meat and bread; when caught, bite at the finger; die very soon on being handled, emitting faint squeaking noises.

This concludes the *Soricinæ*, identified by myself. They are all classed from "Mammals of North America," to which work, and personally to its author, Dr. Baird, I am happy in expressing my acknowledgment. One more species nearly allied to the *Soricinæ*, *Condylura Christata*, is common to the Province. One species, only, the tail diminishing in size as the animal becomes lean; increasing during the sexual season, or when it fattens. Animals of this order have a great tendency to fatten. I also remark that I have never seen a true mole in the Province; from which I infer that at least they are rare. Although some one may have been more fortunate than myself.

Art. II. On the Caplin.* *(Mallotus Villosus.)* By Capt. C. Hardy, R. A.

[*Read December 7*, 1863.]

Although not found on the coast of Nova Scotia proper, the Caplin annually visits northern Cape Breton, and so is to be included amongst the seafish of this Province; but, independent of this fact, so much interest is connected with its habits, the vast armies in which it approaches the coasts which it favors as its favorite resorts in the spawning season, its use and abuse as an article of food or manure for the land, and finally its almost nameless value as bait for the cod, in the prosecution of the great cod-fisheries on the banks and along the shores of Newfoundland and the Labrador, that it deserves a prominent place in the history of the most curious of the finny tribes.

Richardson has carefully described the fish in his "Northern Zoology." After Linnæus, he places it amongst the Salmonoidæ, or Salmon family, of which it is the smallest known member. He

* Hugh Miller in his "Popular Geology," thus speaks of the Caplin as an inhabitant of the deep, in the latter days of the tertiary period:—"Clay nodules of the drift period in Canada and the United States, are remarkable for containing the only ichthyolite found by Agassiz among seventeen hundred species which still continue to exist, and that can be exhibited in consequence in duplicate specimens —the one fit for the table in the character of a palatable viand; the other for the shelves of a geological museum, in the character of a curious ichthyolite. It is the *Mallotus Villosus*, or Caplin."

states that it swarms on the coasts of Norway, Lapland, Iceland, Greenland, Newfoundland, the Welcome, Coronation Gulf, and, believing the *Salmo catervarius* of Steller to be the same, it inhabits, he says, the Sea of Kamtschatka. He also believes it to be an inhabitant of the icy Sea of Siberia, and thus shows that it completes the circuit of the Arctic coasts. Its southern limits on our shores appear to be about the harbour of Louisburg, C. B.,* where, I believe, its visits are not always annual or certain, and thence around the North Cape, in increasing abundance. Perley classes it among the fishes of New Brunswick, and states that it is found at Miscou, entering the Bay of Chaleur in great numbers. Found everywhere on the Canadian side of the Bay. It continues plentiful round Cape Gaspe, and ascends the St. Lawrence, according to Mr. Robert Bell, as far up as Rimouski on the southern shore. On the north shore its range continues along the Labrador as far north as Gros Bay;† whilst it is found throughout the coast of Newfoundland and the smaller islands of the Gulf. Richardson describes a fish, *Salmo (Mallotus?) Pacificus*, called the North-west Caplin, as entering the Columbia annually in immense shoals, on the Pacific coast of North America; and a Mr. Lord, late naturalist to the British North American Boundary Commission, speaks of the same fish as driven out of the Columbia by the steamers which now go panting and snorting along its banks, but says, it is still taken in vast quantities by the Indians above 50° N. latitude. However, there are doubts as yet whether to class this species as a Caplin, or as a Smelt, to which last it seems to be allied by its habit of ascending rivers to spawn. Of the Caplin under our notice as inhabiting the Arctic regions of Europe and America, there is but one species.

The following description of this fish is given by Mr. JONES, to whom I forwarded the specimens before me, on my return from Newfoundland, in July last:—

DESCRIPTION.—Body, elongate, compressed, extent 7 inches. Scales, small. Lateral line straightened to the region of the anal, where it

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* About ten years ago a school of Caplin made their appearance in Halifax harbour. My informant is Mr. ANDREW DOWNS, who purchased some of them in the market.

