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THE

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AND

NATURALIST

A
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VOL. III.
No. 8.
1883.

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THE CANADIAN SPORTSMAN AND NATURALIST.

No. 8.

MONTREAL, AUGUST, 1883.

Vol. III.

WILLIAM COUPER, Editor.

PARASITES ON TELEA POLYPHEMUS.

In one of the popular papers on Entomology by my esteemed friend Mr. W. Saunders of London, Ontario,* he says:—"This insect (*T. polyphemus*) is subject to the attack of many foes, particularly while in the larval state. A large number fall a prey to insectivorous birds, and they also have insect enemies. A large ichneumonidly *Ophion marcurum*, is a special and dangerous foe. This active creature may often be seen in summer on the wing, searching among the leaves of shrubs and trees for her prey. When found, she watches her opportunity, and places quickly upon the skin of her victim, a small oval white egg, securely fastened by a small quantity of glutinous substance attached to it. This is repeated until eight or ten eggs are placed, which in a few days hatch, when the tiny worms pierce through the skin of the caterpillar and begin to feed on the fatty portions within. The *polyphemus* caterpillar continues to feed and grow, and usually lives long enough to make its cocoon, when consumed by the parasites, it dies; in the meantime the ichneumon, having completed their growth, change to chrysalides within the cocoon, and the following summer, in place of the handsome moth, there issues a crop of ichneumon flies." The italics are mine. The insect above described and illustrated (fig. 11, Rep. 1882) by Mr. Saunders, is not correct. The matter refers to a much smaller one belonging to another genus (*Cryptus nuncius*, Sny.) the most common and destructive parasite on *T. polyphemus*. *Ophion marcurum* deposits but one egg on a caterpillar, and as soon as the parasite devours it, the *Ophion* spins a large oblong dark cocoon within that formed by the caterpillar of *polyphemus*. Cocoons of this moth which I have collected last season, contained about thirty specimens of *Cryptus nuncius* of both sexes, and I also found an undetermined species of *Hemiteles* inclosed in the same cocoon; the latter may be a parasite on *Cryptus*. The species of *Ophion* occurring in Canada, are yet to be studied.—C.

* Report of the Entomological Society of Ontario for the year 1882, page 17.

AMERICAN ORNITHOLOGISTS' UNION.

We have received the following circular, signed by J. A. Allen, Editor of the *Nuttall Bulletin*; Elliott Coues, Assoc-Editor of the *Nuttall Bulletin* and William Brewster, President of the Nuttall Club, calling "a Convention of American Ornithologists, to be held in New York City, beginning on September 26th, 1883, for the purpose of founding an AMERICAN ORNITHOLOGISTS' UNION, upon a basis similar to that of the 'British Ornithologists' Union.'

"The object of the Union will be the promotion of social and scientific intercourse between American Ornithologists, and their co-operation in whatever may tend to the advancement of Ornithology in North America. A special object, which it is expected will at once engage the attention of the Union, will be the revision of the current lists of North American Birds, to the end of adopting a uniform system of classification and nomenclature, based on the views of a majority of the Union, and carrying the authority of the Union. Other important matters will be doubtless presented for consideration at the first meeting.

"It is proposed to hold meetings at least once annually, at such times and places as may be hereafter determined, for the reading of papers, the discussion of such matters as may be brought before the Union, and the transaction of the usual business of a scientific society.

"Those who attend the first meeting will be considered *ipso facto* Founders of the AMERICAN ORNITHOLOGISTS' UNION. Active and Corresponding Members may be elected in due course after organization of the Union, under such rules as may be established for increase of membership. Details of organization will be considered at the first meeting."

Canadian Ornithologists who propose to attend the first meeting, please so signify to any one of the above gentlemen.

