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THE ECONOMIC POSSIBILITIES OF THE CRAYFISH INDUSTRY IN MICHIGAN

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In several sections of the United States the crayfish industry flourishes as one of the minor fisheries industries. In the far west crayfishes are utilized as food in San Francisco and other large cities along the Pacific coast. In the Midwest some economic use is made of the crayfish largely in the cities of Chicago, Milwaukee and St. Louis. In the south the French population of Louisiana have long considered the crayfish a great delicacy. Elsewhere many crayfishes are used as fish bait.

I. Species used as food

Along the Pacific coast the various species of Astacus (A. trowbridgii, klamathensis, nigrescens and leniusculus) are used for food.

In Missouri the species used is the exceedingly large local race of Cambarus nais figured in this report.

In Louisiana Cambarus clarkii and to some extent Cambarus blandingii are the species used.

Along the Potomac and perhaps elsewhere in the eastern states Cambarus limosus is used for food. This species has been successfully introduced in France for food purposes.

In the great lakes and especially from Green Bay Cambarus virilis has been taken for the Chicago and Milwaukee markets.

Unfortunately only an expert is able to distinguish between the various crayfish

✓ This report was prepared by Dr. Creaser in response to a request from the Department of Conservation for information on the possible propagation of crayfish. Almost nothing on this subject has been published.—Carl L. Hubbs

species.

## II. Problems of Propagation

The first problem of propagation is that of food requirements. No really adequate study of the food habits of the various species of crayfish has been made. In hatchery ponds in Michigan the crayfish quickly destroy aquatic vegetation. The species largely responsible is Cambarus immunis. Other species are known to eat aquatic insects of various sorts: mayfly nymphs, chironomid fly larvae, caddice fly larvae, stonefly nymphs. Then too crayfish are scavengers and feed upon decaying animal matter such as dead fish. In general for the Michigan species a situation with extensive weed beds and attendant insect life is favorable.

The growth rate of the crayfish species is an important item to be considered in their propagation. Some species are known to be small as adults and never attain a size useable for food. Other species attain a length of nine or more inches. In general the span of life of a crayfish is short. Definite information is lacking on most species but on at least one of the smaller forms the limit is two years. A maximum age of four or five years for the large crayfish is suggested by some workers on rather firm evidence. The age of crayfish and growth rate could be easily determined by a competent zoologist when and if desirable. Some crayfish produce upward of 200-500 eggs and a few breeding individuals would suffice for a large rearing pond. By selective breeding it is possible that even faster growing and larger crayfish could be obtained. The short span of life and the large number of eggs produced is decidedly in the favor of the propagator.

Crayfish differ as greatly in their habitat or living requirements as do the various species of fishes. For weedy situations several species are available as C. nais or C. virilis. Moving water is a favored habitat for C. neglectus and C. longidigitus both of which have economic possibilities. Muddy banks are the favorite home of C. limosus, the species which has been introduced into France for economic purposes.

It has been the writers observation that crayfish seemingly attain a larger size in limestone areas. Water heavily impregnated with lime (calcium carbonate) seemingly favors their propagation.

### III. The Hahatonka Industry

At Hahatonka, Missouri several years ago a crayfish industry was flourishing. This is mentioned here as being a particularly good example of the industry's possibilities. A small lake about 100 yards wide and 400 yards long had been formed by placing a dam across a small stream. The water in the lake is cold, about six feet deep and has its source from a cave. Brook trout live in the outlet of the artificial lake. Huge beds of weeds are now found in the lake. Quite by accident it was discovered that C. nais was plentiful in the lake. At the time the writer visited the estate (1930) crayfish had been removed from the lake for fifteen years. About 6000 a week was the yield but no females were shipped when the young were still attached. These crayfish were shipped to market in St. Louis, Mo. where they were sold for one and one-half cents per crayfish. The gross income of the farm was \$360 per month for ten months of the year.

From Hahatonka, the crayfish were shipped from Lebanon to St. Louis in market baskets which held about 100 crayfish. The crayfish were taken from a storage box and shipped directly without any packing whatever. The loss in transit was negligible except in very warm weather. The business was very profitable according to Mr. Snyder, owner of the estate. The crayfish were caught on this estate by using traps. These were made of nail kegs with both ends knocked out and wire cones inserted. The ordinary minnow traps are constructed along the same lines. Dead suckers were used as bait. In the marshes of Louisiana seines and dip nets are used to capture the crayfish.

### IV. Available Markets

The crayfish before the repeal of prohibition were used on the free lunch counters of saloons. At the <sup>present</sup> time the available markets are restaurants, beer gardens and fish markets. The meat of the crayfish is white, sweet and exceedingly delicious in the opinion of the writer. For no reason at all there is to some people an abhorance in the thought of eating crayfish. Quite likely the marketing could be facilitated by calling these animals fresh-water lobsters which is in no sense a misnomer.

### V. Conservation Measures

The primary conservation measure in crayfish propagation is to prohibit the marketing of females with young attached. The purpose of this conservation measure seems apparent. A closed season during the breeding season might also be desirable.

#### VI. Enemies and Parasites.

The enemies of the crayfish are the game fish and certain game animals such as muskrat, raccoon and otter. The crayfish also has some parasitic infestations such as the larval stages of Crepidostomum and Paragonimus. Paragonimus is the lung fluke of the Orient where raw fresh-water crab flesh is eaten. The crayfish in the United States acts as the intermediate host of a species of Paragonimus. There is however little danger in eating crayfish in this country because the larval stages encyst apparently only in the heart of the crayfish which is never used as food. The snails which harbor the cercarial stage of the parasite live on the land near the margin of the water. Periodic burning of the grass along the shore would probably kill off the species of snail involved. Cooking of the food such as is generally practiced of course renders the parasites ineffective.

In France at one time a protozoan parasite killed off many of the crayfish and threatened the whole industry. Overcrowding of the stock was probably a contributing factor in this disease.

#### VII. Utilization of By-Products

Under certain circumstances where fresh-water lobster meat could be shipped directly to market by-products would become available. These would include parts not eaten and these might be ground and used for food in hatcheries or as tropical fish food. Perhaps such by-products could be used as feed for chickens.

#### VIII. Economic Possibilities of Crayfish Propagation in Michigan.

The writer believes that the crayfish rearing pond has economic possibilities. Small streams which do not now contribute to the Fisheries resources of the state could be utilized. The major facts to be considered in the propagation are listed or outlined below.

1. Choice of species: In Michigan Cambarus virilis is the only species of economic importance. It might prove desirable to attempt the introduction (under controlled conditions) of species from other states. Cambarus nais of southwestern Missouri (figured in this report) is the species recommended for introduction.

2. Choice of location: An area where game fish and game animals can be controlled is essential. The chemistry of the water must be suitable. (Tests will be made at cost for private individuals by the Institute for Fisheries Research). The proximity and nature of the available market should be considered in the choice of a location. It is further recommended that in the selection of a location burning can be practiced to control snails which harbor parasitic infections.

3. Miscellaneous considerations: Crayfish rearing ponds once established require little attention. The establishment of a rearing pond should be attempted only in connection with other part time enterprises. The writer is willing to identify material and to answer additional inquiries regarding the possibilities of crayfish propagation.



Crayfish raised in ponds at Hahatonka, Missouri