# DEPARTMENT OF THE INTERIOR

## INFORMATION SERVICE

FISH AND WILDLIFE SERVICE

For Release SUNDAY, APRIL 13, 1941.

BAIT-FISH CULTURE FAST
BECOMING BIG BUSINESS

With the beginning of the general sport fishing season at hand throughout the country, some 12,000,000 anglers are giving extra thought these days to the subjects of flies, spinners--and bait. That last matter, however, would be our chief subject for discussion.

For fresh-water anglers who consider live minnows as "tops" for bait are running into difficulties in securing sufficient quantities of their favorite lure. Dealers, also, are becoming increasingly aware of the scarcity of minnows in our inland waters; and the old-timers handling this commodity complain that they can no longer keep supplied with minnows from natural waters. Once it was a simple matter for them to net their supply quickly from nearby waters; now, the cry is that they must go long distances, seine for hours, and even then return, in most cases, with a small and inferior catch.

The solution to this problem, according to the Fish and Wildlife Service, United States Department of the Interior, has been found by some dealers who are now propagating their own bait. By so doing, these dealers not only are instrumental in reserving the natural food supply in our waters for the native game fish but, in addition, are providing anglers with a better-conditioned bait--the

latter achieved by having the minnows at hand in their natural home, thus eliminating crowded conditions in the holding tank. Rearing ponds become holding tanks as well as a source of supply, and the transporting of minnows from distant streams in crowded cans is unnecessary.

Not only has the constant taking of minnows from our inland streams and lakes reached the point where bait minnows are hard to get: their scarcity is beginning to have an adverse effect upon game fish, for the taking of minnows reduces the food supply for game species. Thus, in turn, the supply of game fish is reduced. Forage fish, such as minnows, constitute the greater portion of the diet of our game fish, particularly for bass and trout, since these fish are carnivorous and prefer live food. It is readily apparent, therefore, that the depletion of game fish will tend to discourage the angler and, in turn, the bait dealer slowly to lose his business.

Recognizing the danger to game fish through the depletion of minnows in natural streams, some States--Texas and Michigan, for example--have put into effect regulations prohibiting the seining of minnows from certain of their fishing waters. These restrictions have given considerable impetus to commercial propagation of bait-fish, with the result that supplying live minnows to the country's army of anglers is rapidly becoming "big business".

A guide to persons who wish to raise their own bait, Fishery Circular No. 28, "Propagation of Bait and Forage Fish", published by the Service, says this: "The propagation of bait in small artificially constructed ponds, or in natural ponds of limited area, is a simple task and, with proper management, will provide a supply of bait which will justify the expense of construction and maintenance.

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species of small fish, such as the mud minnow and brook silversides, belonging to other families, that are used as bait. However, the Cyprindae family contains the greatest number of bait species.

"A minnow is not just any small fish, as many people believe, nor is it the immature stage of some game fish. With the exception of a few species, they seldom exceed a length of 10 inches. The best field character, to determine a minnow from a game fish, is the fin on the back. This fin on the true native minnow is soft; short, and has no spine. There are, however, other fish that have soft fins on their backs such as the suckers, whitefish, and trout. The fin on the back of the minnow is shorter than that on the sucker."

"A good bait minnow", continues Markus, "must be active and hardy on the hook, and be able to withstand adverse conditions in the bait pail and holding tank. The brighter the coloration, the more attractive fishermen believe it to be game fish, because the highly colored minnows may be seen for greater distances. This color may be a shade of yellow, red, green, or brown, or it may be of a silvery hue. The golden shiner, horned dace, common shiner, and redfin have become famous for bait because they possess the above qualities."

Bearing this out were the results of a survey, made some time ago, among Izaak Walton League members to find out what bait minnows each liked best. Their order of preference indicated Golden shiner, horned dace, common shiner, and the blunt-nosed minnow.

Before undertaking the artificial propagation of minnows on a commercial scale, it is first necessary to discover what desirable species are native to your particular locality, since these will generally do better than imported ones. There are a few species, however, which are native to all sections of the United States except the West Coast: the golden shiner, horned dace, and blunt-nosed minnows are examples.

Minnow ponds may be any size or shape, and it is better to have several small ponds instead of a single large one. The ideal pond is from 1/4 to one acre in area, although one only 25 feet wide by 75 feet long will yield a good production of minnows. It should be one foot deep at the shallow end, and slope to a depth of 4 or 5 feet at the deep end. As a primary requisite for good management, all ponds must be constructed so that they can be drained.