It gives us pleasure to record the fact that our ornithological neighbours of Cambridge and Washington have decided to form a Union similar to that which exists in Great Britain. Many important matters connected with

American Ornithology will be thoroughly arranged and settled forever by the majority of the members of this Union. Two current lists of N. A. Birds cannot be much longer extant, therefore, it is necessary that a uniform official system of classification and nomenclature should exist which would doubtless be recognized and adopted by every ornithological student in North America. We wish success to this Union; its promoters are hosts in themselves—a sufficient guarantee that their object will be attained.—C.

A VALUABLE DONATION.

Parties visiting the collections of the Natural History Society of Montreal will doubtless admire a large English made lighted case of British *Birds*, comprising pairs of each species. They are tastefully mounted on artificial rock by Mr. Reuben Webster, taxidermist, Sheffield. The birds are life-like, and form a very valuable and attractive feature to the Society's Ornithological collection. Those interested should examine this group of British partridge and grouse. Among the latter are a pair of the rare capercaillie in very natural positions. They were presented by A. A. Jowitt, Esq., senior partner in the firm of Messrs. T. Jowitt & Sons of Sheffield, England, through his friends Messrs. Frothingham and Workman of this city. This donation, we are sure, will be appreciated not only by the members of the Society but by all lovers of natural history.—C.

ORNITHOLOGICAL NOTES.

DEAR SIR—It is a repeated pleasure to me as each succeeding number of the *Canadian Sportsman and Naturalist* comes to hand, bringing information new and interesting, concerning the lovely creatures which form the subjects of our favourite study. I feel my inability to write anything that will ornament the pages of your magazine, while I read with delight the articles from pens of able authors, as I think do all those who are in search of a knowledge of the life histories of the quadrupeds, birds, &c., of our country. My sincere desire in sending a letter for publication is to help to increase the knowledge of natural history, and if anything I write is new information to my brother Ornithologists and Oologists, I shall be greatly gratified. Early on the morning of May 26th, 1879, I started into the fields and woods of our neighbourhood in quest of desirable specimens

of all kinds. When I started the sun had just risen brightly and all vegetation was yet moist with dew. Soon after entering a field about half a mile from our house, I came amongst some brier and red raspberry bushes scattered about. After walking a little way a female golden-winged warbler *Helminthophaga chrysoptera* started with sharp chipping notes from within a yard of my feet. Upon glancing down, I saw what at a short distance appeared to be a bunch of red leaves sunk in the grass at the roots of three little raspberry bushes. No other tree leaves were on the ground near the nest, which showed clearly that the birds had carried all the materials which formed their little house. The nest was very bulky, considering the small size of the builder. Fully two-thirds of the leaves fell from the outside of the nest before I reached home with it. The four eggs and also one of the cowbird which it contained were fresh. This is the nest and eggs which I sent to you to be described.* The two damaged eggs were broken by the box containing them accidentally falling from a shelf. Before taking the prize, I stood by and watched the actions of the parent birds. The female fluttered from one dewy bush to another for a few minutes, all the time uttering rapidly her note of alarm, when suddenly her mate appeared; but he, heartless little creature, instead of joining in the defence, darted at the female and fiercely pursued her hither and thither, regardless of her cries of anguish and grief, until both were lost to view. In a few moments the female again returned and behaved exactly as before. She would flutter along as if wounded, alighting on a bush within three or four yards of me and instantly leaving it again, moving away as she came, seemingly anxious to entice me in pursuit of her, instinctively endeavouring to lead me away from the spot where the objects of her affection were laid. So beseeching were the actions of this tiny bird that I had to harden my heart before I could take the nest away. I reasoned thus:—Perhaps if I leave this nest, some carnivorous animal or bird which the Creator has formed with egg devouring propensities, will find it out and destroy them. The bird would not forget her loss a bit sooner than if I took

*The eggs, four in number, do not differ in size and shape from others of this family. The average measurements are .65 50-100, colour white, ground marked with reddish brown spots and blotches of different shades, the larger ends being most thickly marked. The markings are very irregular in size, shade and distribution only one of the eggs having the small end immaculate.

