## Research Notes.

### Biological Observations on Ophiurids.

#### I.

IN a recent paper forming one of the series entitled "Papers from Dr. Th. Mortensen's Pacific Expedition, 1914-16" (LX) (*Vidensk. Medd. fra. Dansk. Naturh. Foren.*, **93,** pp. 1-8, pl. 1, 1932), Dr. Th. Mortensen gives a very interesting account of the unusual features of the Ophiurid, *Ophiocanops fugiens* Koehler, 1922, which had been imperfectly described. This species lives in moderate depths in the Philippine Seas and adjacent waters. The chief features of this extra-ordinary Ophiurid are: (1) the extremely small-size of the disc, (2) the absence of ventral interradii and bursæ, and of the mouth-shields except the madreporite which is as large as an adoral plate, (3) the uppermost of the arm-spines, which is also the longest, is upwardly directed in the skin of the dorsal side of each arm forming a series of chambers extending to nearly three-fourths of its length, (4) there is usually a pair of gonads to each joint opening separately on the side of the arm, and (5) the small stomach of the disc has radiating branches extending into the space above the genital organs in each arm, and thus providing an ample absorbing surface. The vertebræ and the articulation are a slight modification of the streptospondylous type found in the Euryalids, but the extraordinary arrangement of the arm-spines, the gonads, and the stomach is unique in Ophiurids and does not entitle the species to a place amongst the Euryalids or Ophiomyxids. Dr. Mortensen has, therefore, erected a separate family *Ophiocanopidæ* n. fam. to receive this species.

In the same paper (p. 21) Dr. Mortensen records the occurrence of an albino *Ophiocoma scolopendrina* (Lemarck) from Port Louis, Mauritius. The colour of the species is usually dark, mottled with white, but in the specimens that the author observed the black ground colour was entirely absent except at the tip of two of the arms.

H. S. R.

#### II.

IN another paper (LXIII) of the same series (*Vidensk. Medd. fra. Dansk. Naturh. Foren.*, **93,** pp. 171–194, 1933) Dr. Th. Mortensen has recorded some interesting biological observations on Ophiurids collected in the Indo-Pacific region which are summarised below:

1. The author describes an extraordinary little epizoic ophiurid, *Nannophiura lagani* gen. et sp. nov. found living amongst the spines of the oral side of *Laganum depressum*. It is the smallest of ophiurids hitherto known, with the disc not more than 0·5 mm. in diameter. It has 5 equally developed arms 3 mm. long, the distal part of which is broad and flattened with the spines partly modified into hooks, and in life has been observed to cling oral side away from its host, to the spines by its prehensile arms which roll up towards the aboral side. The disc is made up of one central, 5 radial, and 5 small marginal plates. Ventral interradii and genital slits are absent. The ventral and dorsal arm plates are well developed, and there are no tentacle scales beyond the first. The mouth papillæ are rudimentary. The radial nerves are exceedingly well developed in correlation with the prehensile apparatus. This little ophiurid is by no means a parasite as it clings oral side away from the surface of the host, but it apparently finds a safe abode amongst the spines of its host which carries it about on detritus at the bottom of the sea. The detritus whirled up by the ciliary currents produced by the skin of the test and the spines of the host probably forms its main article of food.

2. The practice of autotomy as a means of propagation is well known in the Ophiuroidea and other groups of animals but in the family Amphiuridæ this phenomenon appears to have been overlooked with the result that there are very few records of it in literature. The author describes a new species, *Amphiodia dividua* from a lagoon at Cannoniers Point, Mauritius, which reproduces by autotomy. The chief features of this species are that the disc has no primary plates, but is covered on both sides by small, thin, simply perforated scales of one size, that the radial shields are elongate, very narrow and contiguous along their whole length, which is nearly half that of the radius of the disc, and that each radial shield has a prominence at its outer end which carries two or three hyaline spines. The habitat of the species is peculiar, and harbours Synaptids, Euteropneusts, Planarians, Nemerteans, Annelids and two other species of viviparous ophiurids. The lagoon dries up at low tide leaving a thick mass of

much-tangled filamentous green algæ which retains some water, and the author suggests that the habitat of these ophiurids has some connection with their mode of propagation.

3. In the large sandy flats exposed at low tide at Polana Beach on the coasts of Dolagoa Bay, Portuguese East Africa, the author found among many interesting animals some small ophiurids on the oral side of *Echinodiscus disperforatus* Leske which usually lies concealed under sand. These ophiurids are described under the name *Amphilycus androphorus* gen. et sp. nov. The chief point of interest in this form is the occurrence of a male individual on the oral side of the disc with its arms alternating with those of the adult female in such a way that the mouths of the two sexes are opposed to each other. The males are very small, with their disc not exceeding 1 mm. in diameter, while the females have a disc with a diameter of 5 mm. The author regards this phenomenon as an extraordinary case of copulation hitherto unknown in ophiurids which differs from the only other known instance of "copulation among Echinoderms, that of *Archaster*, in being not temporary as in the said sea-star, but constant—a continuous erotic embrace, the female, evidently, carrying its male throughout life." The instances of viviparity in *Ophiodaphne materna* and *Ophiosphœra insignis* recorded by Koehler in his Memoir on the Ophiurids of Australian and Malayan Seas are, according to the author, really a case of sexual dimorphism in which each female is accompanied by its much smaller sexual mate on the oral side of the disc.

