

SUGGESTIONS FOR COLLECTING TERRESTRIAL
INVERTEBRATES ON PACIFIC ISLANDS

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Introduction. The best general advice on collecting terrestrial invertebrates is to look everywhere, collect everything, preserve it carefully, and label it adequately. This comprehensive statement is especially true for the little-known islands of the Pacific where even the commonest invertebrates may prove to be of exceptional interest. The following remarks are intended to provide detailed information on specific points in collecting. It may appear that a disproportionate amount of time is devoted to the insects, but the collector will find that this is the largest group of terrestrial arthropods, both in species and individuals.

Collecting. The various methods of collecting may best be discussed separately, though in actual practice the procedures are carried on almost simultaneously. The most obvious method of collecting insects is with a net. Flying insects are encountered in greatest numbers when the sun is shining. Sweeping and beating vegetation is possibly the second most important method of collecting. In this connection a sturdy net bag is essential, or a canvas sheet, or an inverted umbrella can be placed beneath vegetation and the limbs can be beaten with a heavy stick. Beating and sweeping yield large numbers of inconspicuous insects which would be completely overlooked by other methods of collecting. The third type of collecting which should not be neglected is ground collecting under stones and logs, on roots, and in leafmold.

In addition to the above-mentioned types of collecting, which are perhaps the most important, there are numerous specialized methods that need to be mentioned. Aquatic collecting is one of these. Specimens should be sought for in ponds, taro patches, wells, cisterns, tree holes, opened coconuts, bases of leaves and fronds of Pandanus, palms and various epiphytes, and in protected coves on coral reefs or even in the open ocean. Mosquito larvae (or better still, pupae) should be collected with a net or dipper and kept alive until the adults emerge. Light collecting is another specialized, but sometimes very profitable, method. Insects are usually attracted to lights in greatest numbers on evenings when there is no moon and when the atmosphere is relatively humid. Electric lights may be used, preferably with a white background, or a Coleman lantern is satisfactory. In places where a Coleman lantern is used, care should be taken to provide white gasoline. Wood-boring insects may be collected by beating dead or dying branches of trees or by gathering such branches and rearing the larvae out in closed containers. A rich fauna will be found under loose bark and in rotting wood. Equally productive are decaying breadfruit and rotted pandanus fruit as well as other fruits which have fallen to the ground. An entirely different type of life will be found in animal carcasses and dung. Ectoparasites of man and animals should not be overlooked. These are found on the animals or in some cases in the beds or nests. Plant-feeding caterpillars including leaf miners should be reared by collecting the infested parts of the plants and placing them in cardboard or tin boxes. Additional food must be provided from time to time. This type of rearing is also very productive of parasites which might otherwise

be overlooked completely. To complete the coverage of the insect fauna, close attention should be paid to small insects which occur on the leaves and flowers of plants. These include scale insects, thrips, aphids and microscopic plant-feeding mites. The latter may only be visible under the magnification provided by a small hand lens.

Other terrestrial invertebrates include the land snails and fresh-water snails, earthworms and leeches, nematodes and planarians, Crustacea and other arthropods such as millipedes, centipedes, spiders, pseudoscorpions, etc. All of these will be encountered in the course of the various types of collecting mentioned above for insects, and especially in ground collecting, bark collecting, and aquatic collecting.

Two highly specialized types of collecting should be mentioned for the sake of completeness, though they should not be undertaken except under the direction of a specialist. The first of these is plankton collecting of Protozoa, rotifers, etc. A plankton net is necessary for this type of collecting. The other, and most specialized type of collecting is the search for endoparasites, and for blood flukes of man and animals. (See section by Marshall).