them, and the valuable specimens would be lost to science; besides are not all the objects of nature created for the happiness, pleasure, and benefit of man. The ewe has as much affection for her lamb as a wild bird for her nest and eggs, but what man considers it cruel to kill the lamb when it is yet barely old enough for food? About the end of May, 1879, I found two more nests of the golden-winged warbler in a willow swamp. One nest was pulled out of the place where it was built and apparently had been robbed by some depredating animal. The other was to all appearance a completed nest without eggs. A few days later it contained one egg. A heavy rain storm occurred on June 6th; I visited the nest next day and found it half submerged; it contained two eggs which I took. I never saw the parent birds near this nest, but no person can mistake one after once knowing them; they are so different from that of any other bird, and the four nests I have seen are all exactly similar in material, construction, and situation. I have seen the young of this species late in June following their parents and clamoring for food, but found no more of their nests until this season, although the bird is quite common here. Between the willow swamp in which the two last described nests were found and the woods is a rough field containing stumps and many briars. A friend named H. P. Attwater and I were hunting in the field one day last May; I saw a pair of these warblers, and wanting a female specimen, I fired at this one with a charge of dust shot from my five shot 22 calibre repeating gun which I use for small birds. Unaccountably I missed the bird, but while watching to ascertain if it was wounded, I concluded by its actions that it had a nest near by, but all search just there proved fruitless. I had told Mr. Attwater that the nest would appear like a large ball of yellow leaves at the root of some little bush and quite exposed. We had separated and started towards the willows. After proceeding about sixty yards, my friend called me saying he had found the nest; it was completed but contained no eggs. We both decided to shoot at no more golden-wings in that locality until this bird laid her eggs. On June 3rd, the nest contained two eggs of this warbler and two of the cowbird, these last I removed, otherwise the bird would have laid no more of her own in the nest. June 6th, I found her sitting on four eggs; she allowed me to almost catch her before leaving

the nest. How pretty she looked sunk in the deep nest; her bill and tail pointing upward. The yellow of the crown and wing markings were beautifully blended with its pure blue gray plume. After leaving the nest she behaved similar to the female of the first nest described, except that the male did not appear. None of these nests were built with any attempt at concealment.

Yours faithfully,
Hyde Park, Ont. JOHN A. MORDEX.

INTERNATIONAL FISHERIES EXHIBITION, LONDON 1883.

CONFERENCE ON JUNE 21, 1883.

The Marquis of Exeter in the chair said "the Conference would to-day be invited to give their attention to another branch of the great question of our fisheries, one which, though nearer home, and perhaps less exciting—for it involved no danger to either life or limb—was of great importance, and to many persons formed a most interesting pursuit. He alluded to the attempts which had been made to increase the value of our fisheries by artificial breeding and by importation; and they were much favoured in having the subject opened with a paper by Sir James G. Maitland, Bart., who had devoted a great deal of time and energy to fish culture."

We insert a portion of Sir James G. Maitland's paper on

"THE CULTURE OF SALMONIDÆ AND THE ACCLIMATIZATION OF FRESHWATER FISH.

The culture of Salmonidæ properly understood embraces not only their artificial propagation, but also the production of their food; the regulation of their ascent to their spawning beds and of their descent to their feeding grounds; the manner of their capture and their rapid and economic conveyance to market; just as much as the culture of corn is understood to mean not merely the sowing, but every step from the preparation of the seed bed to the marketing of the harvest.

The acclimatization of freshwater fish I will consider with special reference to the Salmonidæ, and attempt to foreshadow the results of the importation of some of the best known foreign species.

