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THE OTTAWA NATURALIST.

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SOME CURIOUS FACTS ABOUT FISHES.

(Based on an address delivered before the "Unity Club.")

By ANDREW HALKETT.

The subject of this article is: certain strange facts concerning the habits and structure of fishes. A goodly sized volume might be devoted to this subject to do it justice; therefore a few singular facts only are given here, under distinctive headings.

FISHES THAT CAN LIVE FOR A PROLONGED TIME OUT OF WATER.

The November, 1901, issue of the OTTAWA NATURALIST contained a short article of mine, entitled: "An African Dipnoid Fish" treating of a group of fishes distinguished from all others by "the double character of the respiratory organisation: these remarkable fishes breathing not only under water by gills, but at times ... .. when the waters dry up, atmospheric air by rudimentary lungs"; and a succinct account of this dipnoid group is contained in that article.

But the lung-breathers are not the only kind of fishes which can live for a longer or shorter time out of water. There are others whose gills are provided with accessary organs for retaining water, so that those fishes are supplied with oxygen during their sojourn on land. A well-known instance of this is the Climbing Perch of India, a fish which leaves the water and walks by the aid of its spines over land. It even climbs trees; a fact alluded to by Herbert Spencer in his "Principles of Biology," and Daldorf in a memoir communicated long ago to the Linnean

Society mentions having taken a climbing perch in the act of ascending a palm-tree which grew near a pond. "The fish had reached a height of five feet above the water, and was going still higher."* Furthermore, Drs. Parker and Haswell in their "Text-Book of Zoology" state that the climbing perch "has become so thoroughly a land animal that it is drowned if immersed in water."

There are also certain gobies of the Indo-Pacific which move about over the ground at low tide in search of their food, and take rapid leaps to escape danger. It has been asserted of these also that they would drown if forced for an indefinite time to remain under water. One of those gobies I have myself seen resting on a moist object in its aquarium.

Whilst engaged in some Fisheries matters, at the Trent River, Ontario, a few years ago I had same fishes boxed up and expressed to Ottawa. On opening the box on my arrival I found some of the mud-pouts still alive and when replaced in water they were soon themselves again ; and whilst turning over moist stones along the shore at the west side of Vancouver Island I was surprised to find numerous little frisky, elongated, and compressed fishes which were there awaiting the return of the tide.

FISHES WITH BOTH EYES ON THE SAME SIDE OF THE HEAD.

There are instances of distortion in nature. I mean by this term not some individual freak, but a distortion brought about by a modification of structure permanently affecting a whole group of creatures. The flat-fishes, which are very compressed, are an instance of this. When the newly hatched halibut, or the plaice, or the flounder, has left the egg, it is essentially just like any other fish, with an eye on either side of the head. Very soon, however, the eye of one side, in certain kinds the right in others the left, moves around to meet its fellow, thus leaving one side of the fish eyeless and blind. The jaws also undergo distortion, and the eyeless side remains whitish like the under parts of other fishes, whilst the eyed side becomes covered with pigment coloring substance. The fish then lies on the blind side, which serves the same purpose as the under part of fishes in general.

*Dr. Günther : 'An Introduction to the Study of Fishes,' p. 516.

ELECTRIC FISHES.

There are three kinds of fishes, unrelated to each other, which possess electric functions: that is, they are capable of giving electric shocks. They are the Torpedoes, or Electric Rays; the Electric Eel; and the Sheath-fishes, or Electric Cat-fishes. There are others, the names of which need not be mentioned, which possess elementary or pseudo-electric organs. The electric muscular substance is differently adjusted in the three kinds enumerated. In the Torpedoes the batteries lie on either side of the head; in the Electric Eel they are longitudinal bodies in two pairs, immediately below the skin; and in the Sheath-fishes they extend all over the body, being thickest on the abdomen.

I had once an opportunity to test the powers to give electric shocks which two of these three kinds of fishes possess. Being invited by the keeper of the aquarium of the Zoological Gardens in London to receive a shock from an Electric Eel, I placed my hands upon the fish and received it, but it was slight, a circumstance probably due to the fact that the eel was not at home in its changed environment. Shortly afterwards Dr. Forbes, who kindly escorted me through the aquarium of the Liverpool Public Museum asked if I would like a shock from an electric cat-fish. I remembered the slight shock which the eel had given, and therefore readily placed my hands on the side of the fish, but the shock it gave was so violent that I would not again care to repeat the experiment.

FISHES WHICH TAKE CARE OF THEIR PROGENY.

The vast majority of fishes, of which there are some 13,000 known species, take no care whatsoever of their progeny. The eggs are deposited, and then immediately fecundated, and the parents never see their young, unless they should afterwards encounter them, as they might other fishes, and perhaps devour them. A comparatively few, however, do take care of their young. In some such as the black bass and certain cat-fishes both parents do. In a few only the female does. The females of the cat-fishes of the genus *Aspredo*, of Guyana, press the eggs into a spongy

integument of the skin by lying over them, and then carry them about until hatched.

