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TABLE OF CONTENTS.

JAQUES—The Fish-feeding Coleoptera of Cedar Point.....	525
OSBORN AND DRAKE—Records of Guatemalan Hemiptera-Heteroptera with Description of New Species.....	529
BROWN—Variation in the Size of Ray Pits of Conifers.....	542
MELCHERS—Root-knot or Eelworm Attacks, New Hosts.....	551
DRAKE—Meetings of the Biological Club.....	556

THE FISH-FEEDING COLEOPTERA OF CEDAR POINT.

H. E. JAQUES.

The writer made numerous observations of the fish feeding Coleoptera of Cedar Point during a period of eight weeks in the summer of 1912. In the following summer the work was taken up in a more systematic way and efforts made to secure data as to the number of species feeding on fish, their life histories, food habits, and other items of interest.

A recital of the numerous experiments that resulted in no definite knowledge would be both tedious and unprofitable. To this class then will be assigned the repeated efforts to secure eggs of the several species by dissection and breeding cages, and the many attempts to carry larval forms thru the remaining stages to adulthood.

Fish of various sizes and species are cast up by the waves on the lake side of the Point at more or less regular intervals in large quantities. Herms* in June, 1906, counted and weighed the fish cast up from 5 P. M. to 4 A. M. of one night, along a mile of this beach. His report shows a total of 538 fish representing some 8 or 10 species and totaling in weight 20.38 kilograms. In a few days these are reduced to bones and scales. The forces exerting the most active part in this act of sanitation are the drying influence of the sun, the absorbing power of the sand, the occasional bird visitor, and the very abundant forms of insect life

* Herms. Jour. Exp. Zool. IV, 45-83.

always found associated with the dead fish. Members of the Diptera, Coleoptera, Lepidoptera, and Hymenoptera have been observed in this association. The first two orders named are by far the most abundant, both in number of species and individuals. Of these the Diptera usually far outnumber the Coleoptera in number of individuals, the only four species*, *Lucilia caesar* Linne, *Comptosomyia macellaria* Fabr.; *Sarcophaga sarraceniae* Riley, and *Sarcophaga assidua* Walker, all members of the family Sarcophagidæ, are at all common. Diptera are universally present in the larval stage and usually in large number while with few exceptions, as mentioned, later, the Coleoptera found associated with the dead fish are in the adult stage. This makes the Diptera of first importance in removing the frequent accumulation of fish. Twenty-one species of Coleoptera in all, as follows, were found by the writer associated with dead fish and apparently feeding thereon:

Silphidæ

Necrophorus americanus Oliv.
Necrophorus orbicollis Say.
Necrophorus tomentosus Weber
Silpha surinamensis Fab.
Silpha inæqualis Fab.
Silpha americana Linn.

Staphylinidæ

Leistotrophus cingulatus Grav.
Creophilus villosus Grav.
Philonthus aeneus Rossi.

Dermestidæ

Dermestes caninus Germ.
Dermestes vulpinus Fab.

Histeridæ

Hister imunis E.
Hister abbreviatus Fab.
Saprinus lugens Erichs.
Saprinus pennsylvanicus Payls.
Saprinus assimilis Payls.
Saprinus fraternus Say.
Saprinus patruelis Lec.

Mitidulidæ

Omosita colon Linn.

Scarabæidæ

Onthophagus hecate Panz.
Trox scabrosus Beauv.

It was thought that the Coleopterous scavengers might be most active at night while retiring to more secluded hiding places by day. This was disproven by night trips with lantern, when Coleoptera were found in no greater numbers than by day, except *Trox scabrosus* Beauv. This last named species was usually found in large numbers clumsily wading thru the sand, and leaving their paths as irregular lines running in every direction. When approached they play "possum" and easily pass for pebbles. Their frequency at fish by night, however, did not show a marked increase over that of the day.

One or more of the larval forms of this species may be found in their burrows in the sand a few inches under many of the fish, and are sometimes found under boards on the fish strewn beach. None were observed feeding, however, either by night or day.

Early in the period of observation it was found that fish removed from the beach to shaded places under the trees drew coleoptera in much larger number and representing more species,

than fish remaining on the beach. For a period of six weeks a number of "traps" made by covering several fish with boards were maintained at different places on the Point, and kept in continual operation by frequently adding fresh supplies of fish. Other traps similar in structure were moved from place to place every few days. It was found that location had much to do with the number of individuals present, and that the traps maintained in regions of the deepest shade were most productive. Within certain limits the number of individuals and species increased with the age of the trap. In these traps larval forms of the families, Silphidæ, Staphylinidæ and Dermestidæ were frequent. In the aggregate members of the Histeridæ were represented in larger numbers as adults than any other family, but their larvæ were never present.

During the early morning of July 25th, while making a trip along the beach two carp were found, weighing about two pounds each, not more than fifty feet apart, that had just been cast up by the waves. Over one a box 14"x18" was turned, protecting the fish from the sun and the birds. The afternoon of the 28th the box was removed and the sand for a radius of two feet from the fish and to a depth of about a foot was carefully sifted and the astonishing number of 1310 adult Hister beetles, practically all of them *Saprinus pennsylvanicus* Payk were taken. Most of these we found a few inches under the fish in the sand made wet with the juices. Accompanying these were nine adult *Dermestes caninus* Germ. To these might be added the five beetles taken from the stomach of a small toad found under the box buried in the sand. Only one of the five, however, was a fish feeder, it being *Saprinus pennsylvanicus*. Hundreds of Dipteron larvæ were present, but not the slightest trace of beetle larvæ save one of *Trox scabrosus*.

The sand around the unprotected fish of some size and kind, already mentioned, was sifted but the result was the same as that found at other unprotected fish examined at different times. Of the beetles found at such times the Histers predominated in numbers with an occasional member of the Staphylinidæ and one or two larval forms of *Trox scabrosus*. No other larval forms of coleoptera were found, the fly larvæ were always found in large number. The total number of beetles found in these unprotected fish never exceeded 100 and averaged about 50.

Some writers suggest that the Hister beetles instead of being carrion feeders may be predaceous, feeding on the larvæ of flies universally present in carrion. Several experiments in which adult Histers were confined with fly larvæ for several days with and without other food failed to show one case where a fly larva sacrificed its life to the Hister beetles. On July 31st, however, the writer saw two adults of *Silpha americana* eating fly larvæ

about 3 mm. in length. This feeding continued for some time under observation. As they walked about they would pass exposed parts of the fish to eat at piles of larvæ. Two or three larvæ would be taken up at one time and eaten with apparent relish.

By way of comparing fish and other carrion as food for these forms, the body of a cat was used as bait in a trap. When examined 17 *Silpha americana* were taken while a few others escaped. In the same morning but two beetles of the same species were found in a trap baited with fish twice as bulky in quantity as the cat and located in adjacent territory.

From these rather rambling observations the following conclusions may be drawn.

1. Coleoptera are of only secondary consideration in reducing the fish debris of Cedar Point.
2. They are most active in damp shaded places and resort to fish of the sun-heated beach only of necessity.
3. While associated with the fish on the beach they are eaten in large quantities by the sand pipers and other shore birds and doubtless must draw new recruits from more protected places to preserve their balance.
4. The larval forms, the *Trox* excepted, if fish feeding do not appear on the beach during June and July.
5. With a number of these forms fish is not their first choice as food.
6. The *Hister* beetles on the beach probably feed on neither the flesh of fish nor fly larvæ but on the juices escaping from the decaying fish.