Note on the geographical distribution of Limax agrestis, Arion hortensis, and Fasciola hepatica / by George Rolleston.

NOTE

15.

ON THE

GEOGRAPHICAL DISTRIBUTION

OF

LIMAX AGRESTIS, ARION HORTENSIS, AND FASCIOLA HEPATICA.

BY

GEORGE ROLLESTON, F.R.S.,

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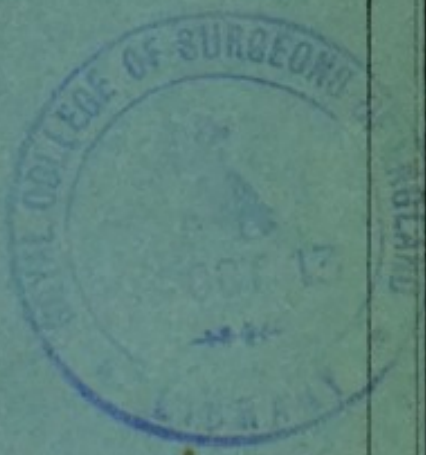

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NOTE

ON THE

GEOGRAPHICAL DISTRIBUTION

OF

LIMAX AGRESTIS, ARION HORTENSIS, AND FASCIOLA HEPATICA.

THAT some not inconsiderable confusion exists as to the question of the existence of *Arion ater* and *Limax agrestis* in Greenland, will be seen from the following quotation, to be found as hereinafter specified:—

'A Manual of the Natural History, Geology, and Physics of Greenland, together with Instructions for the Use of the Arctic Expedition.' 1875. London.

(*P.* 124.) "*Mollusca Groenlandica:*

Classis i. ANDROGYNA, Mörch.
Ordo i. GEOPHILA, Fér.
*1. *Arion fuscus*, Müll. Probably introduced. *L. agrestis*, L., according to Wormskiold.

The species marked with an * are doubtful inhabitants of Greenland."

Prefixed to the list whence the above passage is taken is a note to the effect that the list is the "Prodromus Faunæ Molluscorum Groenlandiæ (in Rink's 'Grönland,' &c., 1857, pp. 75–100). By Dr. O. A. L. Mörch. Revised and augmented by Dr. O. A. L. Mörch, University Museum, Copenhagen. April, 1875."

On referring, however, to the Prodromus itself, as published in Danish in 1857, I find the entry which concerns us stands simply thus:—

"*Mollusca Grönlandica:*

Order i. GEOPHILA.
Gen. i. *Limax*, L.
*1. *L. agrestis*, L. (ifolge Wormskjold).

*Betigner at Artens Forekomst paa Grönland ikke er sikker."

That is to say, that the line in the entry given in the Manual of 1875—"**Arion fuscus*, Müll. Probably introduced"—is altogether something fresh and new; whilst the asterisk, denoting that the animal so marked is possibly not indigenous, was

removed from the Limax agrestis, and prefixed to the curious name "Arion fuscus, Müll."

It is difficult to understand how the late Dr. O. A. L. Mörch can have come, in 1875, to alter his previous entry in this manner. For the name "Arion" was unknown to Müller, the author of the 'Historia Vermium,' having been introduced into malacology by Férussac, as he himself tells us;* and as regards the animal itself, on the supposition that Dr. Mörch, by his entry "*Arion fuscus*, Müll.," intended to have written "*Limax fuscus*, Müll.;" and knowing that this Limax, so called by Müller, was really an *Arion* (*hortensis*), and not a slug with a posteriorly placed respiratory inlet and a continuous shell, it is still more difficult to see how he could have added the word *L. agrestis*, L., apparently as a synonym. For in the thirteenth edition of the 'Systema Naturæ,' tom. i. pars vi. pp. 3101–3102, the (true) "*Limax agrestis*" is distinguished from the "*Limax fuscus*" (=*Arion hortensis* hodie) of "Müller, 'Hist. Verm.' ii. p. ii. n. 209."

