

## Zoology



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The asymmetry of the brain is remarkable ; the large ganglionic cells are most abundant in the center behind the middle and from there to the posterior side of the brain ; a median line is slightly indicated by the arrangement of the fungoid masses. The tract composed of large nerve fibres with scattered ganglionic cells on the left side is very much more extensive than on the right.

*Comparison with the brain of other Arthropods.*—So wholly unlike in its form, the want of antennal nerves, and internal structure, is the supra-oesophageal ganglion, or “brain,” of *Limulus* to that of insects and the higher Crustacea, that it is very difficult to find any points of comparison.

Histologically, judging by my specimens of the brain of the lobster which are stained with carmine, the brain of *Limulus* agrees with that of other Arthropods in having similar large ganglion-cells ; the smaller ganglion-cells, so abundant in the brains of insects and Crustacea, are wanting in *Limulus*. There are, in *Limulus*, no *ballen-substanz*-masses homologous with those of the other Arthropods nor any “mush-room” bodies.

Topographically the internal structure of the brain of *Limulus* is constructed on a wholly different type from that of any other Arthropodous type known, so much so that it seems useless to attempt to homologize the different regions in the two types of brain. The plan is simple in *Limulus* ; much more complex in Arthropods, especially in the brain of the craw-fish, as worked out by Krieger, as in the Decapodous brain there arise two pairs of antennal nerves besides the optic pair, and in external form the two types of brain are entirely unlike. The symmetry of the brain of the crayfish, as of the lobster and insects, is marked throughout, each hemisphere exactly repeating in its internal topography, the structure of the opposite side ; the symmetry of that of *Limulus* is obscure and imperfect.

THE FOOD OF BIRDS.—Under this title Prof. S. A. Forbes has published in the Transactions of the Illinois State Horticultural Society, a valuable report on the food of the thrushes. In Illinois there are estimated to be three birds to an acre during the six summer months. We make the following extracts: “It is my own opinion that at least two-thirds of the food of birds consists of insects, and that this insect food will average, at the lowest reasonable estimate, twenty insects or insects' eggs per day for each individual of these two-thirds, giving a total for the year, 7200 per acre, or 250,000,000,000 for the State—a number which, placed one to each square inch of surface, would cover an area of 40,000 acres.

“Careful estimates of the average number of insects per square yard in this State, give us at farthest 10,000 per acre for our whole area. On this basis, if the operations of the birds were to be suspended, the rate of increase of these insect hosts would be accelerated about seventy per cent., and their numbers, instead of

remaining year by year at the present average figure, would be increased over two-thirds each year. Any one familiar with geometrical ratios will understand the inevitable result. In the second year we should find these pests nearly three times as numerous as now, and with that astounding acceleration of increase characteristic of geometrical progression, they would multiply until in about twelve years we should have the entire State carpeted with insects, one to the square inch over our whole territory. I have so arranged this computation as to exclude the insoluble question of the relative value of birds and predaceous or parasitic insects, unless we suppose that birds eat an undue *proportion* of beneficial species.

“Take another view of this matter. According to the computation of Mr. Walsh, the average damage done by insects in Illinois amounts to twenty millions dollars a year. Large figures certainly; but when we find that this means only about fifty-six cents an acre, we begin to see their probability. Few intelligent farmers or gardeners would refuse an offer to insure complete protection, year after year, against insects of all sorts, for twenty-five cents an acre per annum, and we will, therefore, place the damage at one-half the above amount—ten million dollars per annum.

“Suppose that, as a consequence of this investigation, we are able to take measures which shall result in the increase, by so much as one per cent. of the efficacy of birds as an insect-police, the effect would be a diminution of the above injury to the amount of sixty-six thousand dollars per annum, equivalent to the addition of over one and a-half million dollars to the permanent value of our property; or if, as is in fact a most moderate estimate, we should succeed in increasing the efficiency of birds five per cent., we should thereby add eight and one-fourth millions dollars to the permanent wealth of the State, provided, as before, that birds do not eat unduly of beneficial species.

“These figures will be at once rejected by most naturalists as absurdly low. The young robin of Prof. Treadwell (a bird whose fame has extended over both hemispheres) required not less than sixty earth-worms a day, equivalent to at least two hundred and fifty average insects, to keep it alive. A pair of European jays have been found, Dr. Brewer informs us, to feed their brood half a million caterpillars in a season, and to eat a million of the eggs in the winter.<sup>1</sup>

“Compared with these numbers, my 7500 insects a year seem certainly many times too few, and similar criticisms might very probably be made on other items of the estimate. I prefer, however, to put these matters with a moderation which will command

<sup>1</sup> A young mocking-bird (*Mimus polyglottus*), raised from the nest by my nephew, Robert Forbes, ate about 240 red-legged grasshoppers daily, equivalent to at least 480 average insects.

general assent, especially as we see that the importance of the subject does not require exaggeration. Of course the individual farmer or gardener could, by intelligent and careful management, if he knew just what to do, increase the value of his own birds far beyond his individual share of the above-mentioned general aggregate.

"It is thus made probable that the birds intervene continuously between us and the complete destruction of our most important industries, the irretrievable financial ruin of nearly our whole population."

In conclusion, Mr. Forbes does not, with his present knowledge of economical entomology, attach any great economical value to the thrush family; it appears from his paper that they often eat many insects beneficial to agriculture, particularly ground beetles, still he would treat this question with careful conservatism, and not turn the delicate balance of nature by the extermination or undue breeding of birds.

ZOOLOGICAL NOTES.—The study of the Siphonophores is advanced by two excellent papers by Mr. W. J. Fewkes, in the Proceedings of the Boston Society of Natural History, one on the structure of *Rhizophysa filiformis*, and the other on the tubes in the larger nectocalyx of *Abyla pentagona*, both Mediterranean forms. Mr. Tewkes has added three Siphonophores to our New England fauna.—To the same number of the Proceedings, Dr. W. K. Brooks contributes a paper on the development of the digestive tract in Mollusks.—Dr. Fritz Müller has discovered a minute Ostracod Crustacean, like *Cythere*, living in the tree tops of the Bromeliaceæ in Southern Brazil. It appears that these tree tops harbor a host of animals, including the larvæ of insects, even the tadpoles of treefrogs here undergoing their transformations.—The process of respiration in some Crustacea, as *Astacus*, certain Phyllopoda and Cladocera, has been shown to be in part carried on in the anus; in *Leptodora*, as shown by Weismann, this is the exclusive mode of respirations. Mr. Hartog now shows (in the *Quarterly Journal of Microscopical Science* for April) that it occurs in several Copepod Crustacea. He also describes how the Hydra swallows its prey. The part played by the tentacles ceases as soon as the mouth comes in contact with the food. The hydra then slowly stretches itself over the food and engulfs it, the tentacles usually turning away from the food.

#### ANTHROPOLOGY.<sup>1</sup>

A DICTIONARY AND GRAMMAR OF THE AIMARÁ LANGUAGE.—The literature of aboriginal languages has just been favored with an important addition in the shape of a "Dictionary and Grammar of the Aimará language," spoken in the southern portion of Peru, by the Collas (pron. Cóllyas) and other tribes. This language is

<sup>1</sup> Edited by Prof. OTIS T. MASON, Columbian College, Washington, D. C.