But in most fishes which take care of their young the filial duties, strange to say, devolve upon the males. A very singular instance of this is some of the Pipe-fishes, upon the males of which devolves the duty of caring for the young. On the ventral side of the male is a long groove : the opening of a pouch which is suspended from the fish, and in which the eggs and hatched-out young ones are carried about ; whereas the female does not possess any such pouch, and after depositing the eggs she takes no further care of them.

Again, the male Stickleback constructs a little nest of weeds or other material, which has an entrance at one side. According to Costa, who made a close study of the habits of sticklebacks, and upon whose observations these remarks are in measure based, he then goes in search of a female, whom he conducts to the nest where she lays some eggs. Then she makes her exit by the opposite side of the nest, so that it now has two openings. Next day or so he goes again in search of a female finding perhaps, the same one, or perhaps another, who a second time is escorted to the nest ; and each day this is repeated until the nest contains a goodly number of eggs. Then he assiduously guards them from intruders, including the very female sticklebacks. Nor do his duties cease until the eggs are hatched and the young are able to look out for themselves.

The males of the cat-fishes of the genus *Arius* have another way of taking care of the eggs. The eggs of these fishes are proportionately very large, so that the females lay only a comparatively few. These the male of some, if not all, of the species, carries about in his mouth, or rather in his capacious pharynx ; until hatched.

How the Knotty Question as to the Propagation of the Eel was Solved.

Since Aristotle's time the mode of propagation of the eel has been one of the most knotty questions which has engaged the attention of ichthyologists Aristotle himself gave the subject con

siderable attention, but whilst in many respects the descriptions of that great observer in connection with animals in general would be worthy of a modern zoologist, the nonsense he wrote in endeavouring to solve the intricacies as to the propagation of the eel is hardly worthy of notice; yet his opinion swayed the minds of naturalists for ages.

As late as 1880, or twenty-six years ago, Jacoby wrote as follows in treating of the eel :—

> To a person not acquainted with the circumstances of the case it must seem astonishing, and it is certainly somewhat humiliating to men of science, that a fish which is commoner in many parts of the world than any other fish, the herring perhaps excepted, which is daily seen in the market and on the table, has been able, in spite of the powerful aid of modern science, to shroud the manner of its propagation, its birth, and its death in darkness, which even to the present day has not been completely dispelled.*

Since then more light has come to the students of fishes as to its propagation, and experts have sought to solve the problem, by approaching it along several paths.

More than two hundred years ago a group of ribbon-shaped fish-like creatures were discovered, all the known kinds of which are marine, and it has been proved, within the last two decades, that these are the larval forms, or what we may call the juvenile forms, of different species of eels.

The discovery of ripe eel eggs is due to the researches of Raffaele and Grassi, and dates no further back than 1888, or 18 years ago.

Since 1900, or six years ago, Carl H. Eigenmann, of Bloomington, Indiana, following in the paths opened out of these, and other investigators, has further pursued the subject, and in a pamphlet entitled : "The solution of the Eel question" sums up his conclusions as follows :—

> We now know, (1) that eels, both male and female, migrate to the ocean during October to January ; (2) that these eels probably deposit the eggs that are found on the surface during the following August to January ; (3) that the eels do not ripen in shallow water, but the female, according to Grassi, at a depth of five hundred meters ; (4, that the eggs of the eels float, according to Grassi, at a great depth ; according to Raffaele and Eigenmann at the sur-

*Carl H. Eigenmann : 'The Solution of the Eel Question.' Re-printed from 'Transactions of the American Microscopical Society,' Aug., 1901, p. 5.

face; (5) the development of some eels for the first fifteen days and that the resulting creature is different both from the adult eel into which it will develop, and from the larva of the eel; (6) the *Leptocephalus* of the eel and the process of its metamorphosis through a *Hemichthys* stage into the young eel as it is found entering the streams; (7) the young eels enter the streams during spring about two years after their parents have entered the sea. †

Whether they ever do, or do not breed in fresh water is a question still unsolved: and in this connection Eigenmann says:—

> The question whether or not the eel ever breeds in fresh water has been answered in the affirmative by several observers. There is nothing that would indicate the adherent impossibility of eels becoming land-locked and breeding in fresh water The evidence is, however, so far inconclusive. No one has yet taken eel eggs or larval eels, or younger eels than those that ordinarily ascend streams from the ocean in any fresh water. The statement that they must breed, because we know of no other way in which the supply of eels is being maintained in land-locked basins is not conclusive evidence that they do breed in these basins. ‡

It would seem, at first thought, incredible that eels from far inland lakes should ever make their way to the sea, (and in the case of the young, *vice versa*, from the sea to the lakes), but their instincts lead them that way at the approach of the spawning time; and doubtless thousands perish in the attempt; but we must bear in mind their serpentile form, their wriggling movements, and the fact that they can live for a considerable time out of water, so that they are enabled to make their way through obstacles utterly insurmountable to other fishes.