On referring to Dr. O. A. L. Mörch's "Faunula Molluscorum Islandiæ," communicated on the 13th April of 1866, and published in 1868, in Danish, in the 'Vidensk. Medd. fra den naturhist. Forening i. Kbvn,' pp. 185–227, I find at p. 196, 3, that "*Limax agrestis*, L." stands with a ? after its name, even though there can be no doubt from references to Olafsen, several of which are, in fact, given by Mörch, that *a* grey slug, as well as the black slug, *Arion ater*, exists in Iceland. And a suggestion at the end of the entry, to the effect that the specimens may possibly belong to the species *Limax tenellus*, appears to explain the presence at the beginning of it of a ? after the words *Limax agrestis*.

Perhaps, therefore, the true explanation of the entry in the Manual of 1875 is as follows. In the interval between 1857 and 1875 a black slug may have been proved to Dr. Mörch's satisfaction to have been found in Greenland, and he may have identified it as the *Arion fuscus* of Moquin-Tandon, which is the same as the *Arion hortensis* of Férussac, *and* as the *Limax fuscus* of Müller and Linnæus; and he may, by a very slight slip, have entered it as "*Arion fuscus*, Müll.," instead of "*Arion fuscus*, Moquin-Tandon," or "*Limax fuscus*, Müll." To his addition "Probably introduced," some objection might be taken on the ground that there is no very strong *a priori* reason why an Arion should not exist in Greenland, considering that it exists in Iceland, the land shells of which Mörch himself†

* 'Hist. Nat. des Mollusques,' ii. 1820–1851, pp. 23 and 54.

† See Manual, p. 135.

allows are nearly allied to those of Greenland, and is not only an acknowledged member of the circumpolar fauna,* but the most abundant of all slugs in Finmark and Lapland. It is curious—and not only curious, but in view of the question of the distribution of *Fasciola hepatica* also important—to note what follows. In 1875 Dr. Mörch appears, after thus adding *Arion hortensis* to his former list of Greenland mollusca, to have been content to leave the entry of "*Limax agrestis*, L., according to Wormskiold," untouched, though in smaller type, feeling, probably, that as the entry of the animal was overtly made only on the authority of Wormskiold, he was in no way pledged either to holding that it was *Limax agrestis*, and not *Limax tenellus*, which existed in Greenland, or, indeed, to holding that any Limax whatever existed there. What completes my case is the fact that in 1877, when preparing a list of the Greenland mollusca for the English translation of Dr. Rink's 'Grönland,' of 1857, Dr. Mörch omits all mention of *Limax agrestis* altogether, and his entry runs as follows (p. 436):—

"Class i. ANDROGYNA.
Order i. GEOPHILA, Fér.
1. *Arion fuscus.* Probably introduced."

If we follow Dr. Mörch, therefore, we shall strike *Limax agrestis* out of the list of Greenland mollusca, and hold that *Arion hortensis*, which exceeds it in number in other circumpolar regions, has in Greenland displaced, or at any rate replaced, it altogether.

If, however, *Limax agrestis*, notwithstanding the advantage which its coloration might be supposed to have been likely to give it, is beaten in the struggle for existence in circumpolar districts by *Arion hortensis*, of about the same size, but of such different colour in other districts, if not in the North,† as not

* Middendorff, indeed, in his 'Sibirische Reise,' ii. 1851, p. 419, omits the name of this small slug from his list of Circumpolar Freshwater and Land Molluscs, but five pages farther on, *l.c.*, says in a note, "Vielleicht ist *Limax* (Arion) *sub-fuscus*, Drap. (Drap. 'Moll.' p. 125, pl. ix. 8; *Limax fasciatus*, Nillsen, 'Hist. Moll. Suec.' 1822, p. 3) eine circumpolare Art dieses Geschlechtes;" and he proceeds to note its discovery by himself within the polar circle in Finland, feeding on sphagnum, as also in Lapland, feeding on fungi, up to 69° N. Lat. Schrenk ('Reise in Amurlande,' 1859–1867, ii. p. 692), whilst identifying the *Limax sub-fuscus* of Draparnaud with the *Arion hortensis* of Férussac, and so with the *Limax fuscus* of Müller and Linnæus, confirms the view as to its circumpolar character, and uses it as an argument for its being indigenous in America.

