

limited a measure, in effecting this object, our intentions in founding the Association will be fulfilled, and our humble efforts for the promotion of Science and the elevation of our native land will be abundantly rewarded.

In conclusion, I may add that the Society embraces in the field of its observations not only the Province of Nova Scotia, but also Prince Edward Island, Newfoundland, Labrador, and the Bermuda's localities, to which the scientific observer has hitherto paid but slight attention.

ART. I.—*On the common Herring (Clupea elongata)*. By J. BERNARD
GILPIN, A. B., M. D., M. R. C. S.

[Read Feb. 2, 1863.]

FROM five specimens before me, — one taken at Red-bay, Labrador; the second, from the "Banks," ten miles seaward; the third, from Halifax harbour; the fourth, from Annapolis Royal, Bay of Fundy; and the fifth from a cod's stomach, caught last winter, upon the Banks, I may say they are identical, except in teeth and size; they all may be called slender: the head about one-sixth the entire length, the lips dusky black, the opercles the same, and fins alike in relative position with each other, and in number of rays, and the belly slightly carinated. They all dip forward when held by the dorsal fin, and they all correspond in colour, as far as may be judged from the specimens more or less denuded of their scales, and part preserved in salt, and part in alcohol. As regards teeth, they all had teeth upon the tongue and vomer, except the one from the cod's stomach, which had none upon the tongue; but the Labrador specimens had none upon the lower jaw, the others having them there. J. M. JONES, Esq., showed me a specimen of a Newfoundland herring, with teeth upon vomer, tongue, and both upper and lower jaws. On the head of another Labrador specimen, boiled and taken apart, I found teeth only on the vomer; under a strong glass the lower maxillary was slightly serrated. In size, the Labrador measures 15 inches; the Bank, 13½; the Shore, 11; the Annapolis, or Digby herring, 7 to 8; and that taken from the cod, about 5 inches. Notwithstanding the difference in size, and in teeth, which last I shall again refer to, I can only consider them of one species.

The description of an ordinary herring taken from the market at Halifax, will serve as a type for all:

"Body, long and slender; head, one-sixth the length; 2 pectoral, 1 dorsal, 2 ventral, and one anal fin. The caudal deeply cleft. The dorsal

sub-quadrate, anterior rays highest, the body covered by scales so deciduous that one fancies they owe their adherence to life; color of upper third, dark blue, with faint reflections; lower two-thirds, silvery white, a decided line of demarkation between the colors; opercles, with a yellowish tinge and violet reflections; lower lip longer than upper, both dusky black, a few dark spots of blue along the sides; belly sharp, carinated rather than serrated, sharper in the young, showing very plain in the spawn-bearing female,—irides silvery,—size, 10 to 16 inches—teeth, constant on tongue and vomer; wanting, more or less, on jaws. Fin rays, P. 16, V. 8, D. 18. Though these differ in some individuals.”

Those taken on the Banks, ten miles seaward, are larger, go in separate runs, are fished for with larger meshes, and are sold as distinct fish in market from the shore herring.

During winter small specimens are frequently taken from the cods' stomach caught upon the Banks, and there can be no doubt they might be obtained if looked for during this season in any of our land-locked bays, carrying 50 or 60 fathoms, as they are at Cape Breton and Fortune Bay, Nfl'd. They approach the Nova Scotia shore early in March, at first very stragglingly and very lean; I have myself seen spawn fish in May. The fishermen tell me they find them at all seasons. As the summer advances they become fat. During the latter part of August they are in their prime, and are preparing to spawn—which operation takes place in September and October.

The warm, sandy coves, and still land-locked bays, about Sambro, Eastern Passage, Shelburne and Prospect, are favorite resorts, in from 5 to 10 fathoms. Here the fish may be seen lying upon the bottom in thousands. They may be measured by the acre. The sea is white and turbid with the spawn, and ropes, in passing through it, become as large as small hawsers. The cod and his varieties approach to feed upon it, whilst quantities are cast upon the beaches by the sea.

Before the long cold nights and stormy seas of November arrive, the herring have left the surface to reappear the following spring. In New Brunswick, according to PERLEY, the great spawning ground is Southern Head, Grand Manan. Here the herring commence in July and end in October. Along the Bay of Fundy a run of large, thin, spawn-bearing herring appear about the middle of May. About the last of June a separate run of small barren herring appear in Digby basin from the Bay of Fundy. These are fat, and about 1 in 12 have spawn, and in August immense numbers of fry appear on the shoal bars of the Basin, doubtless the spawn deposited in early spring. PERLEY reports that spawn is found in the Bay of Fundy in June.