They go to the sea when about four years old and are said never to return; the young ones taking their places by ascending the streams in incalculable millions, a comparatively few ever reaching the upland lakes and rivers, but the overcomers make use of swollen tributaries, flood-gates, and even moist places between shut off waters, in getting to the limits of their extensive geographical range.

BRILLIANT HUES OF FISHES OF THE CORAL REEFS.

Naturalists are well acquainted with a phenomenon known as protective coloration in animals. In other words various animals

† Carl H. Eigenmann: I bid: p. 16.
‡ Carl H. Eigenmann: Ibid: p. 17.

so resemble their surroundings as to be disguised either from their enemies or from their prey. According to conditions the hue may be sombre or brilliant. A partridge for instance resembles the dried leaves among which she has her nest, and green parrots resemble the foliage of the trees among which they dwell. Among fishes there are instances both of sombre and brilliant coloration, whereby, in either case, they are concealed. Instances of the latter are certain fishes of the coral reefs. Were these of dull colors, they would readily be seen whilst they moved about among the beautiful flower-like zoophytes; therefore they are singularly ornamented with colors of surpassing beauty. Incidentally were one asked the question whether a bright red or a jet black object would most readily attract attention, the answer would naturally be the bright red of course. But that depends on conditions. If a scarlet cloth were hung upon the wall, and an object similiarly colored placed against it, it would not readily catch the eye; but if a jet black object were placed against the red cloth, it would readily be seen. For the same reason, evidently, such beautiful fishes as the tropical chaetodons, and other forms which abound among the coral mounds, are embellished in gorgeous reds, blues, yellows, or greens: colors ordinarily conspicuous, but which offer concealment, more or less, to those fishes amid their natural environments.

THE ANGLER OR SO CALLED FISHING FROG.

A case the opposite to the above is the so called Fishing Frog or Angler. This fish is not readily detected because it is of the sombre hue of its surroundings. and has moreover the power to change its color according to the character of the surroundings. The Angler lurks at the bottom of its retreat with its great gaping mouth ready to devour its prey. A long filament issues from the back of its head, which the angler waves about like a fishing rod. This filament terminates in a bait like lappet, and some unwary little fish which does not see the angler comes to nibble at it, and is at once engulfed in the great gape of this wily creature.

THE DISAPPEARANCE OF THE PASSENGER PIGEON.

JAMES H. FLEMING, Toronto, Ont.

The disappearance of the passenger pigeon in Ontario dates back at least forty years, though as late as 1870 some of the old roosts were still frequented, but the incredible flocks, of which so much has been said, had gone long before that date, and by 1880 the pigeon was practically exterminated, not only in Ontario, but over the greater part of its old range. There are, however, occasional records of birds taken, for some years later, an immature bird taken Sept. 9, 1887, in Chester county, Pennsylvania is said to be the last for that part of the state, (1) a bird also immature is in my collection taken in December 1888, at Montreal, Quebec; there are other Montreal records of the same date (2) but with the exception of one taken at Tadousac, July 20, 1889, (3) these are last Quebec records of birds actually taken. In Ontario two were taken at Toronto in 1890, on September 20, and October 11, both immature females, the latter is in my collection, as is an adult female taken by Mr. Walter Brett, at Riding Mountain, Man., May 12, 1892, one of a pair seen. I also have an adult male taken at Waukegon, Ill., Dec. 19, 1892. I was in New York in the latter part of Nov. 1892 and was then assured by Mr. Rowland, a well known taxidermist, that he had recently seen several barrels of pigeons that had been condemned as unfit for food, they had come to New York from the Indian Territory (4) and I believe had had their tails pulled out to permit of tighter packing. Mr. Wm. Brewster has recorded the sending of several hundred dozens of pigeons to the Boston market in December of the same year, and in January, 1893; these were also from Indian Territory; these are the last records we have of the passenger pigeon as any thing more than a casual migrant. The

(1) Proceedings of the Delaware Valley Ornithological Club, II, 1898, 17.
(2) Wintle, Birds of Montreal, 1896, 51.
(3) In collection of Dr. J. Dwight, Jr.
(4) Minot, Birds of New England, 1895, 395.

records ceased after this till 1898 when three birds were taken at points widely apart, an adult male at lake Winnipegosis, Man., on April 14, (5) an immature male at Owensboro, Kentucky, on July 27, now in the Smithsonian Institution, and another immature bird taken at Detroit, Michigan on September 14 (5) is in my collection, these are the last records that can be based on specimens. (6)

In 1903, I published a list (5) including sight records one as late as May 1902, this latter is possibly open to doubt, but the ones I gave for 1900 are, I feel confident, correct, as the birds were seen more than once and by different observers. For all practical purposes the close of the nineteenth centuary saw the final extinction of the passenger pigeon in a wild state and there remained only the small flock, numbering in 1903 not more than a dozen, that had been bred in captivity by Prof. C. O. Whitman of Chicago. These birds the descendants of a single pair, had long before that ceased to breed and it was in an effort to obtain fresh blood for this flock that I started a newspaper enquiry that brought many replies none of which could be substantiated as records of the passenger pigeon and many referred to the mourning dove. I am aware that there has been lately widely spread and persistant rumours of the return of the pigeons, but no rumour has borne investigation, and I feel that Prof. Whitman's small flock now reduced in 1906 to five birds are the last representatives of a species around whose disappearance mystery and fable will always gather.

