ISRAEL JOURNAL OF ZOOLOGY, Vol. 18, 1969, pp. 343–348

# A LIGHT-TRAP FOR SAMPLING AQUATIC ORGANISMS*

LYKA ZISMANN
*Sea Fisheries Research Station, Haifa*

ABSTRACT

A light-trap used for collecting small aquatic animals close to the shore or from an anchored vessel at sea is described. The wide range of taxa taken is tabulated to indicate the possibilities of the apparatus.

## INTRODUCTION

The light-trap in question was designed to capture small aquatic, photokinetic organisms. It can be used either to supplement conventional gear such as a beach seine or independently. It can be set close to rocks near the shore or over a rocky bottom where a seine cannot be worked. It can be set and left unattended for some time, so that a series of stations along a profile or in various habitats can be sampled simultaneously. It is more efficient than a dip-net used under a light as the trap can be lowered from 1 to at least 3 m below the surface. The latter depth level has not yet been investigated. This will depend on the level to which the lamp can be lowered.

Organisms are alive and in good condition when the trap is removed from the water. Most of the organisms found were photokinetic, but since some were occasionally found partly eaten, it is possible that some animals entered the trap seeking prey. In two simultaneous experiments using traps with lights and without, the lighted traps secured both fish and invertebrates while the unlighted ones took in one case one *Palaemon* and in the other nothing.

The traps have been used successfully from a research vessel anchored for several hours at sea. Modifications continue to be made on it.

The only previous reference made to an aquatic light-trap was by Klaus Grein in 1912. He described an underwater lamp built of cast bronze which contained flashlight batteries, a lamp and a switch to cut off the current. It could be lowered to a depth of 1000 m and he used it inside an eel-trap. On comparing the catch with that of an unlighted trap, he found that both traps took fish and lobsters but the trap with the lamp also attracted many small crustaceans such as isopods and amphipods. He also used his lamp in the mouth of a Richardson's plankton net.

Received March 13, 1969
*Contribution No. 135, Sea Fisheries Research Station, Haifa.

## CONSTRUCTION AND METHODS OF USE

Three models of the light-trap have been used successfully, all of the same design but differing in size and type of covering. Model A, used for most of the studies, is shown in Figs. 1 and 2. It is made of cloth held taut by two square metal frames (Fig. 1, nos. 5 and 12). The upper frame is connected at each corner by a bridle, or rope, to the float or buoy above; the weight of lower frame keeps the sides taut. The distance between the frames is equivalent to the width of a side of the frame. The lamps and cable are inserted through a sleeve-like opening in the top (Fig. 1, no. 6), which can be closed by a drawstring. Each side consists of four triangular panels sewn together to form a pyramid turned inwards with an entrance to the trap at the apex. Thus there are four entrances to the trap. Each pair of opposite entrances is joined by two fine strings which help keep the sides taut and the entrances fully expanded. The traps are easily collapsed for storage and transport.

The sides of the frames of Model A are 80 cm but in B and C only 60 cm and the other dimensions are reduced accordingly. The top, sides and cod-end of Model A are made of nylon fibre with a 2½ mm mesh. The seams are reinforced with 2-cm wide cotton tape. In Model B, the vertical sides leading to the entrances are made of plastic gauze bolting cloth of 0.7 mm mesh, with reinforced seams. The top and cod-end are of unbleached cotton. All the cloth of Model C is unbleached cotton.

Near the shore, the light-trap is set as shown in Fig. 2. The floating plastic container in which the batteries are sealed, also acts as a buoy supporting the light-trap. This container, of about 25 litre capacity, is sold locally. The hole in the top for the passage of the electric cable and the edge of the cover are both sealed with plastic putty and electric tape. The battery container is tied to an auxiliary buoy which is anchored to the bottom. When used from a research vessel lying at anchor at sea, a regular buoy replaces the container and the auxiliary buoy is tied to the ship.

Of several lamps tried, two were chosen: a 12 watt, 12 volt automobile lamp and a 24 watt, 24 volt lamp bulb. Under identical conditions, the trap with the stronger light took more organisms. In working near the shore it was found convenient to set the traps just before sunset and to take them up at dawn. With locally produced dry cells an all-night power supply could be assured only with the weaker lamp. The 24-watt lamp was feasible when connected to the research vessel's power supply.

Lamps and the lamp sockets were waterproofed by forcing a piece of flexible rubber tubing over the base of the socket up to the base of the bulb. The diameter of the rubber tubing was such that it snapped tightly around the lamp base. A thick fluid aquarium sealer was squeezed under the edge of the tubing which was then tightly bound with plastic electric tape.