4. In this note the author, discussing the occurrence of viviparity in ophiurids, adds four more instances of this phenomenon to those already known, and describes a new species of *Ophionereis*, *Ophionereis vivipara* from Cannoniers Point, Mauritius. He gives a list of the known viviparous ophiurids with remarks on the condition of the sexual glands, hermaphrodite or sexes separate, from which it is clear that the majority of viviparous species are hermaphroditic. The casual relationship of viviparity and hermaphroditism is unknown, and the author leaves the problem open with the remark that hermaphroditism is in some way connected with viviparity, and has been acquired gradually among the more specialised forms.

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### Floral Anatomy and Its Morphological Interpretation.

IN a recent paper on the subject (*New Phyt.*, Aug. 1933), Agnes Arber shows that the differences between the flower and the vegetative shoot are conditioned in the main by three factors: (1) The divergence of the floral members from the foliage leaf type in correlation with the difference between sporogenous and vegetative activity. In the carpel this involves the shifting of activity from the midrib to the margins. (2) The peculiar relation of the ultimate leaf members (carpels) to the apex of a shoot of limited growth (the floral axis). (3) The telescoping of the floral axis, and its intimate association with the parent axis and bract, which leads to close packing of the appendages, and favours cohesion, adhesion, and various forms of distortion, suppression, and departures from radial symmetry. With this theory of the flower as a basis, she considers the phylogenetic claims of floral anatomy. She holds that the general scheme of vascular system may have some value as indicating the broader trends of race history, but from a study of certain rudimentary leaves, sepals and stamens, it appears to her that there is no positive evidence for the alleged 'conservatism' of vascular bundles or for their survival when the organ which they supplied has ceased to exist.

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### Mucus Formation in Goblet Cells.

MR. E. S. DUFFIE in an article on the "Mucus formation in Goblet Cells" (*P.R.S.B.*, 784, 1933) starts with a brief review of the previous work done by Nassonov, Clara and more recently by Florey. Vital stains and also the classic technique have been employed and the subjects of the experiment were young and adult mice. The secretory granules make their appearance at the periphery of the cells where the mitochondria abound. Having thus made their appearance possibly due to the influence of the mitochondria they migrate into the Golgi region where the transformation into the mature mucin granules takes place and this is stainable.

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### Plant Galls as Natural Checks to Wild Vegetation.

OUR knowledge of the rôle of plant galls in the economy of Nature is very

fragmentary. Since 1928 the writer has been interested in this highly fascinating aspect of cecidology. A preliminary study in the South Indian region has yielded certain extremely interesting results, which it was thought worth while to record here.

One of the important parts played by plant galls in Nature is that of natural checks to the abnormal spread of wild vegetation. Many species of galls effectively keep wild plants within certain normal bounds. But for the formation of these galls, which reduce their numbers, the plants now bearing them would spread over much larger areas of any locality. They would grow and spread so luxuriantly as sometimes to choke out of existence all other plants, which might happen to be cultivated and economically useful to man. Without such galls to our aid our constant fight against many noxious and troublesome weeds would be far tougher than now and we should have many more weeds on cultivated land. The extremely troublesome weed *Lantana* would be a more formidable enemy to the agriculturist than even now, but the formation of the fruit galls on *Lantana* by a gall-midge *Asphondylia lantanæ* Felt. reduces the number of seeds produced to 50% to 60%. This in turn aids to keep the species within reasonable limits. South Indian jungles should be richer than now in *Morinda tinctoria* Roxb., if the latter does not bear the newly discovered flower galls by *Asphondylia morindæ* N. sp. This midge produces galls on the flowers of 80% of the plants and only a much smaller portion of the rest develop into ripe seeds. *Mimusops hexandra* Roxb. would form denser societies in the South Indian scrub-jungles but over 95% of its flowers turn into a curious, undescribed gall. In a certain scrub-jungle in South India, due to an exceptionally moist and favourable condition in 1931, the wild twiner *Rivea hypocrateriformis* Choisy. spread and produced an unusually larger number of flowers. It was estimated that the flower production in the previous two years was 50% less than in 1931. This increase in flowers in 1931, however, did not bring about in 1932 any unusual increase in the number of plants in the locality or in the neighbourhood. This was due to the fact that in 1931 and 1932 gall-formation on the flowers by an undescribed Itonidid (*Cecedomyid*) was nearly 35% more prevalent than usual. The galls prevented the seed formation and hence kept down the number of plants.