Tapping creeks or rivers provides an excellent water supply; although springs--since they offer a constant flow--are the most desirable source. If the latter supply too much water, a portion should be bypassed. In any event, only sufficient water to keep a constant level should be used.

"Contour of the land, plus available water supply", emphasizes Markus, "must govern pond construction. They may be built by excavation or by throwing up dykes, or both. The damming up of a small creek valley into a series of ponds often makes an ideal set-up."

From experiments carried on at the former Fairport, Iowa, fish cultural station of the Service, it has been demonstrated that the golden shiner lends itself readily to intensive culture in small ponds. For example, a brood stock of approximately 50 shiners in a pond whose area slightly exceeded 2,500 square feet, yielded about 2,000 fingerlings.

In a single season, one known pond with an area of .034 acres produced 6,867 fingerling blackhead minnows from 91 adult fish. This species spawns continually from the latter part of May to early August, and during this time seeks to deposit its eggs beneath submerged objects to which the eggs adhere. The tendency was met by floating boards on the surface or driving them horizontally into the bank. The pond was fertilized several times during the season to augment the natural food.

The presence of aquatic vegetation is essential for the propagation of minnows. Fertilizer, such as cow and sheep manure, or small quantities of sewage reduction sludge, added to the water stimulates the growth of vegetation and also serves as food for daphnia or water-fleas, nymphs, and larvae of insects. A bushel of either cow or sheep manure should be added to a quarter-acre pond every ten days. Care must be exercised, however, not to over-fertilize.

Minnows also feed directly upon a number of artificial foods such as shrimp meal, fish meal, cottonseed meal, middlings, bran, tankage, dried skim milk, and soy-bean meal. A mixture of shrimp or fish meal, with some of the grain meals made into a mash and dried and ground, makes a good food. Bread scraps are also excellent. Any of these foods that are not directly taken by the minnows serve as fertilizer for the aquatic plants, water-fleas, and nymphs of insects, which in turn make natural food for the minnows.

Frequently the first obstacle encountered by the commercial minnow-culturist is the securing of adult minnows for breeding stock. Very few of the State hatcheries are able to furnish them; but occasionally private commercial pondfish hatcheries maintain a stock of the more common species, such as the golder shiner. Main reliance, however, must be placed upon seining or trapping the adult stock from natural waters. State laws usually govern such an enterprise, and inquiry should be made of the State conservation authorities to ascertain what regulations, if any, apply. Since the private propagation of bait is a desirable conservation measure, State officials will undoubtedly be as liberal as possible in authorizing the seining of breeding stock from public waters.

It is better to rear only one species in a pond, but frequently two species will do fairly well together. For those species where the eggs are taken and hatched artificially, two or more species may be released in the same pond.

The best results will be obtained if an equal number of males and females are released to spawn naturally. The number of brood fish to be placed in a pond for natural spawning depends upon the number of breeders available and the size of the pond. A satisfactory crop may be obtained from 50 pairs of breeders in a quarter-acre pond, but it is more desirable to stock this size pond with 100 to 200 pairs.

"Bait dealers should instruct anglers in the care of the minnows they purchase", cautions Markus. "They should not overcrowd the angler's container, even though it may mean a smaller sale. If the minnow pail is crowded, the angler will probably lose his bait before he gets to fishing waters. The angler would then accuse the dealer of having weak minnows and would not return for further purchases.

"When the minnow pail is not provided with an aeration device, the purchaser should be advised to aerate the water in his pail at frequent intervals while traveling on the road. Aeration of the water, or 'fanning the fish'--a phrase that is often used--is accomplished by dipping up water and pouring it back into the pail. Repeat this process about a dozen times and the fish will have good water again. This operation picks up the oxygen from the air, and excess carbon dioxide in the water is released into the air. It is much better than changing or adding water from different water supplies.

"If the angler has a long trip to make, advise him to put ice into the water with his minnows. Add the ice slowly until the temperature reaches about 55 degrees. If the water temperature is kept at this point, the minnows will need less fanning, for cool water slows down the rate of breathing and picks up more oxygen than warm water. When the angler reaches the fishing ground, if the water in the minnow pail is colder than the body of water to be fished, warmer water

should be gradually added to the pail. As soon as this is done, the angler usually places the pail in the water to be fished. If this procedure is followed, the minnows will be more active and work better on the hook."

Fishery Circular No. 28, "Propagation of Bait and Forage Fish", containing detailed instructions for the commercial propagation of minnows, is available at 5 cents a copy from the Superintendent of Documents, Government Printing Office, Washington, D. C.

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