BRITISH MUSEUM (NATURAL HISTORY)

INSTRUCTIONS FOR COLLECTORS

No. 9A

INVERTEBRATE ANIMALS OTHER THAN INSECTS

PRICE THREE SHILLINGS AND SIXPENCE

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I. INTRODUCTION

It is desirable that the collector should bear in mind the object of the work that he is undertaking. A few random samples of a population of animals, even if imperfectly preserved, may not be entirely without value, but modern systematic work in zoology demands more than this. The proper study of any group of animals requires as large as possible a series of specimens, and these must be well preserved. In this way the specialist is enabled to study minute variations of form, and perhaps to correlate them with particularity of region and habitat and so to gain a better insight into racial and specific differences. The collector should therefore remember not to content himself with a small sample of a species which appears to be abundant, but to gather a representative sample of each species from as many different places as possible.*

The scientific staff of the Museum are always willing to advise as to what work may be attempted in any given region, and to give any other assistance in their power. It is therefore desirable for the prospective collector to get into personal touch with them before setting out on an expedition. Preliminary enquiries should be addressed to:—The Keeper of Zoology.

* The specialists should be consulted regarding numbers and methods of selection since requirements may differ.

II. HOW TO DISTINGUISH THE MAIN GROUPS OF INVERTEBRATES, AND WHERE TO LOOK FOR THEM

The invertebrates, or animals without a skeleton of bone or cartilage, are divided into groups, differing radically in structure. It is impracticable here to give adequate descriptions of these groups, and the plates at the end are intended to help the collector to distinguish between them.

(a) Protozoa. (Pl. I, figs. 1–11 ; pp. 17, 18.)

These are minute animals present in water (marine and fresh) and in almost all moist situations. Some are parasitic. Many of the free-living forms build hard shells, and among these are the Radiolaria and Foraminifera, which inhabit the sea, and whose shells form extensive deposits on its floor. The shells are usually microscopic, and display a very great variety of form.

(b) Sponges (Porifera). (Pl. II, figs. 12–15; pp. 18, 19.)

Sponges are immensely variable in appearance, and it is impracticable to find a definition whereby they can

be recognized at sight. The " sponge " of commerce is a familiar object, and represents one type. Others form irregular masses or thin incrustations of various colours, while others again assume the shape of vases, fans, plants, etc. The majority live on the floor of the sea, usually attached to rocks, stones or shells, and a few in sheltered situations between tide-marks. Even on sandy beaches certain kinds may be found almost buried, with only a few finger-like processes protruding. Some attach themselves to seaweeds or to animals such as crabs ; others bind together masses of calcareous debris, or make borings in shells and calcareous rocks. There are also freshwater sponges, all of the irregular or incrusting type.

(c) Coelenterata. (Pl. II, figs. 16–18, and Pl. III, figs. 19–22 ; pp. 19, 20.)

Jellyfish, sea-anemones and corals are typical members of this group, but it includes many other diverse creatures of similar fundamental structure, some solitary, others forming colonies. Almost all coelenterates are marine, but a very few are found in fresh water. The stony and horny corals are fixed colonial forms with a hard skeleton, and occur at all depths and on almost all kinds of bottom. The sea-anemones and the hydroids, sea-firs or " zoophytes " (small, plant-like, often branching organisms), are most abundant in shallow water and between tide-marks, where they live in rock-pools or on boulders, stones and seaweeds. Jellyfish of many kinds float or swim in the sea.

(d) Flatworms (Platyhelminthes).

These are more or less flattened, soft-bodied animals, commonly unsegmented and leaf-shaped, ribbon-shaped or cylindrical.

(*a*) PLANARIANS (TURBELLARIA). (Pl. III, figs. 24–26 ; pp. 20, 21.)

Chiefly aquatic (marine and freshwater), but some terrestrial and found in damp places. The marine forms are common between tide-marks and in shallow coastal waters.

(*b*) TREMATODES or FLUKES (TREMATODA). (Pl. III, fig. 23, and Pl. IV, fig. 27 ; pp. 23, 26.)