Thus we arrive at a very curious fact, that our herring, though of the

same species, spawn some in June and others in October. At Labrador, Newfoundland and the Magdalen Islands, April and May are the spawning months,—allowing from six to ten weeks for the period of hatching, from the analogy of other fish whose periods we do know, then one run must be produced during the stormy seasons of November and December, after the fish have long left the surface, whilst a second more highly favored run commences its existence during the warm tranquil season of midsummer, upon the shallow beaches and warm shoals of the basins emptying into the Bay of Fundy.

Thus, commencing life under such different auspices, it would seem that each hatching or “run” keep by themselves, at least during their early life, and revisit annually their breeding places. Self-protection keeps them from the older ones, who prey upon them equally as the cod. The most intelligent observers informed PERLEY, that it takes three years to perfect their growth, and that they spawn the second year.

Thus we have a small run of 7 to 9 inches of the second year, about one in twelve spawning, revisiting the shallow basins of the great Bay of Fundy (which run reappears as the famous Digby herring in all the markets of the world), during July and August, and then retiring from the surface. The shore run of the Atlantic coast of Nova Scotia, about 11 inches in size, appearing in early March, and spawning in September and October; and large Labrador, Bank, or Grand Manan run appearing in March, and spawning in April, May and June. All seek the deep soundings in winter. At Fortune Bay, Nf'd., they are taken in nets during mid-winter, beneath the ice. Here the soundings are 70 or 80 fathoms, the water land-locked and still. The fishermen suppose the frozen surface makes the sea dark and apparently more secure for them. The return of spring warming the water, and the summer seas, seems to be the signal for this vast army, each in its separate brigade, to move upward to the surface and onward along our coasts, to fatten in the rolling pastures of the ocean, and prompted by instinct, whose causes are unknown to us, but irresistible to them, to shed their spawn now upon the ice-washed Labrador in early Spring; now upon the warm sand bars of the Digby basin; or, lastly, upon the shoals of Grand Manan, or Prospect Bay, warmed by the summer heats and autumnal sun. The pursuit of food must be another great cause for their annual migrations. A close observation of the food found in the stomachs of herring at different seasons would do much in discovering a general rule for the proverbial uncertainty and caprice of their movements.

Upon the authority of YARBELL, who quotes DR. M'NEIL, I have stated

the larger ones prey upon the smaller, but our fishermen deny the fact of finding young herring in the stomach of larger ones. The surface of the sea about our coasts in Spring and Summer is fairly alive with the medusæ, and our shores are covered in winrows with small shrimps, called brit and herring bait, one cannot but fancy that these rich gelatinous masses must allure him to the surface.

To sum up all that I have obtained within regard to our herring :

1. It is of one species.

2. With regard to teeth, those upon the tongue and vomer seem constant in all ; the larger specimens very rarely upon the lower lip ; the smaller usually having them there. Generalising from examining some hundred specimens, I would say the teeth became obliterated by age, and that the more readily as they have no bony origin like the genus *Salmo*.

3. Some spawn in May and June, others as late as October. This very remarkable fact, causing suggestions of how far it modifies the growth and habits of each run, stands so far without any reason.

4. These separate runs, hatched under very different circumstances, and necessarily of different age and size, revisit their old haunts, spawn the second year, and are three years in attaining adult size, and probably by that time become absorbed in the runs of older fish.

5. That great and small of all ages approach the surface, and the land in spring, and disappear in autumn. The warm seas and calm weather of the summer being necessary for their spawning and their food,—that as far as regards our coasts their only migration is from the deep soundings of the sea banks to the coasts and back again,—though I by no means assert that in higher latitudes they do not perform greater migrations. These migrations must cause a total change in the food, the temperature, respiration and external pressure during winter and summer.

Following DEKAY and STORER, I have considered it a distinct species, from the Harenga, or English, though RICHARDSON calls his taken at Bathurst inlet, Harenga ; and YARRELL'S description of the Harenga seems to vary but little from ours.