After describing the artificial propagation of Salmonidæ, the hatching house; water, its temperature, and the apparatus employed in hatching salmon, Sir J. G. Maitland says:—

"I will now consider the Hatchery as a

factor in the cultivation of migratory Salmonidae, restricting myself for the present to those species placed by Dr. Gunther in the group Salmones either with a wide geographical range, as *salar*, *trutta*, and *combuscus*, or limited to Great Britain and Ireland, as *brochippomo* and *galliscensis*, merely pointing out that while touching on the general conditions common to the increase of the above named species, the extermination of the Bull Trout on the Tweed and the Sea Trout on the Forth forms a very serious point to discuss in treating of the culture of the Salmon, and that the best results can only be obtained by the careful protection and artificial production of the species best suited to each particular district. The objects here are to increase Salmones whose pastures are in the sea, and whose nurseries are in the rivers. The size of the river has no fixed relation to the number and weight of fish caught in its estuary and contiguous seaboard, and if a very large number of smolts were annually turned in immediately above the tidal waters the stock of Salmones would be increased by a proportion of the number turned in, fixed only by the conditions of food and of natural enemies in the estuary and adjoining sea. I do not mean to say for an instant that all the fish reaching maturity would return or attempt to return to the mouth of the river in which they were liberated as smolts, but I think that the evidence tends to show that most of them would do so. The question at this point resolves itself into a matter of pounds, shillings, and pence. Salmon smolts of two years old can now be raised at less than sixpence apiece, and Salmon in the estuary on their return are probably worth on an average five shillings each; rent and the expense of nets, wages, and rates probably add another five shillings, of course if there was a much increased take the proportion to each fish would be less and all the fish that return to the estuary are not caught, but it will be sufficient for our purpose if we assume that a Salmon on his road to destruction is worth while still free five shillings two years after it has been liberated as a smolt; if, therefore, 10 per cent. of the smolts turned in are caught two years afterwards no profit will result, for the increase would only equal the first cost, and the interest on the outlay would be nil. The old idea in this country was to turn out young fish big enough (and big enough does not necessarily mean sufficiently educated) to

take care of themselves. The results from the Stormontfield experiment at first, when everything was new and in working order, were sufficiently marked; but they have not been permanent, and if pisciculture had achieved no more, Salmon culture, in this country at least, would be an interesting exotic, with magnificent results in some cases, far oftener with none; but fortunately it is not necessary to depend on two-year-old smolts for the future increase of our Salmon fisheries. Mr. Spencer Baird, who I am glad to see so ably represented at this Exhibition, in a letter to the Commission of Fisheries of the Dominion of Canada, refers to the magnificent increase of Salmon in California, an increase in five years from five to fifteen million pound weight in one river, an expenditure of merely two million Salmon fry per annum, which in this country would entail less than a thousand a year after making a full allowance for all expenses. But stocking with fry or with smolts is but a small portion of the great question; parts of some of our Salmon rivers are too fouled by pollution to rear fry after they are liberated; it is only by adapting the means to the end that Salmon culture can reach the highest degree of success. In many parts of the country where the pollution is only moderate, we can meet it by taking advantage of the pure water above or by turning smolts in directly above the tidal waters, but I am certain the surest remedy for pollution is to make pure water pay. It is easier to shake an industry to its foundation than to put something better in its place, and if, through fish culture, pure streams and more plentiful food would displace the black sewers of our midlands without the intervention of harassing legislation, fish culturists will not have laboured in vain. The Hatchery can supply eyed ova for the redds and fry for the shallows, and ponds should be constructed near the Hatching-house for yearlings, but where it is necessary to stock with smolts ponds for the purpose must be constructed near the head of the estuary, as the carriage of two-year-old sunlets is neither easy nor economical. The time that intervenes between the smolt just entering the tidal water and its first return towards the river varies considerably on the east coast of Scotland; two summers may sometimes intervene, and we must be careful not to assume that all fish return or attempt to return in the grilse stage, for I have found in the case of the Lochleven