Internal or external parasites, unsegmented and usually of oval shape, with suckers and sometimes hooks for attachment to the host. As internal parasites they may be found in animals of all kinds ; as external parasites they live only on aquatic hosts.

(*c*) CESTODES or TAPEWORMS (CESTODA). (Pl. IV, figs. 28 and 29 ; pp. 23, 26.)

More or less elongate, flattened, internal parasites, usually segmented and commonly having a head bearing suckers or hooks, or both. The larval or young forms are often bladder-like, and are found in the tissues or cavities of the body of animals. The adults occur almost exclusively in the intestines of vertebrates.

(*d*) NEMERTINES or RIBBON-WORMS (NEMERTINEA). (Pl. IV, fig. 30 ; p. 21.)

Unsegmented, generally elongate, cylindrical or flattened worms, capable of great extension and contraction, and sometimes several yards long when extended. Marine ribbon-worms are abundant in situations similar to those of planarians, but a few are pelagic; others live in fresh water or in damp places on land.

(e) Roundworms (Nemathelminthes).

Cylindrical unsegmented, non-contractile worms without appendages. Some are free-living others parasitic.

(*a*) NEMATODES or THREADWORMS (NEMATODA) (Pl. IV, fig. 31 ; pp. 21–22, 27), and GORDIIDS or HAIR-WORMS (GORDIACEA). (Pl. IV, fig. 33.

Most of the larger threadworms are internal parasites of vertebrates while some of the smaller forms are parasitic on plants. Free-living threadworms, generally of minute size, are abundant everywhere, in fresh water or salt, in sand or mud, in the soil or in decaying vegetation.

The hair-worms are long, wiry-looking worms, popularly likened to animated horse-hairs. They are parasitic when young in insects and occasionally in other creatures, mostly aquatic. When mature they are free-living, usually in fresh water, more rarely on land.

(*b*) THORNY-HEADED WORMS (ACANTHOCEPHALA). (Pl. IV, fig. 32 ; pp. 23, 28.)

These are roundworms having a proboscis armed with hooks. They are all internal parasites.

(f) Rotifers or Wheel-Animalcules (Rotifera). (Pl. V, figs. 34–36 ; p. 29.)

Microscopic animals, most of which live in fresh water or in damp places, *e. g.* among mosses. A few are marine. They are solitary, and sessile or free-swimming. They possess vibrating hairs at the front end, which often give the appearance of a rotating wheel.

Several small groups, not necessarily related, may be mentioned here. The MESOZOA are minute animals living as internal parasites, chiefly in cuttlefishes. The KINORHYNCHA (Pl. V, fig. 38), GASTROTRICHA (Pl. V, fig. 37), and TARDIGRADA (Pl. X, fig. 77) are small creatures living in water (marine and fresh) or in damp places, among moss, seaweed, etc., and may be obtained incidentally when other groups are being collected. They are so small that a dissecting microscope or lens is usually required for their detection (pp. 30, 51).

(g) Moss-Animalcules (Polyzoa or Bryozoa). (Pl. V, figs. 39, 40, and Pl. VI, figs. 41–43 ; pp. 30, 31.)

These are small "zoophytes", a few of which are solitary, but the majority form branching colonies or incrustations. The marine kinds (sea-mats and lace-corals) are found attached to rocks, weeds, shells, submarine cables, the piles of piers, the bottoms of boats, etc. They live between tide-marks and at all depths. The solitary species are usually attached to other animals. The freshwater kinds form delicate plant-like colonies or gelatinous masses, growing on submerged stones, roots of trees, logs, floating plants, etc.

(h) Lamp-Shells (Brachiopoda). (P. 32.)

This is a small group of sessile animals, living in the sea at all depths. The body is contained in a bivalved shell, of which one valve is shaped like an ancient Roman hand-lamp. There is commonly an anchoring stalk which passes through an aperture recalling the hole for the wick.