We have seen that our herring passes his existence alternately in a state of rest in deep soundings, (this rest not so deep though, as from recent facts, we infer the mackerel does, who, it would appear, becomes torpid and blind during winter, like certain Batrachians whom he resembles in his color), and of a highly, aerated and lively existence upon the surface. During this state he presents himself as food for man who employs his arts in securing this rich bounty, spread as it were at his

door. This brings us insensibly to the history of our **HERRING FISHERY.**

As early as March, herring are taken in nets on our coast, but the fish are so straggling and the seas so boisterous, that except for bait, fishing does not commence till May. In this month a run of large fat herring are taken in nets upon the Banks, which lie 10 or 15 miles seaward, and carry about 75 fathoms water. A net 30 fathoms long and 3 deep is passed from the stern of a boat at anchor. The free end drifts with the tide, held to the surface by cork floats, sometimes the tides carry the net down 15 fathoms in a slanting direction,—thus drifting from night to morning,—the net is overhauled, and from 20 to 100 dozen is the ordinary catch. It is very evident from the distance from shore, the need of calm weather for the boats and nets, as well as for the fish who are very susceptible to rough seas, this fishing must be precarious. The boats are stout, weatherly keel boats, with a half deck, from 5 to 15 tons, carrying a gib, fore and mainsail, and usually called second class fishermen, when entered at a regatta.

The “in shore run,” a fish of smaller size, are taken in nets set to a buoy, instead of a boat, the free end drifting to the tide. These nets are often moored from one buoy to another, to preserve a permanent position across a creek or small bay. In these various ways herring are taken by the shore population of the whole Atlantic and Gulf coast of Nova Scotia, from the Bay of Fundy to Cumberland. The immense tides of the Bay of Fundy, leaving long flats and sand bars at low tide, and the steep trap formation of its southern coast line have singularly altered the character of the fishing. Here the drift-net fishing obtains, boats and nets drifting for miles upon the flow and returning upon the ebb, the nets twisted and coiled into apparently impossible masses. The shores of the trap formation being flat tables of trap reaching plane after plane into the sea, with no crevice to hold a stake or anchor a buoy, the fishermen procure stout spruce fir trees, and lopping off the branches, leave the long lateral roots attached to them. These, they place upright in rows upon the bare rock, and pile heavy stones upon the roots as ballast, stretching their nets between them. Entirely submerged at flood, at ebb they are left high and dry, and often loaded down with fish caught by the gills in the meshes of the net. These nets are usually set for a large, lean spring herring, running for the flats in early spring to spawn. This method of fishing obtains throughout the whole trap district of the Province bordering upon the Bay of Fundy. With the exception of Briar and Long Islands, about whose coves nestle a hardy race of fishermen,

whose red-tan sails are seen from Mount Desert to Cape Sable; and in all weathers, the population of these districts are farmers, rather than fishermen, tilling the southern slopes of the North Mountain, and employing their spare time in procuring their winter supply, or a few boxes of smoked herring for barter. Where unopposed by the stern barrier of trap-rock, the great Bay pours its tide-waters up St. Mary's, or through the Digby Gut, into the Annapolis Basin, or sweeps up the Avon and Horton estuaries, or stays its flood on the Cumberland marshes, Minas, Basin, or the Shubenacadie; there, a rural population, dwelling on the borders of those streams and basins, hail with delight the periodically returning wealth teeming in its muddy waters. Smooth seas, sandy bars, and mud flats dry at ebb, replace trap-dyke and boisterous waves. The fisheries are curiously modified by these physical changes. Flats and punts take the place of keel-boats and whalers. Young fir-trees are driven into the soft sand, dry at ebb. Standing eight feet high, their green branches interlacing, they are formed into circles or L's. The retreating tide, which, in its flow, swept some 30 feet above them, leaves a teeming mass of helpless fish stranded in the shallow pools within their circle. This brush weir-fishing, as it is termed, less rude than the rugged stone-loaded stakes of the trap coast, yet is inartistic enough to provoke criticism in its waste of life, fish too small for use being included in the catch; yet we must recollect that it requires capital and population to be humane, and that these fir-trees, renewed yearly, are the cheapest and only material at hand for a population, with no surplus time or capital. In these weirs are taken the Digby or smoked herring, known so well in all markets.

The returns for the year 1861, are 190,000 bbls. of pickled, and 35,000 smoked herring, for the Province; but the number sold as fresh, in the market at Halifax, and those cured by the families living on the sea-board, for their own use, as well by those in the interior, who may be met in strings of 20 or 30 waggons, returning laden with fresh or round fish, as they are technically called, to be cured at home, would, at least, give 50,000 bbls. more.