† Even in England, where the *Arion hortensis* is often of a "deep blue-black," and is, I suspect, the "Black Jack" of agriculturists; it is not rarely "yellowish, sometimes gray or greenish-gray."—(Lovell Reeve's *British Land and Freshwater Molluscs*, p. 11). In Amoorland it is "graugelblich," with three stripes, one dorsal and two lateral narrower ones; whilst its rival the *Limax agrestis* is described as "hell-bräunlich- oder bläulich-grau."—See Schrenk, *l.c.*

only to have been called *fuscus* and *sub-fuscus*, but even to have been confounded with the true *Arion ater* (from which, indeed, it is mainly distinguished by its more mesially placed respiratory orifice and its small size)—it surpasses *Arion hortensis* * in more southern latitudes.

Middendorff indeed expressly says, *l.c.*: "In Siberien traf ich diesen *Limax* (*Arion hortensis*) nicht, sondern nur einen einzigen kleinen *Limax* in *Starowoj* Gebirge, welcher dem *Limax agrestis*, L. recht ähnlich sehe." But this absence from Siberia, to which F. Schmidt's silence as to its presence bears some testimony, may be paralleled by the similar absence of *Paludina vivipara* (Middendorff, *l.c.*, p. 426) and of crayfishes from the Siberian river basins,† and, as in those two cases, when compared with the facts of a distribution elsewhere does not disprove a circumpolar character.

Gerstfeldt, 'Mém. Sav. Etrang. St. Pétersbourg,' 1859, 515 (11), refers to some few, small, ill-preserved specimens, "einige wenige kleine und schlecht erhaltene Exemplare" of slugs from Irkutsk and Wilni and from the Amur, and speaks of them under the name *Arion ater*. Their small size may justify us in supposing them to have been *Arion hortensis;* and the bad state of preservation in which they were, and which makes Gerstfeldt himself speak doubtfully of his identification, p. 535 (31), makes this note of their presence less authoritative than it otherwise would have been, and has caused Schrenk to suggest that they were in reality specimens of *Limax agrestis*.

An illustration of the paucity and rarity of *Limax agrestis* in circumpolar regions is furnished by the entry made by Frederich Schmidt in his list of Animals from the Region of the Lower Yenisei, 'Mém. Acad. St. Pétersbourg,' 1872, p. 48, as to this eminently social mollusc: "In einem faulen Treibholzstamm auf den grossen Brjochow Insel (70° N. Br.) *in einem Exemplar* gefunden." But, *per contra*, in Amoorland, Schrenk tells us, *l.c.*, that *Limax agrestis* outnumbers *Arion hortensis*, just as *Arion hortensis* outnumbers *Limax agrestis* in Sweden, Finland, and Lapland, and that while *Limax agrestis* spreads into Spain, Portugal, Italy, Algeria, and the southern slopes of the Caucasus, *Arion hortensis* reaches no farther south than the southern slopes of the Pyrenees and Alps.

In a letter published in the 'Times' of April 14, 1880, and republished with certain omissions in the 'Zoologischer Anzeiger' of May 24, p. 258–260, I suggested that *Arion ater* may be the "*Zwischenwirth*," or one "*Zwischenwirth*," to *Fasciola*

* See Schrenk, 'Amurlande,' ii. 690–693, 1869. Middendorff, 'Sibirische Reise,' ii. p. 424, 1851.

† See Huxley 'On Crayfishes,' p. 305.

hepatica. For, calling the small black slug upon the distribution of which I have, following Schrenk and Middendorff, just been writing, "*Arion ater*," I have the example and authority of Forbes and Hanley, and I think that of Gerstfeldt. But now, following Schrenk more closely, I should call it *Arion hortensis*, and should wish to be understood to be of opinion that it will—as I hope, by means of experiments now being carried on in my laboratory by Mr. A. P. Thomas—be ultimately shown that the smaller of our two British Arions really is one at least of the hosts infested by the sheep-fluke, *Fasciola hepatica*.