All species of galls do not behave equally in this respect. Those species which involve in their development flowers, fruits, buds and roots are the most effective checks. Flower and fruit galls especially keep down the plants incapable of vegetative modes of reproduction. Sporadic forms of galls do not so effectively play this rôle as the epidemic ones. Due to the formation of galls on them, the flowers fail to reach maturity and seeds, which are needed for propagation, are not formed. This very seriously affects the spreading of the plant in the absence of a vegetative mode of reproduction. In any locality with a hundred or so of plants so affected only a few flowers develop normally and contribute to the spreading of the species. The species is thus checked. This, for instance, is the case with *Lantana* sp., *Mimusops hexandra* Roxb. and *Rivea hypocrateriformis* Choisy. Even when the plants with flower galls are capable of vegetative modes of reproduction their number is very much reduced. Gall-formation on roots so weakens the plants by under-nourishment that the production of an over abundance of flowers is very seriously affected.

There are a number of other instances in which galls play this part to a much larger extent than any cited here. Indeed the whole subject is very intricate but its full importance is not generally known. The present note merely aims at showing the extremely interesting field available for work. A detailed account of the subject is put off for a future occasion pending a more thorough investigation.

M. S. MANI.

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## The Investigation of Atmospheric Pollution.

THE Report of the observations made during the year ended 31st March 1932, which has been issued by the Department of Industrial and Scientific Research and published by H. M. Stationery Office, London (1933, Price 5s. net), makes very useful reading.

During the year under review, thirty-seven bodies—municipal, industrial or agricultural—co-operated in conducting the investigation. A number of useful observations were made, but the following deserve special mention. In view of the difficulties in obtaining accurate estimates of solid contents of smokes, attempts are now being made to devise a photo-electric apparatus for the purpose. Improved methods for the

estimation of sulphur impurities in air have been developed. The deposit-gauge measurements relate only to the limited areas covered by the instruments, so that generalizations therefrom for all the surrounding areas would not be justified. The results of analyses of deposits collected at different centres show considerable variations. A study of the averages for the past few years would show that the sulphur content of London fog has greatly increased while at other centres it has shown perceptible decrease. Ashington High Market gave the highest figure for total solids, ash and tar. Burnley Town Hall was richest in carbonaceous matter and chlorine. Others, like those from some of the country parks, gave low figures under all the heads.

Although India is not so much subject to dense fogs as Great Britain is, yet her dust problem is very much more serious. In view of the fact that dust is the chief carrier of a number of diseases, it is hoped that the Government would soon take up the problem seriously and appoint a competent staff to conduct the investigation.

## Calcutta Fish Depôt.

CALCUTTA Fish Supply Co. (Managing Agents, *Agencies Co.*, India, 7-1, Lindsay Street, Calcutta) have opened a fish stall No. 109-110, Municipal Market, Calcutta, for the sale, under European supervision, of foreign sea fish in fresh condition and country sea fish. The stall is daily open for business from 5 to 10 A.M. The supply for the daily requirements is drawn direct from the cold storage at Kidderpore. The following foreign fish are sold: Sockeye Salmon, Red Salmon, Haddock, Herrings, Kippers, Bloaters, Flounders, Halibut, Trout, Snappers, Soles, Smelts, Cod, White Fish, Shrimps and Lobsters. The country sea fish are Bhetki ("India Halibut"), Indian Haddock, Indian Salmon, Indian Mackerel, Hilsa and Pomfret. The prices in September ranged from annas 7 per pound for Hilsa to Rs. 1-4-0 per pound for Lobsters and Halibut.

The entire stock of the foreign fresh fish is imported from British Columbia (Canada). Before shipment, the fish is gutted, cleaned and subjected to rapid freezing by Ottisen Process. There are only two boats that have arrangements to carry fresh fish, so the supply is received every two months. In 1932, the quantity of fresh fish imported was about one ton, but during the current year it is expected that import will be about 6 to 7 tons. The business is confined to Calcutta and the customers are mostly Europeans. At present it is a losing concern, but is said to be full of great possibilities, especially in the town of Calcutta, where practically the entire population consists of fish-eating people and where, due to a ring of middlemen, the fish is sold at a very high price and is almost beyond the reach of poor people. If this new venture can help to break the ring and lower the prices, it will be hailed as a great boon in Calcutta.

The establishment of this new company for the supply of fish in Calcutta brings home, very vividly, the immense possibilities of developing the fishery resources of India. Our seas and inland waters are full of fish. A Central Organisation is needed that will pay attention to the conservation of the resources, and will undertake vigorous application of fish culture methods. It will then be possible to maintain and build up in India the population of the finny tribes and to make the profession and business a profitable one. It is within living memory how Japan and British Columbia have developed their fishery resources by the well-conceived application of scientific methods. "Where no regulations exist as to the method in which fisheries should be worked, and should other circumstances be equal, that country or District which is most populated by man will be the denuded of fish. Individuals would sooner live by fishing than by agriculture, as the trouble of capturing the finny tribes is less than tilling the soil, being simply catching without any idea of preservation." Those, who have studied the methods of fishing in the various parts of India, know how true all this is with regard to the fisheries in India and how imperative it is to devise some means of conservation and propagation.