In this paper I have endeavoured to prove by facts seen myself, by others gleaned from old and experienced fishermen, and from the best American writers—DEKAY and STORER,—and from the very able report of the late MOSES PERLEY, Esq., (whose loss, as a gentleman and naturalist, to the Lower Provinces, I may be allowed here to deplore,) that our common herring makes no long migrations as those of the British Isles are said to: that he passes his winter either in our deep bays, ice-locked, or in deep sea soundings: that the summer heats and smooth seas bring him

to the surface and to the land, in separate runs of different aged fish, caused by his spawning in early spring and autumn. I say endeavoured to prove, for I am conscious many of the facts need more proof and closer investigation, and may turn out not facts, after all. I have merely hinted at the different existences of winter under deep pressure, half torpid, perhaps beneath 70 fathoms, and his summer life on the surface—of the different times of spawning, as yet without reasons for so singular a fact, modifying, as it must, the early life of the fry. I do not advance any of these facts as new, but rather as newly put together; and I have given a slight sketch how, out at sea, he is waylaid by the fishermen, conducted in shore and beset with drift and set nets, fir-tree stakes and pine brush weirs, by a rural population intent on gathering their rich sea harvest to their homes.

The following letter of MR. BENJAMIN HARDY, on the Digby Herring: its food and habits; its three separate runs; and his opinion that six years is the period of its growth is given, as it well deserves entire, though differing from other observers:—

MR. JONES,—*Dear Sir,*—

I have not much to communicate on the subject named by you, but will give you what little information that I am in possession of, as regards the Digby Herring.

The first herrings that make their appearance in the Basin, come the last of March and first of April; about the first of May they begin to spawn, and by the 20th of May they have mostly left the Harbour. About the time they leave, a small sized run of herrings come in, they stop but a short time, about two weeks, and then leave. From the middle of June to the first of July the regular school come in—they stop generally about six weeks, sometimes longer, and then leave. There are a very few spawn fish amongst the last named; of the second there are none; the first are nearly all spawn, or what is called melt fish,—which means male and female. The spawn, or young herring, grow rapidly: I think, the first year about four inches, as near as I can ascertain. I think, in about six years they attain to what is called the large Digby herrings. Their food is a small insect, just discernable with the naked eye, which I think generally keeps near the surface of the water. Their manner of taking them is by swimming along with their mouth open, and catching them, and then emitting the water through their gills. They are timorous; thunder drives them into deep water. They follow their prey close in shore in the night, but retire as soon as broad day light appears, and then return the next night, and so on. I have heard them jumping and skipping about, till about half an hour before the weir would shew out of the water, and then retire just outside of the weir, and there stay and feed awhile. When they go over the weir, as before named, there would be about three feet of water over the

weir. I have seen them, just at night, come within about 300 feet of the weir, and stay there, not coming nearer that night; their line would be, in some places, straight, and others, crooked, just as our weir's were shaped, though there were from 6 to 8 feet water over the weirs.

I do not think I have anything more that would be of service to you.

I remain, Dear Sir, Yours,

BENJAMIN HARDY.

Smith's Cove, November 26, 1861.

ART. II.—*Nocturnal life of animals in the Forest.* By Capt. C. C. HARDY, Royal Artillery.

[Read Feb. 2, 1863.]

IN one of the most attractive of the works of HUMBOLDT, entitled "*Views of Nature*"—a collection of thoughts and personal observations in connection with some of the noblest objects of nature in different parts of the world visited by the great naturalist—appears an interesting fragment called "The nocturnal life of animals in the primeval forest," suggesting to me comparative remarks on animal life in our own sombre woodlands.

The great writer in the commencement of this chapter describes the scene of his observations, coupled with some decisive remarks of his own, on the nature of a primeval forest, which I think it well to introduce here. It is the boundless forest district which, in the torrid zone of South America, connects the river basins of the Orinoco and the Amazon. "This region," says HUMBOLDT, "deserves, in the strictest sense of the term, to be called a primeval forest—a term that in recent times has been so frequently misapplied. Primeval (or primitive) as applied to a forest, a nation, or a period of time, is a word of rather indefinite signification and generally but of relative import. If every wild forest, densely covered with trees, on which man has never laid his destroying hand is to be regarded as a primitive forest, then the phenomenon is common to many parts, both of the temperate and the frigid zones; if, however, this character consists in impenetrability, through which it is impossible to clear with the axe between trees measuring from 8 to 12 feet in diameter a path of any length, primitive forests belong exclusively to tropical regions. This impenetrability is by no means, as is often erroneously supposed in Europe, *always* occasioned by the interlaced climbing 'lianes' or creeping plants, for these often constitute but a very small