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(5) Auk, XX, 1903, 66.

(6) There is a mature female in the collection of the Carnegie Institution of Pittsburg Pa. marked "Pennsylvania" August 15th 1898 but without further locality.

CORRESPONDENCE.

London, Ont., Thursday, Feby. 14, 1907.

To the Editor of the Ottawa Naturalist:

In your issue of May, 1902, I published a notice of the capture of the Longtailed Jaeger at Rondeau. Mr. J. H. Fleming, Toronto, inquired from me about this bird, stating that it was probably the Parasitic Jaeger, not the Lonktailed. After a good deal of correspondance with him and study over the matter I met him recently in Toronto and we went over all the specimans carefully together and as a result I am convincel that he is quite correct and that all the characters upon which stress is laid in the books for the separation of these two species are unreliable.

My birds answer to these characters but the important point which is not mentioned in any of the American books is the color of the primary shafts, the Parasitic Jaeger having white shafts throughout and the Longtail having only the first two or three white and the rest dark.

All the remaining characters seem to vary with individuals to such an extent that they become absolutely worthless for diagnosis. Mr. Howard Saunders, London, England, who is considered the great living authority on the gull family, supplied. Mr. Fleming with his information and after the careful examination which he and I made of all the available matter, I am not only satisfied that Mr. Fleming is correct but feel that he should be congratulated on such careful work. When the authorities make mistakes it takes exceptional care to find it out.

W. E. SAUNDERS.

NOTES ON SOME FRESH WATER SHELLS FROM MANITOBA.

By J. F. WHITEAVES.

In June, 1906, Professor Macoun collected a few fresh water shells at two localities in Manitoba. The species represented in these collections are as follows, those to which an asterisk is prefixed having been kindly determined by Dr. V. Sterki.

A. *From a small lake four miles and a half due west of Hamiota.*

PELEGYPODA.

**Sphærium* (*Musculium*) allied to *S. securis*, Prime.

Several specimens.

**Pisidium Roperi*, Sterki.

Several specimens.

GASTEROPODA.

Segmentina (*Planorbula*) *Christyi*, Dall.

Six adult and perfect, but dead specimens. This species, which was first described and figured by Dall in 1905, in volume xiii of the "Harriman Alaska Expedition" Reports, was based upon seven specimens, from "High Bluff, Manitoba, (R. Miller Christy)" and "Fort Smith, Mackenzie River (E. A. Preble)," in the United States National Museum. The small lake from which Professor Macoun collected his specimens, is about 104 miles west of High Bluff.

Planorbis (*Torquis*) *parvus*, Say.

Ten specimens.

Physa gyrina? Say.

Four very young specimens.

B.—*From a small lake in the sand hills west of Pine Creek, and north east of Carberry.*

PELECYPODA.

**Pisidium Roperi*, Sterki.
Several specimens.

**Pisidium variabile*, Prime.
Several specimens

**Pisidium medianum*, Sterki.
Four specimens.

**Pisidium ventricosum*, Prime.
Several specimens.

**Pisidium novehoracense*, Prime, var.; (or near).
Three specimens.

**Pisidium*, resembling *P. milium*, Held.
Several specimens.

**Pisidium*, near *P. pauperculum*, Sterki.
Several specimens.

GASTEROPODA.

Planorbis (*Menetus*) *exacutus*, Say.
Several specimens.

Planorbis (*Armiger*) *crista*, L.
One specimen, since broken.

Ottawa, Feb. 9th, 1907.

METEOROLOGICAL OBSERVATIONS.

Taken at the Central Experimental Farm, Ottawa. Maximum, minimum, and mean temperature for each month, with date of occurrence, also, rainfall, snowfall, and total precipitation, in 1906.