† Where my informant, Mr. DAVIS, for many years connected with the Labrador fishery, resided for a long time. Indeed, he questioned whether they visited the north side of this large bay at all.

bends upwards to the caudal base. Eyes, large, diameter 3¼ lines. Nostrils, double, horizontal, having the posterior cavity 1¾ lines from ocular margin. Mouth, small; vertical gape 5 lines; horizontal gape, 3 lines, the lower jaw longest; width above eyes across occiput, 3 lines. Depth, immediately in advance of anal, 10 lines; at caudal base, 4 lines. Width of body, immediately in advance of dorsal, 6 lines. Extent from point of lower jaw to posterior margin of opercles, 1 inch 4 lines; from frontal extreme to base of occipital cleft, 10 lines. Upper and lower jaws armed with sharp conical teeth, bending inwards, extending on the former to the base of the maxillaries. A row of similar teeth on either side of the palate. Head, compressed, attenuate; facial outline, declivous. At upper angle of operculum arises a filamentous fin-like process, which runs parallel with, and immediately above the lateral line to the caudal base, the mass partaking of the character of flaccid fringe.

The dorsal fin commences 3in. 3¼ lines from frontal extreme, and has its first ray longest, 8 lines; last ray shortest, 4¼ lines. Basal extent, 6¾ lines.

The pectoral fins flabelliform, commencing immediately behind the lower angle of the opercles, 6 lines beneath the dorsal ridge. Basal extent, 4¾ lines. The twelfth ray longest, 8¾ lines; expanse, 6¾ lines.

The ventrals commence in a line with the dorsal, the sixth ray longest, 8¼ lines; basal extent, 3¼ lines; expanse, 10 lines.

The anal commences in a line midway between the dorsal and adipose fins, having its fifth ray longest, 5¼ lines; basal extent, 7¾ lines.

Caudal, forked; lobes equal, 9½ lines extent; cleft, 3½ lines; expanse, 8½ lines.

Adipose fin commences 9¼ lines behind dorsal; basal extent, 3¾ lines.

Colour.—Whole upper part (including the head) from the regions of the lateral line, olive green, fading to a silvery pearl beneath; the opercles dotted with dark spots, and the whole body, under the lens, more or less covered with dark specks. The whole fish shines with metallic lustre; cheeks and gill covers, silvery; fins transparent.

D. 13,—V. 8,—P. 18,—A. 22,—C. 17.

Besides Richardson's description, I have found notices of the Caplin in "Cuvier's Nat. Hist.," in Perley's report of the Gulf fisheries, and in an account of a voyage to Newfoundland and Labrador, published in 1818, by Lieut. Chappell, R. N. They all notice the ridge or process which runs along each side of the male, parallel to the lateral line. The great naturalist speaks of it adorning the fish in the *spawning season*, implying its absence at other times. He calls it a broad band all along the flank, furnished with long, narrow and raised scales, which have the appearance of hairs; and they are particularly recognised, he says, by the broad round pectorals, which almost touch one another underneath. Richardson states, that "it approaches the shores in dense shoals in the spawning season, the females preceding the males. The latter at this

period acquire elevated bands at the sides, composed of soft, tumid, elongated scales, by which, it is said, they adhere together, sometimes to the number of ten or more, and in this state are occasionally driven on shore by the wind in immense quantities." As I heard from fishermen in the out-harbours near St. John's that Caplin were sometimes caught in the deep waters of the bays in winter, when the males are found to be destitute of the elevated ridges, it would appear that these singular appendages only occur in the spawning season, and must therefore be imagined to have some specific purpose in the operation of spawning,—the well known manner of which performance is a most curious fact in the natural history of the Caplin. Chappell first notices this: "The manner of the Caplin depositing its spawn is one of the most curious circumstances of natural history. The male fishes are somewhat larger than the female, and are provided also with a sort of ridge projecting on each side of their back bones, similar to the eaves of a house, in which the female is deficient. The latter, on approaching the beach to deposit its spawn, is attended by two male fishes, who cuddle the female between them until her whole body is concealed under the projecting ridges before mentioned, and only her head is visible. In this state they run all three together with great swiftness upon the sands: when the males by some imperceptible inherent power compress the body of the female betwixt their own, so as to expel the spawn from an orifice near the tail. Having thus accomplished its delivery, the three caplin separate, and paddling with their whole force through the shallow surf of the beach, generally succeed in regaining once more the bosom of the deep."