Preparation and Preservation of Material. It is obviously useless to collect material unless it is to be cared for in such a way that it will serve some useful purpose. The preparation and preservation of terrestrial arthropods is especially important in the tropics. The following generalizations may assist the non-specialist, though it is recognized that special techniques may be devised to fit unusual situations. The commonest method of killing insects is with a cyanide jar. Material killed in this way should be protected in the jar by means of tissue paper, and should be removed from the jar before specimens become damaged by rubbing or by accumulated moisture on the sides of the jar. Bees, wasps, true bugs (except aquatics), flies, mosquitoes, lacewings, many Orthoptera, moths and butterflies, dragonflies and damselflies, crane flies, and other fragile insects too numerous to mention should be killed in this way. Such insects should be curated at the end of the day's collecting. Failure to do this will result in stiffening of the appendages and excessive breakage. The moths and butterflies, dragonflies, damsel flies, and crane flies should be folded individually in paper triangles or envelopes. This prevents rubbing and is the only satisfactory way to preserve such fragile insects. The remaining types of insects killed in cyanide should be spread out on layers of cellucotton in cigar boxes or other safe boxes for shipping. The cellucotton layers should be double between each layer of insects so that specimens will not be damaged when they are removed layer by layer for mounting. Specialists may wish to pin a few of the most fragile specimens such as small gnats and micro-Lepidoptera. If it is desired to do this, minute pins should be used and a regulation insect box with tight-fitting cover should be used to store the specimens. Small Hemiptera and perhaps some other insects may be glued to small paper points and stored in this same way, but this is only recommended in cases where pinned material can be cared for properly in the field.

All of the other groups of insects and most other terrestrial invertebrates should be collected in 70% ethyl alcohol. Small procaine vials, used by dentists in most parts of the world, may be found convenient for

collecting the smaller invertebrates, but some large vials and bottles will also be needed. Land snails, which are such a characteristic feature of many Pacific islands, are better collected in water and transferred to alcohol after a few hours. This results in an expanding of the soft parts and greatly facilitates later study.

Labeling is of the greatest importance and should be done at the time the material is prepared. Because of the large numbers of specimens, it is best to label the material as fully as possible and make sure that these data accompany the specimens. The exact locality should be given in every case, together with the date and name of collector. Ecological data should be added whenever possible. Elaborate cross-reference systems, including index numbers and field notebooks, are to be discouraged because of the danger of loss of one or another of the essential elements in such a system.

Storage and shipping. Numerous hazards are likely to beset the collector in the field, the most important of which are mold, cockroaches, ants, and rats. To avoid such hazards, material should be kept in tight boxes and not allowed to remain out on tables overnight. In some cases it is necessary to hang spreading boards or exposed specimens from the ceiling by strings, and cover the strings with sticky material or protect tables by treating the logs with a DDT solution. Usually it will suffice to finish all curating in a single evening and place the material in tight boxes. Mold is an ever present menace and should be guarded against by storing material in a hot locker or in glassine bags provided with silica gel.

Specimens should be shipped to a museum or home base at the earliest possible time. Specimens may be shipped in the original boxes in which they have been layered by adding naphthalene (which keeps out museum pests and seems to prevent mold), or by adding silica gel crystals. In either case the boxes must be wrapped carefully, and preferably with water-proof wrapping because of the hazards of rain and salt water in Pacific island transport. Alcohol vials should either be full or a cotton plug should be inserted to prevent damage due to the action of bubbles. Vials should be wrapped separately in paper and then mailed in rigid cartons.

Equipment List.

- Collapsible net, e. g. fish-landing net, or other
(preferably with nylon bag)
- Cyanide bottles (several sizes--Alka Seltzer bottles with a cork top are a useful size, and smaller jars of plastic material are valuable because they are unbreakable)
- Procaine vials and larger bottles
- 70% ethyl alcohol (this may be available locally at medical supply depots)
- Paper envelopes or cellophane envelopes, glassine bags
- Silica gel
- Naphthalene
- Cellucotton
- Cigar boxes, or other wooden boxes, unless air-tight containers are available, in which case silica gel is absolutely essential to prevent mold and rotting

Insect box and pins, including minute pins (only if handled with great care)

Coleman lantern and white gasoline

Hand lens, forceps, scissors

Barking tool (crowbar, screwdriver, or heavy knife)

Small tins or pill boxes for rearing

Cotton

Conclusion. Finally, it is a good guiding principle to concentrate on small forms, because these are so often overlooked. It is also axiomatic in good collecting to take a series; one specimen of a new species is not enough and excess specimens can easily be thrown away. The opportunity to collect on a remote island may not come again for many years, if ever.

A useful reference for general collecting technique is the pamphlet by Oman and Cushman (U. S. Department of Agriculture, Miscellaneous Publication No. 601, Washington, D. C., 1946. Price 15 cents). This small pamphlet includes illustrations of the common orders of insects, as well as specific instructions for collecting and preserving insects.

Most of the above-mentioned equipment can be obtained from supply houses any place in the continental United States. One of the best known sources of such equipment is Ward's Natural Science Establishment, 302 Goodman Street, North Rochester, New York.