Month.	Mean of Maxima.	Mean of Minima.	Range of Means.	General Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation	Number of days Precipitation	Heaviest in 24 hours.	Date.
									in.	in.	in.		in.	
January	28.68	10.17	18.51	19.92	48.0	23	-14.4	10	0.26	9.25	1.18	14	0.35	18
February.....	25.18	3.26	21 92	14.22	46.0	21	-21.8	2	0.66	7.75	1.43	12	0.50	14, 25
March	30.83	12.87	17.96	21.85	47.0	29	-3.2	24	0.98	7.50	1.72	10	0.92	27
April.....	54.20	34.85	22.68	46.19	71.6	19	17.0	7	0.78	1.75	0.95	12	0.29	10
May	64.94	40.14	24.80	52.54	89.8	18	28.8	11	1.88	.....	1.88	15	0.45	25
June.....	77.83	53.96	23.87	65 89	89.0	15&20	36.6	12	4.85	.....	4.85	18	1.05	8
July	82.34	56.04	26.29	69 18	93.6	22	44.2	5	1.58	.....	1.58	8	0.62	30
August	84.04	57.07	26.96	70.55	96.6	19	43.5	15	2.43	.....	2.43	9	0.74	20
September	75.86	47.86	28.00	61.86	92.0	12	32.2	25	2.53	.. .	2.53	7	1.56	29
October	56.42	35.86	20.55	46.13	75.8	4	24.5	12	3.56	.....	3.56	10	1.22	6
November	38.28	23.87	14.40	31.07	50.0	2	7.4	15	1.01	7.75	1.78	11	0.61	26
December	20.70	3.23	17 46	11.96	38.0	15	-25.2	8	0.84	21 75	3 01	19	0.55	6
									21.36	55.75	26.90	145		

Rain or snow fell on 145 days during the 12 months.
Heaviest rainfall in 24 hours, 1.56 inches on September 29th.
Heaviest snowfall in 24 hours, 5.50 inches on December 6th
The highest temperature during the 12 months, was 96.6 on August 19th.
The lowest temperature during the 12 months, was 25.2 on December 8th.
During the growing season rain fell on 12 days during April, 15 days in May, 18 days in June, 8 days in July, 9 days in August, and 7 days in September.
September shows the lowest number of days with precipitation, viz., 7.
Total precipitation during the 12 months, 26.90 inches, as compared with 32.42 inches during 1905.

RAINFALL, Snowfall, and Total Precipation from 1890 to 1905, also, the Total and the Yearly Average Precipitation for the 17 years.

YEARS.	Rainfall.	Snowfall.	Total Precipitatio
1890	24.73	64.85	31.22
1891	30.19	73.50	37.54
1892	23.78	105 00	34.28
1893	31 79	72.50	39.04
1894	23.05	71.50	30.20
1895	27.01	87.50	35.76
1896	21.53	99.75	31.50
1897	24.18	89.00	33.08
1898	24.75	112.25	35.97
1899	33.86	77.25	41.63
1900	29.48	108 00	40.27
1901	29.21	97.25	38.91
1902	25.94	101.75	36.10
1903	26.43	85.00	34.92
1904	25.95	108.75	36.79
1905	23.71	87.25	32.42
1906	21.36	55.75	26.90
Total for 17 years	446.95	1496.85	596.53
Yearly average for 17 years	26.29	88.05	35.09

RECORD OF SUNSHINE FOR THE YEAR 1906.

MONTH.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
January	20	11	87.5	2.82
February	21	7	132.3	4 72
March	22	9	163.7	5.28
April	27	3	200.8	6.89
May	26	5	201.8	6.50
June	28	2	224.0	7.46
July	31	0	272.4	8.80
August	31	0	273.7	8.82
September	29	1	215.8	7.19
October	25	6	138.6	4.47
November	19	11	95.8	3.19
December	20	11	72.6	2.34

WILLIAM I. ELLIS, *Observer.*

ENTOMOLOGICAL BRANCH.

Meeting No. 3, held at Mr. W. Simpson's house, Jan. 24, 1906: ten present. At the request of Mr. Simpson, Dr. Fletcher acted as Chairman.

Mr Harrington gave an account of the chief characteristics of the Lampyridæ, reading extracts from Dr. Sharpe's article on the subject in the Cambridge Natural History. The phemonenon of luminosity was discussed and several present spoke of having observed this in larval forms. The different groups were considered, and Mr. Simpson exhibited his collection in which most of the Ottawa species were represented. Mr. Harrington read extracts from an article in the January "Entomological News" by Dr. W. A. Riley, giving an account of the remarkable process of polyembryony of *Litomastix truncatellus* as discovered by Prof. Filippo Sylvestri, of Portici, Italy. A most striking feature of this process is that from a single egg there originate in the parasitized larvæ over a thousand individuals of two different types of larvæ, one thousand being of the normal form; and in addition there are about one hundred vermiform asexual larvæ, which lack all trace of circulatory, respiratory, or genital systems or of malpighian tubes. They are, however, provided with strongly developed mouth parts adapted for tearing, and their special function seems to be the breaking down of the organs of the parasitized caterpillar and thus preparing them to serve as nutriment for the sexual forms.

Mr. Gibson exhibited a case containing complete series of inflates illustrating the life histories of *Gluphisia severa*, *Smerinthus cerysii*, var. *ophthalmicus*, and *Crocigrapha normani*, all of which had been reared from the egg, and larvæ preserved of each stage. Mr. Gibson also read a short article on the Great Leopard Moth, *Ecpantheria deflorata*.

