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THE EFFECT OF POLLUTION ON MOLLUSKS IN IOWA

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The lake and kettlehole region of Iowa, lying within the Wisconsin glacial lobe between Spirit and Clear lakes, and known to the early visitors and settlers as "the thousand lake region," was formerly a rich field for the study of mollusks. Fresh water pulmonates, as well as prosobranchs and bivalves, were plentiful in every swamp, pond and lake, and in all the sluggish streams of that region.

Some of the species, such as *Bulinnea megasoma* and *Stagnicola emarginata*, have become quite extinct; others, like *Lymnæa stagnalis appressa*, *Helisoma campanulatum*, *H. truncatum*, etc., have been greatly reduced in numbers; and even the members of the *Stagnicola palustris* group, which once crowded every kettlehole and lake border, and such operculates of deeper waters as *Valvata tricarinata* and some of the Amnicolas, if not exterminated have become much reduced in numbers and distribution.

This result has been brought about in part by the drainage mania which caused the destruction of practically all the smaller bodies of water in the state; in part by the disappearance of many of the kettleholes following the breaking of the prairie; and in part, especially along the Mississippi River, by the various so-called "river-improvements" projects.

In recent years, however, another factor, namely lake and stream pollution, has come in to complete the work of destruction, and our once rich field for the study of fresh water mollusks is fast becoming barren.

This condition exists more or less throughout the state. Mollusks once abounded in the Iowa, Cedar and Des Moines Rivers,

but since their pollution by municipal and industrial agencies, most of the fine colonies have been destroyed and only a few scavengers remain. The Iowa River at Eldora and Iowa City, the Cedar at Cedar Rapids, and the Des Moines at various points from Estherville to its mouth, contained great numbers of specimens of species belonging to the genera *Somatogyrus*, *Cincinnatia*, *Amnicola*, *Campeloma*, and others, besides numerous bivalves, but after these streams were polluted practically all of this fauna disappeared. The Mississippi and some of its other tributaries, as well as the streams tributary to the Missouri, have suffered likewise.

In more recent years even our larger lakes have been similarly afflicted. Thus, some twenty-five years ago the writer made a creditable collection of fresh water mollusks from Storm Lake, but since the pollution of that lake by municipal sewage, only a few scavenger Physas seem to remain.

Many other similar cases might be cited, but perhaps the most complete and most heart-breaking destruction of a molluscan fauna has taken place in the formerly fine, and malacologically rich Okoboji Lakes, and their extension, the Gar Lakes.

In the somewhat deeper parts of these lakes (at depths down to about 30 feet) it was formerly possible to dredge large numbers of aquatic mollusks, a six-inch dipper-dredge usually bringing up from 25 to more than 100 specimens at each haul. In the deeper parts living specimens of *Valvata tricarinata*, *V. bicarinata*, *Amnicola limosa* and *lustrica*, *Cincinnatia cincinnatiensis*, *judayi* and *emarginata*, several species of *Musculium*, *Sphaerium*, and *Pisidium*, and numbers of *Lampsilis luteolus* and *Anodonta footiana* could be secured; while in shallower waters, or on beds of *Potamogeton*, *Myriophyllum*, *Ceratophyllum*, *Elodea*, etc., the following occurred more or less frequently: *Helisoma antrosom*, *campanulatum* and *truncatum*, *Gyraulus hirsutus* and *parvus*, *Menetus exacuus*, *Stagnicola emarginata* and other species of this genus, *Physa halei*, *anatina* and *gyrina*, *Ferrissia fusca* and *parallela*, and *Campeloma decisum*.

In August, 1933, after a five-year neglect of this phase of the work at the lakes, the writer again attempted to dredge at various points in these lakes, particularly in East and West Okoboji

and the Gar Lakes, where mollusks were formerly abundant, and *not a single living specimen was secured*, though great numbers of old bleached shells were brought up.

During the past summer, in July and August, 1934, the effort was repeated several times with essentially the same result, excepting that at one point, where an unpolluted streamlet enters the west lake, two or three living specimens of *Physa halei* were observed. At the same time Mr. Earl T. Rose, who was employed in research work for the Iowa State Fish and Game Commission, similarly dredged in various parts of East Okoboji Lake, with like results.

It is therefore evident that comparatively recently there has been a practically complete destruction of the molluscan fauna of these lakes, once so rich and abundant. Other damage, of course, was done, but we are not concerned with that in this connection.

The causes of this destruction are very clear. In the main it is due to the fact that the towns of Orleans, Spirit Lake and Arnolds Park have been discharging the effluent from their sewage disposal plants, or the sewage itself, chiefly into East Okoboji Lake, which connects with West Okoboji, the Gar Lakes and the Little Sioux River. In addition to this there has been much pollution from cottages and resorts, and from stock which has been permitted to wade in the shallow places.

East Lake Okoboji and the Gar Lakes, being more closely connected along the drainage outlet, have been more directly affected, but east winds drive the befouled waters of East Okoboji into those of the west lake, until finally the entire system has been polluted.

A movement is on foot, through the efforts of the Iowa State Board of Conservation, to stop the discharge of sewage into the lakes. If this succeeds, and it must if the lakes are not to be completely ruined, the study of the come-back of the molluscan fauna, now so completely destroyed, will be of exceeding interest. Fortunately very full records (with specimens) of the original fauna are preserved, and the facilities of the Iowa Lakeside Laboratory will be available for the study of the future changes.



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