Trout only a small proportion spawn in the corresponding state. But whatever the time is we know that his growth is most rapid, and his sea food must be studied before much further advance can be made in Salmon culture; garvies and young herring probably form a great portion of his food, but whatever it be his paths in the sea are as well-marked, and to some fishermen, alas, as well known, as in the river. Trammels in the sea are successfully dropped by east coast fishing boats on their way out and lifted on their return. The food of Salmon at sea may possibly be influenced by the modes of fishing. Boats year by year go farther north and farther to sea for their Herrings; the fishing grounds are slowly but surely receding from the shore. It is too early yet to foreshadow the results, it may be that food inshore grows more plentiful now that the herrings are further out, or it may be that the herrings are further out because the inshore food has decreased, it may be, and to a certain extent it must be, a matter of changing currents and temperature; but what I wish to impress in this paper is that the sea food of the migratory Salmones forms a very necessary preliminary study to the great question of Salmon culture. A diagram expressing the art of Salmon culture would contain no broad, hard, rectangular lines, no vivid colouring easy to be understood, but flowing curves traced by the ever varying intensity of the now few now many circumstances whose combination constitute the problem of the migratory Salmones. Temperature and food are here, as with the nonmigratory species, the principal factors. The mode of captures and obstructions in rivers also weigh heavily against the increase of Salmon. But when one of our watersheds is sufficiently artificially stocked so that the advantages of the process are brought clearly and directly before the public an alteration in the modes of legal capture will assuredly follow. Of obstructions in the river it is difficult to treat; many upper proprietors prefer good Trout fishing to the pleasure of dragging about a few kelts in spring, and it cannot be too strongly impressed that Trout are most destructive to Salmon spawn, and that Salmon in their turn are after spawning most destructive to Trout. I am aware it is very commonly held that Salmon do not feed in fresh water, probably because in common with all large-ovated Salmonidae the ovaries for from two to eight weeks completely fill the cavity of the

abdomen, and should the fish yield to hunger during this time the freshly swallowed food causes the immediate extrusion of the ova. If Salmon never fed in fresh water a well-mended kelt would be a superfluous expression in the parlance of fishermen. The deduction as to kelts in certain parts of the rivers is obvious. Obstructions in the river will interfere little with young fish artificially bred descending to the sea, although they are often fatal to the ascent of spawning fish. Returning to the artificial propagation of salmon, the selection of breeders is very important, eggs from young fish being far smaller in size and the fry hatched from them more delicate than is the case with ova spawned from mature breeders. I think it therefore necessary that the Salmon should be caught and selected as soon as the rod fishing closes, as by selecting the best hen fish the future stock of the water will be much improved. The non-migratory Salmones in this country are classed by Doctor Gunther under the following species—*S. fario*; *ferox*; *Gilleron nigripinnis*; *oreocensis* and *lencensis*, but probably with the exception of the *S. lencensis*, which more nearly approaches a marine form, these are all more or less permanent varieties of *fario*; and their fry, at least those produced under artificial conditions, are more easily reared than the fry of the migratory species. Their cultivation may be said to consist in the selection of the oldest females for breeding purposes, in the artificial incubation of the ova and the rearing of the fry; beyond this their culture resolves itself into a question of habitat and food, of habitat by choosing the species or variety best suited to the ends in view, and of food, for it is only by increasing the food supply in the water that the heaviest weight per acre and the most delicate quality of the flesh can be produced. The cultivation of the food supply in fresh water is effected by the reduction of coarse consumers of food who come in competition with the Salmones, by the cultivation, introduction, and acclimatization of fish whose value as food for Salmones is greater than the value of the sustenance they themselves derive from the water, as, for instance, the Char of Loch Rannoch, who subsist almost entirely on the *daphne pulex*. The smelt, and some of the white fish also, may be the link in the chain which will bind the land-locked salmon to our northern lakes, and prove a very disturbing weight in the scales on the side of the upper proprietors on waters now tenanted by