(i) Starfishes, Brittle-stars, Sea-urchins, Sea-lilies and Sea-cucumbers (Echinoderma). (Pl. VI, figs. 44–47, and Pl. VII, figs. 48–50 ; p. 32.)

Typical starfishes and sea-urchins are familiar animals. The presence of radial symmetry and of a firm, spiny outer casing or skeleton of small rods and plates is a distinctive character of all members of the group except the sea-cucumbers. These have a soft, slug-like body and their symmetry is superficially bilateral. The echinoderms are marine and may be found between tide-marks and at all depths. Among the sea-cucumbers there are a few pelagic species.

(j) Ringed Worms (Annelida).

More or less cylindrical, free-living worms in which the body is divided into a series of rings or segment, each of which is usually provided with appendages or bristles, or both.

(*a*) Marine Bristle-worms (Polychaeta). (Pl. VII, figs. 51–53 ; pp. 34, 35.)

These worms generally have feelers or other appendages of various kinds. The majority have in each

segment a pair of lateral lobes from which bristles project. They are abundant between tide-marks and in shallow coastal waters. A few live at great depths, and a few are pelagic. Freshwater forms are very rare.

(*b*) EARTHWORMS and FRESHWATER BRISTLE-WORMS (OLIGOCHAETA). (Pl. VIII, fig. 54 ; pp. 37–38.)
These worms have bristles implanted directly in the wall of the body and not in paired lateral lobes. They are nearly always devoid of feelers and other appendages. They are mainly terrestrial and freshwater, but a few live on the sea-shore.

(*c*) LEECHES (HIRUNDINEA). (Pl. VIII, figs. 58 and 59 ; pp. 38, 39.)
Cylindrical or flattened animals in which the body is divided into numerous rings. They have no bristles and usually no appendages, but there is a sucker at each end of the body. They are either free-living or external parasites, and are found on land, in fresh water and in the sea.

(k) Gephyreans (Gephyrea). (Pl. VIII, figs. 56 and 57 ; p. 39.)

Finger-shaped or sausage-shaped animals, unsegmented and often with a tough body-wall and a retractile proboscis covered with small hooks. They live on the sea-floor in shallow coastal waters.

The term " Gephyrea " includes four distinct zoological groups. Other groups of worm-like animals, superficially somewhat resembling gephyreans, but not related to

them, are the ENTEROPNEUSTA and POGONOPHORA. The former live in sand at extreme low-tide mark.

(l) Arrow-worms (Chaetognatha). (Pl. VIII, fig. 55 ; p. 40.)

Small, transparent, torpedo-shaped animals having horizontal fins and bearing bristles on either side of the head. They are marine and pelagic.

(m) Jointed Animals (Arthropoda).

These include crabs, shrimps, barnacles, woodlice, etc. (CRUSTACEA) ; insects (for which see special guide) ; spiders, mites and scorpions (ARACHNIDA) ; centipedes (MYRIAPODA) ; sea-spiders (PYCNOGONIDA) and *Peripatus* (ONYCHOPHORA). All the Arthropoda have more or less distinctly segmented bodies and jointed limbs, and generally a hard external shell.

Insects have the body usually divided into three parts—head, thorax and abdomen. The head bears a single pair of feelers, and there are three pairs of legs attached to the thorax. One or two pairs of wings are commonly present. Myriapoda have a distinct head with one pair of feelers. The segments of the body are numerous and nearly all alike. There is a large number of legs, all alike and extending the whole length of the body. Arachnida nearly always have the head and thorax fused and the abdomen distinct. The thorax carries four pairs of walking legs, besides another pair of limbs in front, which often look like legs. Crustacea have the head not distinct from the thorax and carrying two pairs of feelers. The legs may be few or numerous, but are rarely all alike.

(*a*) CRUSTACEA.

These include the following groups :

(1) Fairy-shrimps and Water-fleas (BRANCHIOPODA, OSTRACODA and COPEPODA). (Pl. VIII, figs. 60–62; Pl. IX, figs. 68 and 69; pp. 40, 43.)