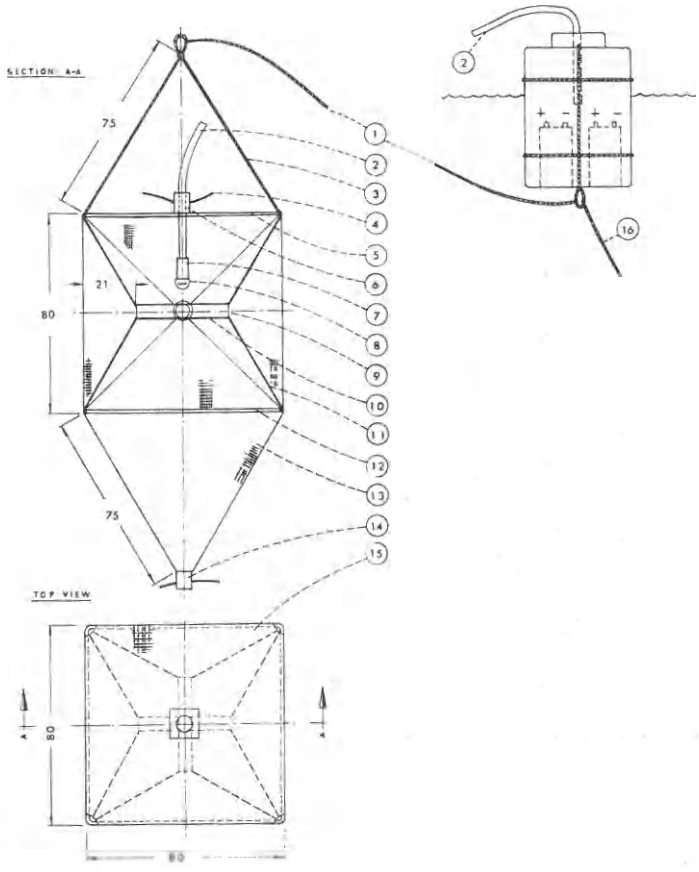


Fig. 1. Construction plan of Model A light-trap and battery container. All measurements are in cm.

1. Rope to float containing batteries — the length may be adjusted to determine the depth at which the trap is set
2. Electric cable leading from the batteries to the lamp
3. Rope or bridle supporting the top frame
4. Drawstring to close the sleeve
5. Top frame 0.8 mm diam. iron rod
6. Sleeve for lamp and cable
7. Rubber tubing covering lamp base and socket, this in turn is covered by plastic tape.
8. Lamp
9. Entrance into trap
10. String joining opposite entrances
11. Side of trap leading to entrance
12. Lower frame
13. Cod-end
14. Opening of cod-end, closed by drawstring
15. Top-view of trap
16. Rope to auxiliary float

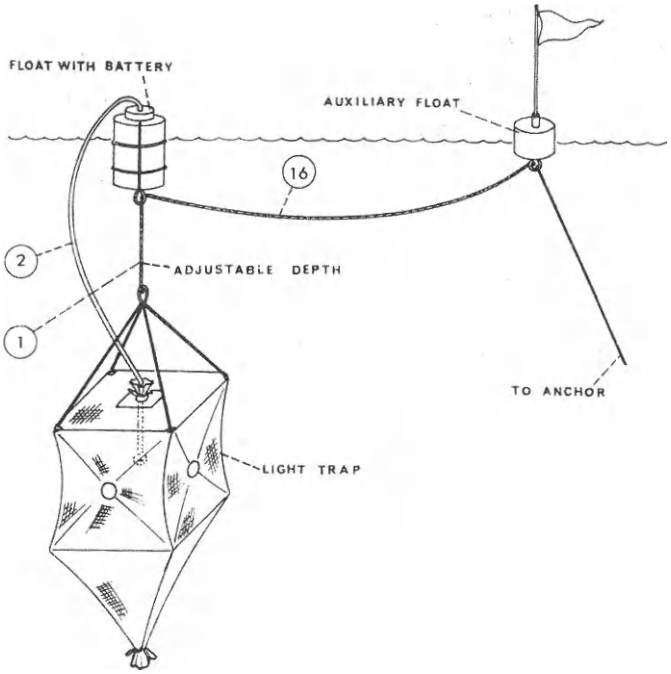


Fig. 2. The light-trap as set for sampling near shore. Nos. 1, 2, 16 as in Fig. 1.