Mr. Young showed a case of 130 different species of geometridæ which he had taken at Ottawa and specimens of all of which had been through the Rev. G. W. Taylor's hands for identification. The most interesting species were pointed out and some facts of their occurrence stated.

Mr. Keele gave an account of his last summer's work in the Klondike country proper, which he explained was not as good a locality for insects as that where he was working in 1905. He showed some most interesting photographs of the country and of animals, which had been taken during the expedition. Some pictures of Dall's Big-horn, a cow moose protecting her two calves, a Canada Lynx, a percupine, and a group of ptarmigan on a mountain side, were much admired. Mr. Keele related some interesting incidents with regard to each picture.

Mr. Nelles, of the Alaska Coast Strip Survey, explained the nature of the country where he was working last summer. A large number of insects had been taken by Mr. Theo. Bryant, an enthusiastic entomologist who was one of the party.

Mr. Baldwin showed the galls of *Eucosoma scudderiana*, a common gall on the Canada Goldenrod, and also the moths, and several parasites. Dr. Fletcher spoke of the checkered history of this species, which by mistake was thought to have been reared by Walsh from willow galls and was originally described under the specific name *saligneana* for this reason. It had been referred to two or three genera at different times but was for the present resting in the genus *Eucosoma*. Mr. Baldwin also exhibited a large specimen of the West Indian Spider usually spoken of as the Banana Tarantula, on account of the frequency with which it is introduced with bunches of that fruit.

Mr. Simpson showed living specimens of the small red lady-bird beetle, *Adalia bipunctata*, and spoke of the enormous abundance of these insects at the present time in the Dominion Astronomical Observatory and during the past summer on the Experimental Farm. This was attributed to the great abundance of plant lice of all kinds in the early part of the season, the lady-bird beetles feeding upon the plant lice and performing a most useful part in the balance of nature. Soon after midsummer it was noticed that the pupæ of the Adalias were infested by minute hymenopterous parasites to such an extent that probably not more than two or three per cent of the pupæ produced beetles.

Dr. Fletcher showed a photograph by Mr. E. A. Carew-

Gibson, of oak trees in the vicinity of Victoria, B. C., which were draped with the silken webs of *Ellopia somniaria*, the Vancouver Island Oak-looper. This photograph was taken in the evening, and the defoliated trees were so hidden by webs made by the caterpillars when letting themselves down from the trees to pupate, as to give the appearance of being looked at through a fog. Specimens of the larvæ and moths were also shown. A paper by the Rev. G. W. Taylor, on some geometers taken at Ottawa between May 24 and June 2, was read, and also a paper by Mr. W T. Ellis, giving a résumé of the Meteorological Observations taken at the Central Experimental Farm, Ottawa, during 1906. Both of these papers were prepared for the Ottawa Naturalist. J. F.

No. 4, held on Thurday, Feb. 7, 1907, at the residence of Mr. Harrington.

Present:—Messrs. Halkett, Gibson, Fletcher, Eifrig, Baldwin, Young, Metcalfe and Harrington.

Rev. Mr. Eifrig exhibited some lepidoptera from Indiana, consisting of six species of butterflies, including *Papilio ajax*, var. *marcellus*, *Terias nicippe*, and two species of moths. He also showed pupa cases of one of the large dragon flies (*Cordulia* sp.) and also a number of specimens of ants, *Camponotus pictus*, from the stomach of a Pileated Woodpecker shot at Eganville. Dr. Fletcher stated that he had examined the contents of the crop of a ptarmigan, for Mr. Eifrig, and found them to consist entirely of the tips of twigs of willows.

Mr. Baldwin exhibited a box of lepidoptera captured the previous summer, containing 24 species, among which were *Grapta faunus*, *Caripeta divisata*, *Nisoniades lucilius*, *Pamphila metacomet*, *Crambus agitatellus* and *Leucania phragmatidicola*.

Dr. Fletcher showed a small collection of butterflies made by Mr. Lawrence M. Lambe of the Geological Survey, near Kamloops, B. C. Of the five species secured, one fritillary was apparently a new species found by Mr. C. DeBlois Green of Osoyoos, B. C., some years ago but not yet described. He also exhibited an example of the Riker method of mounting insects in glass-topped boxes; the speciments illustrated being *Limneria Guignardi*, Prov., bred from *Œdemasia concinna*, and a spruce twig showing the characteristic galls of *Chermes abietis*, which

had been very abundant for the past two seasons in Western Ontario.

Mr. Halkett read an extract from Wallace on variability in insects, which lead to some discussion on the well known mimicking of certain butterflies by others of different genera.