As regards the distribution of the *Fasciola hepatica* in northern regions we have the authority of Leuckart, 'Die Menschlichen Parasiten,' i. p. 531, 1863, for saying that it is found in Greenland and North America; and the same excellent authority quotes, *l.c.*, ii. p. 870, 1876, Krabbe to the effect that it is not found in Iceland. The last statement is confirmed by Jonsson in 'Deutsche Zeitschrift für Thiermedicin und vergleichende Pathologie,' Bd. v. Heft vi. 1879, p. 413, in the words "Leberegeln kommen in Island nicht vor." I wish to add that there is no mention of the disease which *Fasciola hepatica* causes in Olafsen's and Povelsen's two volumes of 'Travels in Iceland,' though the diseases of sheep are repeatedly treated of by those authors.* And a similar remark may be made as to Siberia; neither Middendorff, nor Radde, nor the great Pallas, treating as they do so exhaustively of the natural history of that region, ever within my knowledge make any allusion to the existence there of *Fasciola hepatica* as a cause of sheep disease. As regards, however, the existence of this animal and of the sheep-rot in Greenland, as testified by Leuckart, I wish to lay alongside of it the following statement from the English translation of Rink's 'Greenland' already referred to, and edited by Dr. Robert Brown in 1877. There, p. 97, it is stated that about the year 1855 there were in the whole of Greenland only from 30 to 40 cows, 100 goats, and 20 sheep, and that this handful of cattle were located at Julianshaab, on the west coast. A statement to the same effect is given by Dr. Brown himself in the 'Manual of Arctic Instruction,' 1875, p. 27. Surely if the rot still exists in Greenland, and has not shared the fate of so many other forms of life which have finally left its inhospitable shores, we have in Julianshaab a simple case and a circumscribed area wherein to prosecute research.

If the presence of *Fasciola hepatica* in an isolated locality—

* See German translation published in 1794. i. pp. 112–280; ii. pp. 46, 198, 199.

that of Julianshaab, on the west coast of Greenland—is likely to prove instructive, its absence from Iceland may also throw some light upon the subject. Most or all of the mollusca which have been or can be supposed to act and suffer as *Zwischenwirth* for the *Fasciola* are to be found in Iceland, viz., *Arion ater*, *Arion hortensis*, *Limnæa truncatula* and *Limnæa peregra*,* as well as *Planorbis rotundatus*, if not *Planorbis marginatus*. And that abundant opportunities for the introduction of *Fasciola hepatica* into Iceland have been given by the importation of sheep from abroad is learnt from what Olafsen, *l.c.*, ii. pp. 198–199, tells us as to the ascription of another sort of sheep disease to such importation.

I incline to ascribe this immunity from rot which the sheep enjoy in Iceland to the habit which they in common with the Shetland and Orkney sheep have of feeding between high- and low-water marks upon the seaweeds specified by Olafsen in various passages, *q.v.*, *l.c.*, i. 233, 279, ii. 198, and Low, 'Domestic Animals of Great Britain,' p. 59. The *Fasciola hepatica* is a freshwater animal, and would not of course be picked up in such a locality as the interval between "Ebbe and Fluth," to which the sheep resort even on the dark nights of winter. It is possible to speculate as to the virtues of salt as an anthelminthic, and to suggest that it may act either by enabling a better gastric juice to be secreted, and so giving the sheep a better chance of digesting the larval *fasciolæ* when swallowed, or by provoking a more copious flow of bile, and so washing the young fluke out of the gall-ducts. This, perhaps, is not the place for such enquiries. But it is a pure natural history fact that localities rich in deposits of salt are favourable to the growth and health of sheep. Pallas, in the wonderful eleventh Fasciculus of his 'Spicilegia Zoologica,' dwells on this in reference to the Steatopygous variety of the domestic sheep at pp. 65–67, and with reference to the Argali, the *Ovis fera Siberica*, supposed to be the parent stock of *Ovis aries*, var. *domestica*, he writes thus at p. 12: "Omni vero tempore ubi possunt loca salsagine rorida quibus universa Siberia abundat crebro frequentant, terramque sale fœtam cavant quod cervino quoque generi solemne est."

* See Mörch, 'Faunula Molluscorum Islandiæ,' 1868, pp. 12 and 16.

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