Perley speaks of this peculiar habit of the Caplin as a fact. It is thus described in the evidence taken before a committee appointed during the last session of the Newfoundland Parliament, to enquire into the cause of the decline of the fisheries, and in which much mention is made of the Caplin, in its economic relations to the cod-fishery; and, finally, so generally did I find, during my recent visit to Newfoundland, this curious feature in the Caplin's history, known and spoken of by the fishermen of the out-harbours, and by long residents in St. John's, of the upper classes, that, in my estimation, it deserves the credence of an authenticated fact. It is

difficult to say in what precise manner the processes or ridges of the male are used during the act of the female spawning; probably they exert some amount of downward pressure in running upon the sand, thus assisting the female to exude the ripe and easily-expressed spawn.

The Caplin arrives at its spawning beaches on the south-east coasts of Newfoundland, about the 20th June, and remains close inshore for about five weeks; beyond this period the fish is rarely seen or taken under any circumstances. The warm days with light fogs occurring at this season, are looked upon by the expectant fishermen as favourable to their striking in; they call such days "caplin weather." Now all is rivalry as to who shall get the first haul for bait; a bucket-full would command any price—like the first strawberries at Covent Garden, or the first salmon at Boston. In a few days' time they will be rolled over the roads by strings of carts, selling at 3s. a load, and exported by thousands of barrels to the eager French fishermen on the Banks; for now is the great banquet of the cod: and herring and clam, mackerel and sardine, are each refused for the new and delicate morsel. It was the height of the Caplin season when I arrived in St. John's last summer. Caplin were being wheeled through the streets, caught in tubs, buckets, and ladled up in scoops by everybody from the wharves of the town; the air was strongly impregnated with the smell of Caplin; they were scattered about in the streets, and you trod on, or drove over them everywhere. The fish flakes, roofs of houses, and little improvised stages attached to nearly every dwelling, were strewn with Caplin drying in the sun. In the country, on the roads to the out-harbours, a continual stream of carts was passing loaded with glittering cargoes of fish; the whole mass moving together like a jelly, and so very likely to spill over the sides, that division boards are placed across the cart to separate the fish into two masses, and thus keep them steadier. In the fields men were engaged in spreading them broadcast, or sowing them in drills with potatoes; whilst others were storing them for manure, by burying enormous masses of fish in great mounds of earth. But it is on the beach only that a just conception can be formed of the great multitudes in which this fish approaches the shore, when sometimes the surface of the water appears as a living

mass, as far as the eye can reach, and, with their heads towards the land, they lie close in like a black line, each succeeding wave dashing them on the beach; where, as the tide ebbs, they remain and die. The seine, the cast-net, and the dip-net are being plied by the busy fishermen, whose families are collecting the dead fish, and depositing them in heaps, or in pits for manure. Sometimes the mass is so dense that a boat is impeded in sailing through them, and in dipping them up more fish than water are taken up in a bucket. Numbers of the lively little tern wheel screaming through the air over the school of fish, every now and then making a dash on their prey; whilst out in the deep water lies the great army of codfish, ready to feast on them as they return from the beach. In fact as regards their finny foes, every fish large enough to swallow them preys on the Caplin. Capt. Murray, R. E., informed me that he had taken a salmon with five, and a sea trout with two Caplin in the stomach; the latter being only 2 lbs. weight. A friend of his once thought he had hooked a sea trout, but after a little play succeeded in landing a dead Caplin, to which the hook had affixed itself in the trout's mouth, the latter being apparently too full to complete the act of swallowing.