These form an important part of the plankton (floating fauna and flora) of lakes, ponds, etc., and of the sea. Some of them creep about in the mud and weeds on the bottom, and a few live in moss. Some copepods are external parasites, chiefly of fishes. These are the sea-lice, which are often so modified as to be unrecognizable superficially as Crustacea.

(2) Barnacles (CIRRIPEDIA). (Pl. VIII, fig. 63 ; Pl. IX, fig. 64 ; pp. 40, 43.)

Sessile marine animals, sometimes with a stalk, found on rocks, driftwood or ships' bottoms. Some attach themselves to whales and turtles. Many are parasitic, often on crabs, and these have a greatly modified structure, and look like little bags or cushions.

(3) Crabs, lobsters, crayfishes, shrimps, prawns, sandhoppers and woodlice (DECAPODA, AMPHIPODA, ISOPODA, etc.) (Pl. IX, figs. 65–67 ; pp. 40, 43.)

These animals are essentially aquatic, and representatives of nearly all the groups are found in the sea, in fresh water and in damp places on land. Some are parasitic ; the whale-lice belong, like the sandhoppers, to the order Amphipoda, and some of the Isopoda, allied to the woodlice, attack fishes and prawns.

(*b*) SEA-SPIDERS (PYCNOGONIDA). (P. 45.)

Spider-like marine animals that live between tide-marks and on the sea-floor at all depths. They have a greatly reduced body and typically seven pairs of appendages, the last four of which are long walking legs.

(*c*) SPIDERS, SCORPIONS, HARVESTERS, MITES, TICKS, KING-CRABS, TONGUE-WORMS, etc. (ARACHNIDA). (Pl. IX, figs. 70, 71 ; Pl. X, figs. 72–74 and 76 ; pp. 42, 51.)

Nearly all the Arachnida are terrestrial. Many of them are of nocturnal habit, avoiding light, and are found in dark places during the daytime. Some Mites are aquatic, either freshwater or marine. Others are parasitic on animals or plants. Ticks spend part of their lives on the ground or among vegetation, and part attached to animals, on whose blood they feed. The king-crabs are marine animals measuring up to about 18 inches in length, including a long tail. They live in shallow water and burrow in the sand. The Tongue-worms (PENTASTOMIDA) (p. 51) are worm-like internal parasites having an elongate, cylindrical or flattened body. The head is provided with two pairs of retractile, fang-like hooks.

(*d*) CENTIPEDES and MILLIPEDES (MYRIAPODA). (Pl. X, fig. 75 ; pp. 45, 48.)

These are usually nocturnal and often of burrowing habit, and are to be found in damp and dark situations. In centipedes each segment carries one pair of legs ; in millipedes, two pairs.

(*e*) *Peripatus*. (Pl. X, fig. 78; p. 51.)

This is a soft-bodied, elongate animal, bearing some superficial resemblance to a centipede or a caterpillar, and living, like the Myriapoda, in dark, damp places.

(n) Mollusca. (Pl. XI, figs. 79–84 ; Pl. XII, figs. 85 and 86 ; pp. 52, 53.)

Snails, slugs, limpets, coat-of-mail shells, tusk shells, oysters and cuttlefishes are typical members of this group. The great majority have a calcareous shell which is either single or composed of two valves. In some the shell is concealed within the tissues, and some have no shell at all. The coat-of-mail shells have a series of eight dorsal plates. Snails, slugs and their allies are marine, freshwater and terrestrial. The marine froms are found between tide-marks and at all depths, while a few are pelagic. Bivalves (oysters, cockles, mussels, etc.) are marine or freshwater, usually living in mud or sand, or attached to rocks. Coat-of-mail shells, tusk shells, squids, cuttlefishes and octopods are all marine. They live at various depths, either lying on the bottom or swimming about.

(o) Tunicates. (Pl. XII, figs. 88–91 ; p. 55.)

The tunicates are all marine. The sea-squirts are sessile, and may either be solitary or form spreading colonies on rocks, etc. The salps and some other forms are pelagic and usually transparent.