the migratory Salmonidae. I have only just commenced the construction of a botanical pond to enable me to study water plants as herbage for mollusca, shelter for *graminæ*, and the natural production of myriads, of *outcrostried*. On the sea-shore of the Western Highlands if the kelp be not regularly cut, or in other words rudely cultivated, for cutting is most assuredly a process in cultivation, the whelks and bukies decrease on account of the want of the young tender shoots of seaweed, and the fishing in the neighbourhood is sensibly diminished. From this it is easy to understand what a great future may be opened out by the systematic culture of water plants in our inland waters. Food limits the culture of non-migratory Salmonidae, therefore our study must be where to grow it, how to grow it, when to grow it, and what to grow. In lakes some shoal swimming fish is essential to the growth of the large species of non-migrating Salmonidae. Since the Char have disappeared from Lochleven in the first quarter of the present century, the ten pound Trout in that loch have passed into the realms of romance. Acclimatization here steps in: either the freshwater Smelt of America or our own *Osmerus eperhantus*, which I have successfully hatched and am now rearing in fresh water, if introduced into a Highland loch, for instance, Loch Tay, would enable it to carry a very heavy crop of some of the larger inland species, for instance, the landlocked Salmon of Loch Werner in Sweden, or the *S. schuys* of America; but we must not conclude that the acclimatization of every species is in all cases desirable, for if the Black Bass were introduced into the Tay, and the Pike Perch allowed to sport wherever he listed, even were the sport with the new comers at all commensurate with the highly-coloured descriptions which we have read, it will hardly compensate for a troutless river, and a salmonless estuary. There may be parts of the country where the Pike Perch would form a desirable addition to the local fauna, but I cannot conceive the Black Bass, who is only at his best in waters essentially fitted for Salmonidae, to be other than a most dangerous intruder. The Colorado beetle boasts, I believe, of a special Act of Parliament, and I do think the introduction of strange and dangerous species of fish should only be attempted under State control. The *S. schuys*, should he retain in this country his non-migratory instincts, would probably be a splendid fish for the

Thames, and if used in the upper parts of the Severn would introduce a new and important element in the question of the respective rights of upper and lower proprietors. It is not for the public good that this should be done, for this fish would probably be able to hold the spawning grounds from all comers, and a rapid decrease of the migratory species would be the result, and if it be urged that a lake species would not localize itself to the upper portions of our larger rivers, still it crossed with a British variety, such as *S. leucostus*, it in all probability would do so. The acclimatization of the Corregoni, of which there are many species, all of which can be easily transported as alevins in my opinion, only to be considered as a factor in the production of food for more valuable Salmonidae. If we had the great American lakes, no doubt the large white fish of Canada would, if introduced, form a valuable article of popular food, but our space in this island is too confined to enable us to deal with other than the best we can have, and I doubt, except in a few solitary cases, if any of the Corregoni fall under this head."

MR. WILMOT (Commissioner for Canada) said he rose with great pleasure to move a vote of thanks to Sir James Maitland for the very lucid and instructive paper he had read, for he felt satisfied that much benefit would be derived from it. He was a deep lover of the science of fish culture, believing it to be one of the means by which the population of the earth hereafter would derive much benefit in the way of food and wealth. It was well known that the waters of almost every country which had been largely inhabited had become very scarce of fish, but this result was brought by the greed and avarice of mankind almost entirely, not in consequence of the predatory habits of other fish which frequented the same waters. In any new country an abundance of fish was to be found in the rivers and waters, showing that the balance of nature was evidently correct; that though fish fed on fish, they did not exterminate one another; but the moment man stepped in with his engines of destruction, the fish were reduced to such an extent that this great International Exhibition had been established for the purpose of devising means whereby this description of food could be increased. He regretted to find that, to some extent, there was a difference of opinion with regard to the means to be adopted to this end, but, for his part, he