Mr. Metcalfe reported that he was continuing his work of preparing a list of hemiptera of the locality and exhibited a few species including a very young Ranatra and a winged example of *Coriscus subcoleoptratus*. He also exhibited a female *Prionus Californicus*, which was taken by him on July 31, 1905, at Grierson's Wharf on the Ottawa River about 25 miles from Ottawa. The insect was in flight when observed and captured. It was suggested by Mr. Harrington that the beetle must have come east on one of the train of the C. P. R., which runs down along the Ottawa river. The specimen was compared with examples from Vancouver Isd. and seemed to be identical.

Dr. Fletcher drew special attention to a curious beetle, received from Mr. J. W. Cockle ,of Kaslo, B. C., in a box of very interesting coleoptera, but was unable to furnish the name, as even the genus was unknown to him and to Mr. Harrington. It was thought to belong to the Cupesidæ, as it had many of the characteristics of that family.

Mr. Gibson, showed a good example of the work of a Megachile, the Rose-leaf-cutter Bee, in which several of the cells were visible. He also spoke of a collection of lepidoptera which had been determined for Mr. John Russell, of Digby, N. S. Among the most interesting specimens were the following:—*Thecla læta*, *Semiophora youngii*, *Mamestra rubefacta*, *Hadena minuscula*, *Hadena bridghami*, *Catocala cælebs* and *Grapta satyrus*, var. *marsyas*. A specimen was also exhibited of the Lesser Magpie Moth, *Eurrhypara urticata*, collected at Milton, N. S., by Mr. W. H. Moore. This was the first American record for this European insect, which was stated by Dr. Fletcher to have been also taken by Mr. W. McIntosh at St. John, N. B., where it was not uncommon.

Mr. Young exhibited Vol. VI of Sir George Hampson's catalogue of the Phalænæ in the British Museum. The exquisite plates accompanying the volume were much admired by the members and were specially interesting from the many moths figured which had been found in Canada. A large number credited to Colorado in this volume have also been taken in Manitoba, the North-west Provinces and British Columbia. Several of the members availed themselves of the opportunity of examining Mr. Harrington's collections and entomological library.

W. H. H.

NATURE STUDY, No. XLII.

THE RELATION OF SPARROWS TO AGRICULTURE

By L. H. NEWMAN, B.S.A., Ottawa.

The relation of Sparrows, as a Class, to Agriculture is very little known, and people have some very erroneous ideas regarding this relationship.

In the first place, the fact that there are several species of sparrows in this country, is known by comparatively few, and thus the inroads committed by the numerous English Sparrows upon our garden and field crops condemn, to a large degree, the whole class.

Now it is evident that a group of birds so abundant, so widely distributed, and in such constant association with farms and gardens must play an important part in rural economy, and that a through investigation of their food habits would be useful. The results of such an investigation are embodied in this paper and amply demonstrate the value of the different birds to the agriculturists.—"A value", says Judd, "greater than that of any other group of birds whose economic status has thus far been investigated."

In order that the different kinds may be easily distinguished, and thereby to assist in preventing the reckless slaughter of beneficial species in mistake for the more injurious English Sparrows, I shall give the chief characteristics of some of the common birds which are known generally as Sparrows.

The following species are common in all parts of Ontario: the English Sparrow; the Chipping Sparrow; the Vesper Sparrow; and the Song Sparrow.

ENGLISH SPARROW (*Passer domesticus*).

The well-known English, or House Sparrow, is found in almost all parts of the United States and Canada. There is a marked different in the appearance of the males and females but both are well known to all. The note of these birds is anything but musical.

Throughout its range, the English Sparrow abounds chiefly in towns and villages, along roadsides, and about farm buildings, it is seldom found in the open fields, except during the harvest.

The spot chosen for the nest is some hole or crevice in a wall or chimney. Sometimes it is built in tree tops. The nest is very

bulky, and is composed largely of straw and grass. The interior is lined with feathers and other soft material.

The eggs vary in number from four to six, are grayish-white in colour, and are more or less covered with oblong grayish black spots.

CHIPPING SPARROW (*Spizella socialis*).

The Chipping Sparrow is the smallest of all our Sparrows, and may be easily recognized by its red-capped head, a conspicuous light stripe over the eye, and its slate-coloured breast. It may also be identified by its incessant metallic chirp, as it hops about in the grass or hedge-rows, looking for seeds and insects, as well as by its monotonous little song chippy-chippy-chippy, many times repeated.

This species is plentiful in Ontario. The female builds its neat little home in low trees near the habitation of man, and, in fact, often in the vines on his porch. The nest is constructed of grass and is beautifully lined inside with horse hair. The eggs are of a delicate robin's-egg blue, spotted at one end with dark purple. There are two broods of from two to five each year.

VESPER SPARROW (*Poocætes gramineus*).