A scene of this description is exceedingly interesting, as I saw it one deliciously warm sunny afternoon in July, on the pebbly beach at Topsail, near the head of Conception Bay. As we approached the village from the road leading to St. John's, the prospect from the top of the last hill was charming. The little neat village at our feet, with its fish stages and patches of garden, bounded by the rough barren sandstone cliffs of Portugal Cove; a pebbly beach in front dotted with groups of fishermen throwing their cast nets over the black patches which indicate the approaching beds of Caplin; the activity prevailing on board the boats and schooners moored a few yards off; the men dipping up the fish, and throwing them over their shoulders into their boats: formed a pleasing and animated foreground to a picture where the distance was formed of the lofty blue mountains across the bay, whilst in middle distance reposed the well cultivated islands of Great and Little Belleisle. In the centre of the bay lay grounded a large iceberg, evidently melting away in torrents under the influence of the hot July sun.

Nothing could exceed the beauty of the iridescent colours of the fish, as I handled them fresh caught. The back of the male between the ridges was of an emerald blue as it caught the light. I observed a remarkable absence of timidity on the part of the fish. It seemed as if no amount of splashing over them with the heavily-weighted cast nets could frighten the remainder away from the shore. They seemed impelled to push close in by strong instinct, and even when wounded and dying from being struck by the lead weights of the net, their heads would still point to the beach. We could easily take them with our hands, scarcely wetting our feet, as they swam close in. The sand and gravel of the beach was mixed with a large proportion of spawn. I found the latter in the stomachs of all the male fish which I opened.

In concluding these remarks on the habits of Caplin in spawning season, I append an extract from the letter of Mr. W. H. WARREN, of St. John's, who was engaged for 28 years in the fisheries off the Newfoundland and Labrador coasts, to the chairman of the Select Committee on Fisheries. After describing the manner in which the two males accompany and assist the female in the act of spawning, he continues: "From the observations I have been enabled to make, I believe the Caplin approach the coast and spawn at spring tides. By the next spring tides the spawn has become vivified, and is washed off and mixed with the sand and gravel. In about six weeks the young Caplin are about the size of a cambric needle, and half the length. About this time the codfish come in after the young spawn in great numbers, and I have had 70 to 100 quintals often taken in a seine at a single haul, at a beach that was a favourite spawning place of Caplin." I also give the following observations on the Caplin in Labrador, kindly forwarded to me by Mr. DAVIS of this city, many years engaged in the fisheries on that coast: "These fish," he says, "make their appearance about the latter part of June or beginning of July, in such immense quantities as to appear quite fabulous to persons who have had no opportunity of witnessing the sight. On a clear calm day may be seen from the highest hill, as far as the eye can reach, the ocean literally covered with these fish, forced to the surface of the water by their different enemies preying on them; and it has been clearly ascertained that for hundreds of miles east and west a similar sight has

been observed on the same day. The object of their annual visit to these shores is undoubtedly to deposit their spawn. The myriads to be seen on the sandy beaches at this season, baffles description. The manner in which this is performed is one of the most singular and interesting facts in the character of this fish. It may be observed that the male and female differ so much in appearance that it would be difficult for a stranger to believe they were of the same species. In the female the skin is perfectly smooth, with no other obstruction than the fins. The male, on the contrary, has a beautiful ridge on each side, resembling velvet, and when first taken out of the water has the colours of the rainbow. The time for the female depositing her spawn having arrived, she is assisted by two male fish, one on each side, and when the surf offers, they all force themselves on the beach, taking particular care that the female is kept in the middle, and by thus compressing her, the object of their visit is accomplished. Many repetitions are undoubtedly required. If the sea remains undisturbed for several days, so that the spawn may accumulate, and a moderate surf then follows, the spawn may frequently be found on the beach to the depth of twelve or even eighteen inches. The Caplin commences its departure about the last of July."

