be cited *Euthria*, *Bullia*, *Photinula*, *Siphonaria*, *Ranella*, *Acanthina*, *Voluta*, *Struthiolaria*, *Cominella*, and *Modiolarca*.

It is a notorious fact that Mollusca from high latitudes and from deep water are to a great extent devoid of bright colours. Even this prevailing dull appearance of the shells from the Arctic and Antarctic areas is almost enough to suggest an imaginary resemblance.

Although much might be written upon this subject, indeed the discussion might be prolonged to any extent, I think enough has been said to show the fallacy of this bipolar theory, at all events from a molluscan point of view.

Nevertheless, Dr. Pfeffer, referring to the examination of collections received from Patagonia, observes—"One thing can be affirmed with decision, that the theory of the great similarity of the faunas of higher northern and southern latitudes receives new support from the working out of nearly all groups; and the accord between the two faunas extends to hundreds of genera."

Perhaps some day he will publish a list of these forms. We shall then be in a position to judge to what extent these hundreds of genera are bipolar.