The Vesper Sparrow is abundant throughout all parts of North America. Fields, grassy hillsides, and open valleys are its places of resort. It is a shy, timid little bird, resembling to a considerable extent the Song Sparrow; but is of grayer brown with a bay-brown patch on each shoulder and the outside feathers of the tail white. It is also known as the Bay-winged Bunting, Ground Bird and Grass Finch. In winter, according to Nuttall, these birds flock together in great numbers in the Southern States; and, mingling with other species, line the roadsides and straggling bushes near the plantations. But no sooner does early spring arrive than they seek out again their nesting regions of the Northern States and Canada. When disturbed, they flit up from the ground, spread their white-bordered tails, and alight a short distance away, to resume their work. This trait is sufficient to identify this species. Their characteristic, attractive song may also be heard during the summer, especially in the late afternoons and evenings.

The female builds her nest on the ground, sheltered by some grassy tuft. The four to six eggs are of a grayish-white, thickly covered with dull, reddish-brown spots.

SONG SPARROW (*Melospiza melodia*).

The Song Sparrows is one of our earliest summer visitor to

appear in the spring, and it is fitting that this, one of our most musical birds, should be so called. Its bright, canary-like lay is one of the most attractive voices of the spring, and is familiar to many who do not know the identity of its author. In habit, it differs from the Chipping Sparrow,—it is not so often met with in the open country or in the garden, but is generally found inhabiting the borders of rivers, meadows, swamps, and other watery places. I have found it, however, in company with the English Sparrows hopping about the barnyard. It seeks its food on the ghound, hopping along through grass and weeds in a peculiar, mouse-like manner.

It is a plump little bird, with dark-brown streaks over its head, and along its sides. The breast is light in colour, boldly streaked with dark-brown and with a conspicuous dark patch in the centre. The beak is stout and dark-coloured. The Song Sparrow resembles the Vesper Sparrow considerably; but is much darker and of a ruddier brown. Its tail is longer and lacks the two white feathers which are such a striking feature of the Vesper Sparrow.

The female generally builds her nest on the ground in a little elevated tuft of grass, or other vegetation. It is composed of fine, dry grass, and is lined with horse-hair and other material. It lays four to five eggs of a bluish-white colour, thickly covered with large reddish-brown spots.

Economic Value of Sparrows.

Some years ago in an effort to arrive at the true relation of these common birds to agriculture, I undertook a rather extensive investigation of the food consumed by the four above named sparrows during one summer. For this purpose of course it was necessary to kill a few specimens each week, throughout the summer, and a most careful examination was made of the stomach, the crop and the gullet of each. From this investigation the following conclusions were drawn regarding the economic importance of each species.

The English Sparrow is almost exclusively a grain and weed-seed eater. Nearly all the insects found in the stomachs of those examined were of a kind practically neutral in their effects on Agriculture.

Now, although it is true that they consume a considerable amount of weed-seeds, yet the fact that they limit their weed-seed eating largely to the barnyard and the immediate vicinity of buildings, lessons to a great degree the benefit which they would otherwise confer upon the farmer.

During harvest, when they can get grain easily, they leave the shelter of buildings and, by thousands, pillage the fields, causing great damage. At this time, very few weed-seeds were found in their stomachs, grain being evidently preferred to weed-seeds when available.

It appears, therefore, that there is little to be said in favour of the English Sparrow. Its weed-seed eating habits are creditable, as far as they go, but they are insignificant because the damage done to grain far overbalances the benefit derived from weed-seed destruction. Adding to this the injury it does about buildings by its filthy habits, and the fact that it drives away other birds beneficial in their habits, there is no escape from the conclusion that this bird is a serious pest, the extermination of which would be an unmixed blessing.

The Chipping Sparrow is not so well known generally as the English Sparrow,but is of much greater benefit to the farmer. Much service is rendered in destroying weed-seeds, but the greatest utility of the species is shown in its animal food, the greater part of which consists of noxious insects. Practically no grain was found in the stomachs examined, although the birds were shot in grain-fields. This, therefore, proves conclusively that they are not injurious to our grain crops.

The Vesper Sparrow, like the Chipping Sparrow, is also very beneficial. Its diet varies with the season. During spring and Fall, when insects are scarcer, its food consists to a large extent of weed-seeds, but during the summer months, its work as a destroyer of injurious insects is very great, measured by the sparrow standard.

Unlike the English Sparrow, it feeds farther out in the field, and hence the weed-seed consumption is a direct benefit. Its value to the farmer is beyond question, and should secure for it the fullest protection. It may be easily distinguished from the injurious English Sparrow by the 2 white feathers in the tail, and it is hoped that people will soon learn to distinguish these two birds, and thereby save many of these useful little songsters from an untimely death.

The Song Sparrow also, taking the food habits as a whole, this bird does much more good than harm, and is worthy of protection and encouragement. Its food is composed chiefly of insects, the greater part of which are injurious; it is, however, also a weed-seed destroyer, particularly in autumn. .

Experience has also shown that while this bird will not refuse grain during harvest, yet the injury caused in this way is inconsiderable.

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