The Caplin was leaving the harbours in the vicinity of St. John's, this last summer, on the 25th July, and the squids, the next bait in succession used in codfishery, making their appearance.*

It remains to say a few words in connection with the uses of the Caplin to man, and its present unlimited wholesale capture and wasteful application. The primary and most important use of the Caplin in Newfoundland, Labrador, and the Gulf fisheries, is as a bait for the cod. During the spring, all the cod have been taken, both on the Banks and along shore, by herring, but in inconsiderable numbers; now, however, the fish look for their great annual glut, and Caplin alone will take them. Every shore boat must have its fresh Caplin, as well as every Frenchman on the Banks. It is the bait of the hook-and-line fisherman, as well as for the destructive bultow. If the supply of Caplin were withheld, by an act of the Newfoundland Government, from the French, their great

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* It is generally noticed by the fishermen as a sign of the approaching departure of the Caplin, that the eyes assume a red or bloodshot tinge.

fishery fleet could do nothing: as, having exhausted the supply from their own islands of St. Pierre and Miquelon, by taking and wasting the fish with too great prodigality, they are now entirely dependent on the supply from the harbours of the main island. Many attempts have been made to associate the failure of the cod-fishery, with a decrease of bait, such as herring, caplin, &c. This year, however, the take of cod has been unusually bad in all directions, whereas Caplin struck in in unwonted numbers. It is said by some that they were so glutted with the live fish that they refused the dead bait. Again, I find it stated that a decrease in the Caplin would be advantageous, as the cod would take more readily. However this may be, it must be evident that any material and permanent decrease in the bait must tell on the fisheries. For example, the Caplin may, as has been shewn to be the case, be so thinned by wholesale destruction whilst spawning on the beach, whilst many are driven off and compelled to drop their spawn in deep water, where it will not vivify, as finally to desert a locality forever. On many parts of the Newfoundland coast this has been the case, and PERLEY states that the codfishery of the Bay of Chaleur has greatly fallen off since the Caplin have almost ceased to visit parts of it, and many houses in consequence found it necessary to break up their establishments. The great complaints of the scarcity of bait along the western shore of Newfoundland, is owing to the complete failure of a celebrated baiting place at Lamaline, where formerly the strand looked like a bed of spawn, but now is completely ruined: the Caplin no sooner approaching the shore than they were hauled before they had time to spawn. In fact little argument is required to prove that the codfishery must stand or fall with the supply of Caplin. The wasteful practice of manuring the land with Caplin is another incentive to taking these fish wantonly. Not only are the dead fish which are strewn in myriads on the beaches collected for manure, but live fish are hauled for the same purpose, and hundreds of cartloads have I seen upset to form a heap of putrefaction, and be afterwards spread on the soil, every fish composing which was good and wholesome food for man, eaten fresh on the spot, or simply dried for exportation or winter use. But Newfoundland is shamefully prodigal of the great natural resources afforded to her. It is true that the fish is dried and

exported to the markets of Europe—and a more delicious dried fish than the Caplin does not exist; but why this shameful conversion of food into manure from sheer laziness? Neither does the Caplin manure prove so very beneficial after all. Though very efficacious for one year for grass and all root crops except potatoes, it then requires renewal—the land cannot do without the stimulus—or soon falls off. About five loads of earth are mixed with one of Caplin, which is bought at three to four shillings. The fish, well covered, are allowed to decompose till October; then mixed and ploughed in the land either that fall or the ensuing spring. On the other hand the Caplin requires little or no attention in drying, to become an article of food. A few hours in pickle, and a few more exposed to the sun, on a stage, or roof, or even on the ground, and they may be packed loosely in a barrel, without salt, and headed up. Before those who enjoy the luxury of a dish of fresh Caplin, a more delicious repast cannot be placed. Eaten very hot, and nicely browned, they are far superior to the common smelt in flavour and delicacy. The flavour much reminded me of the famous whitebait of the Thames.

In conclusion, it appears that the Caplin, though its range is too great, and its spawning ground too far extended to render extinction of the species possible, yet, in the baiting places whence it is obtained for the use of the neighbouring codfisheries, it has been in many instances rendered exceedingly scarce; and its final total departure from these resorts must ensue, unless it is protected from being hauled before or in the act of spawning, and for such a wasteful purpose as that of manuring the land. The total absence of bait will at once ruin the fisheries in a most direct manner; the immediate effects of which must be the ruin, starvation, and abandonment of their present residence, on the part of thousands; and to such a state the affairs of the Newfoundland fisheries, including its very vitality as a colony, seem rapidly drifting.