advocated the protection of fish in every possible way, as well as of assistance to those engaged in artificial production. In Canada this subject was of very great importance. It was now some years ago since artificial culture was introduced by himself, with the recognition of the Government, and now they stood second to no other country with regard to it. The number of Salmon they turned out annually was not exceeded by any other country in the world. During the last two years from thirty-five to forty millions of Salmonidae had been turned into the waters of Canada through the artificial process, and, though there were no doubt sceptics and others who were inimical to the science of fish culture, he thought that could only arise from ignorance of the benefits to be derived from it. At first sight it seemed extraordinary that fish could be produced by artificial means; but it was a most simple process when understood. Fish were so prolific, that man with a little ingenuity could produce from them far more than nature could herself, because it was a well known fact that large quantities of the eggs of the fish family were destroyed by other species. This was the obtained law; it was intended that fish should live on fish, because if all the eggs of fish were permitted to hatch out, there would be no room in the waters for them. Consequently, nature had provided wisely that fish should live on one another, and this being the case, large numbers of ova must be consumed. Under artificial culture, however, where the egg was protected from its enemies, a larger percentage could be brought to maturity than by the natural process. Hence, if it could be shown that 75 per cent. of the eggs could produce living fish, the system ought to be encouraged by all intelligent people. Sir James Maitland had gone into the matter in a most lucid and instructive manner, and there was no doubt that when the paper was disseminated it would do a vast amount of good. The only difficulty that he saw was, that it did not appear to go hand in hand with the ideas of some scientific gentlemen, who maintained that protection was not necessary to some of our fish. He contended, however, that if an intelligent country considered fish culture of service at all, it should also adopt every possible mode of protecting the fish. It would be no use for a pisciculturist to trouble himself to reproduce fish in great numbers if the intelligence and legislation of the country did not protect that which had been produced, and

if every one were allowed to fish without any control. It seemed to him, therefore, that it behoved all who were interested in this matter to join in every possible measure to enhance the production of fish, either by natural or artificial means, and also to protect the fish afterwards. Nearly every civilized country possessed laws for the purpose of protecting fish; and when some gentlemen came forward and said that fish could not be exterminated, the consequence must be that all these protective laws were a mistake, and that every one should be allowed to kill and eat as he pleased. He maintained, on the other hand, that it was the duty of the legislature of every intelligent country to suppress intemperance of all kinds, not only in the matter of liquors, but in killing fish; and to pass judicious laws for the benefit of mankind. If any law were more judicious than another, it was that the waters should be protected from the inordinate destruction of man, in order that fish might be produced in larger numbers, both as a luxury for the rich and for the benefit of the poor. He felt that he was treading on somewhat delicate ground in giving expression to these sentiments, but as this was the first opportunity he had had, he felt it his duty to express publicly the strong conviction which he entertained on this subject.

Professor Huxley begged leave to second the vote of thanks which had been so well moved by his friend Mr. Wilmot. Unfortunately, he had not had an opportunity of seeing Sir James Maitland's establishment at Howietown, but he had frequently been favoured by reading and hearing what he had done, and thus had the means of knowing not only the nature of his operations, but what was to his mind the singularly precise and accurate scientific spirit which he had brought to his work, and it was the secret of the very remarkable success he has obtained. In this matter, as in all biological questions, the secret of success lay in attention to minute details, and that was really the moral of the paper. You must, in the first place, be able to comprehend precisely—which very few people did—the exceeding complexity of natural conditions, and then you must know how to carry into practice all the precautions necessary to meet the variation in those conditions. He could not recommend anyone who was endeavouring to acquaint himself with natural history to take up a more useful and valuable study than that of the manner in