Table I is intended to show the wide variety of organisms that were collected by light-traps in the Mediterranean and the Red Sea. An analysis of the biological data will be presented separately. In the Mediterranean Sea, the light-traps close to shore were set over both rocks and sand; offshore the traps were suspended just under the surface and attached to an anchored research vessel. In the Red Sea, the traps set at Et Tur and Sharm esh Sheikh were suspended from a research vessel anchored close to the shore and at Elat they were set near the shore with floats and anchors.

An experimental beach seine, made of the same nylon mesh as in Model A, was used to make several night hauls in the area where the light-traps were used. While some of the organisms taken by the seine were also taken in the light-trap e.g. Atherinidae and Sparidae, others such as grey mullets were taken in numbers by the seine but none were found in the light-traps. Others such as the large polychaetes, squids and blennies were taken in the light-trap but not in the seine.

Only two trials were made comparing Models B and C, these were made near the shore at a depth of $1\frac{1}{2}$–2 m. It was observed that more smaller organisms were retained by these models than by Model A. Experiments are continuing with these models as some of the organisms taken in B differ from those in C.

TABLE I

TAXA CAPTURED BY LIGHT-TRAPS

| *Taxa* | *Maximum length in mm* | *Mediterranean Sea* | | | | *Red Sea* |
|---|---|---|---|---|---|---|
| | | *inshore* 1-6 *m* | | | *offshore* 10-75 *m* | |
| | | *Model* | | | | |
| | | *A* | *B* | *C* | *A* | *A* |
| Nematoda | | × | × | × | | |
| Annelida | | | | | | |
| Polychaeta | 100 | × × | × | × × | | × × |
| Arthropoda | | | | | | |
| Crustacea | | | | | | |
| Ostracoda | | × | × × | × | × | × |
| Copepoda | | × | | × × | | × |
| Malacostraca | | | | | | |
| Stomatopoda | | | | | × × × | × |
| Mysidacea | | × × | × × | × × | × | × × × |
| Cumacea | | × | × | × | | × × × |
| Tanaidacea | | × | × | × | | × |
| Isopoda | | × × | × | × × | × × | × × |
| Amphipoda | | × × × | × | × | × | × × |
| Decapoda | | | | | | |
| Macrura | 23 | × | × | × | × | × |
| Brachyura | | | | | | |
| adult | | × | | | | × |
| megalops | | × × | × × | × | | × |
| zoea | | × | × | × × | | × |
| Arachnida | | | | | | |
| Acarina | | × | | × | | |
| Insecta | | | | | | |
| Chironomidae larvae | | × | × | × | | |
| Mollusca | | | | | | |
| Gastropoda | | × | | | | |
| Cephalopoda | | | | | | |
| Decapoda (mantle)* | 7 | × | | | × | × |
| Osteichthyes | | | | | | |
| Anguilliformes | | × | | | | |
| Clupeiformes | | | | | | |
| Clupeidae | 53 | × | | | × | × × × |
| Engraulidae | 71 | × | | | × × | |
| Atheriniformes | | | | | | |
| Exocoetidae | | | | | × | |
| Hemiramphidae | | | | | | × |
| Atherinidae | 86 | × × × | | | | × |
| Berciformes | | | | | | |
| Holocentridae | 32 | × × | | | × | |

Table I cont'd

| | | | | | |
|---|---|---|---|---|---|
| Gasterosteiformes | | | | | × |
| Syngnathidae | | | | | |
| Perciformes | | | | | |
| Serranidae | 24 | × | | | |
| Carangidae | 61 | × | | × | |
| Sparidae | 109 | × × | | × | |
| Mullidae | 40 | × | | × | × |
| Sphyraenidae | 39 | × | | | |
| Labridae | 20 | × | | | |
| Scaridae | | | | | × |
| Blenniidae | 25 | × × | | | |
| Gobiidae | 29 | × | × | | |
| Siganidae | 32 | × × | | × | × |
| Scombroidei | | | | × | |
| Pleuronectiformes | | | | × | |
| Tetradontiformes | | | | | × |
| Balistidae | | | | | × |
| unidentified post-larvae | | × × | | | × |

× — few × × — common × × × — numerous

* The Decapoda consisted of various squids, the mantle length of the largest is given.

ACKNOWLEDGEMENTS

The construction and experiments were partly financed by the U.S. Bureau of Commercial Fisheries under grant No. 14–17–007–231, and partly by the Israel National Council for Research and Development. I wish to acknowledge the helpful suggestions of Mr. M. Ben-Yami in designing the battery conaitner and lamp bulb insulation and for his advice in setting the traps. Thanks are due to Mr. A. Shmida and Mr. Y. Zimmerman for their special efforts in the field work. Thanks are also due to my husband, Avi Zismann, for the technical drawings and for helping with some of the field experiments.

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