which Sir James Maitland had carried out his operations with regard to fish culture. He dwelt upon this point the more because, since the time—some forty years ago—when M. Coste first popularized the notion of fish culture, the idea became prevalent that you only had to carry out artificial impregnation, or the collection of spat in the case of Oysters, and the thing was done. He need not say what disappointment those who first experimented in the matter of Oyster culture were destined to undergo; that was a matter recorded not only in the minds but the pockets of a large number of persons. The same considerations applied to all forms of fish culture, and unless those who undertook it were prepared to work at it with that happy combination of science and practice which was exemplified in the case of Sir James Maitland, disappointment would await their efforts, as it had those of many persons who had attempted the same process. For himself, he did not take very rosy views of the value of protection pure and simple for sea fisheries, but perhaps he was all the more inclined to attach especial value to thoroughly well considered and scientific fish culture. He was inclined to think that it was in this direction we must look, and not to measures of inefficient protection, for the ultimate preservation of our fisheries. This was not the time to discuss the point, but he gathered from Mr. Wilmot's remarks that there was some extremely wicked person who had been saying that protection was of no use in Salmon fisheries; that people should be allowed to destroy anything and everything they liked; but anybody who heard the remarks he had ventured to offer at the first Conference would be aware that he, at any rate, was not one of those wicked persons. No one had insisted more strenuously than he had done on the absolute necessity for the most careful protection for those sea fisheries in which protection could be shown to be efficient, and if any one were prepared to show that measures of protection as efficient as those which were adopted in the Salmon fisheries, and which must be enforced unless the Salmon fishes were to be destroyed, would be equally efficient in the case of any of the sea fisheries, by all means let them be adopted, and no one would be a stronger advocate for protection than he should be; but, until it was made clear that the regulations were efficient, that you were really doing something for the fishery, and not

burdening the fishermen with useless and vexatious regulations, it would be better to leave the question of protecting sea fisheries alone.

Professor G. Brown Goode (U.S. Commissioner) said he should be pleased to give a few figures illustrating what fish culture could do. Professor Baird (U.S. Commissioner) informed him that the Sacramento River, California, was, owing to the large number of canneries there, to a large extent depleted of its Salmon; but by the establishment of a hatchery there he had turned out something like sixty-seven millions of eggs or young fry of the Californian Salmon in the past eight or nine years, one-fourth of which were put into the Sacramento River, and it was now much more productive than ever before. On the Clacamass, in Oregon, a similar experiment was tried some years ago with a like result. These experiments had clearly shown that the Salmon industry of the Pacific Coast, which was now producing fish to the value of something like three million dollars a day, was thoroughly under the control of fish culture. He might also take the case of the Connecticut, in the last century, which was one of the most productive rivers; but by the construction of a great dam, 60 miles above its mouth, the Salmon were cut off from the spawning ground, and for very nearly ninety years not a Salmon was seen. In 1866, or thereabouts, the Commissioners of Connecticut began to plant Salmon in this river, and four years afterwards they began to appear. In the first year 500 fine Salmon, of 15 lbs. to 20 lbs. each, were taken; in the following year almost an equal number. Since that the Commissioners of the States have discontinued Salmon culture in that river, the supply has again fallen off, and the river might now be considered practically deprived of its Salmon again. He simply wished to add a word in confirmation of what Sir James Maitland had said concerning American Bass. Although he did not like to say anything against a fish which was a countryman of his own, he thought it was a fish which interested only the private individuals who were able and willing to feed him, and were willing to pay any sum for the gratification they found in angling. So far as fish with which public fish culturists should deal, the Black Bass had no claims whatever, unless they put him into the same stream with Pike, and let them fight it out together.

(TO BE CONTINUED.)

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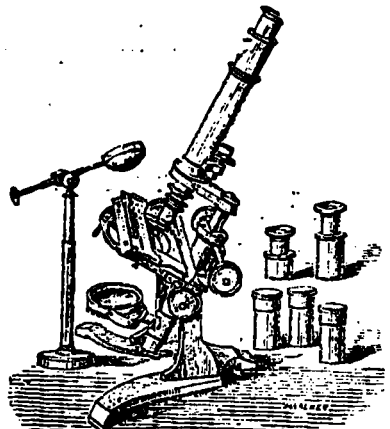
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