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THE RETAIL BAIT-FISH INDUSTRY IN PENNSYLVANIA — SOURCE OF INTRODUCED SPECIES[1]

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ABSTRACT

After identifying the non-native rudd minnow, *Scardinius erythrophthalmus*, obtained by the Pennsylvania Fish Commission from a Pennsylvania retail bait-fish store, a survey was designed to determine the potential that bait-fish retailers may serve as sources for the introduction of exotic fishes. The state was divided into six areas with 15% of the licensed live bait-fish dealers in each area randomly selected. Over 100 of the 761 live bait dealers in the state were visited, interviewed, and their bait-fish identified. Eighty-three percent of the surveyed retailers sold fathead minnows, *Pimephales promelas*, and 80% sold golden shiners, *Notemigonus crysoleucas*. Seven species not on the Pennsylvania Fish Commission's approved bait-fish list were identified. Five cyprinid fishes collected were infested with glochidia, the parasitic larval stage of freshwater mussels. There was no evidence to support intentional importation or selling of non-native fishes. The rudd minnow was not observed during our survey.
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INTRODUCTION

Courtenay and Stauffer (1984) summarized potential impacts of introduced fishes, including the possibility of gene pool alteration or extirpation of indigenous fishes. For example, Deacon et al. 1964 attributed the elimination of a local population of *Rhinichthys osculus* (Girard), to the introduction of six exotic species in Nevada. Stauffer and Hert (1992) documented changes in morphology of endemic haplochromine cichlids in Lake Malawi following intralacustrine introductions, and hypothesized on the occurrence of introgression. Raesly et al. 1990 documented the occurrence of hybrids between *Etheostoma olmstedi* Storer and *Etheostoma zonale* (Cope), following the introduction of the latter species into the Susquehanna River. Certainly, the most widely referenced example of the devastating impact of an introduced fish is the establishment of the Nile perch, *Lates niloticus* (Linnaeus), into Lake Victoria (Hocutt et al. 1992), leading to the extinction of several undescribed fish species (Barel et al. 1985).

Bait-fish are one of several sources of introduced fishes that can successfully colonize and disrupt the balance and distribution of the indigenous fish community (Stauffer 1984), Courtenay and Taylor 1986, Stauffer et al. 1988, Raesly et al. 1990). For example, the Arkansas River shiner (*Notropis girardi* Hubbs and Ortenburger) is suspected of being introduced into the Pecos River, New Mexico by anglers releasing bait-fishes below Summer Dam (Bestgen et al. 1989). From its presumed point of introduction in 1978, the Arkansas River shiner had been reported 260 km downstream by the fall of 1981 and another 98 km farther south by 1987 (Bestgen et al. 1989). Another suspected bait-fish introduction, the banded darter, *E. zonale* extended its range 400 km in less than eight years after it was introduced into the upper Susquehanna River (Raesly et al. 1990). In spite of these potential adverse impacts, there have been few other studies concerning the live bait-fish industry aside from those that concentrate on the propagation, catching, or marketing aspects of bait-minnows (Cross et al. 1974, Van Eeckhout 1978).

Approximately 159 species distributed among 24 families inhabit the waters of Pennsylvania (Denoncourt 1975, Cooper 1983). These fishes are derived from the ichthyofauna of the Mississippi Valley, Atlantic Slope, and Great Lakes drainages. Although there is overlap of fish species among drainages, certain fishes are confined to selected river systems. Clearly, the indiscriminant introduction of fishes among drainages could have adverse impacts on indigenous faunas. Thus, we designed a survey to determine if bait-stores in Pennsylvania were a potential source of non-native fishes.

METHODS AND MATERIALS

We obtained a complete list of the 761 licensed live bait dealers in 1990 from the Pennsylvania Fish Commission's Bureau of Administrative Affairs. In an attempt to survey at least 10% of the bait-dealers, a random numbers list for 15% of the bait-stores throughout the state was generated. Ten bait-dealers in the vicinity of State College, which were not included in the final results, were given a pilot survey

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to evaluate its effectiveness. Subsequently, each of the randomly selected bait-dealters was visited and interviewed, and their bait-fish identified. Certain voucher specimens were obtained, preserved in 10% formalin, transferred to 50% isopropanol, and placed in permanent storage in the Pennsylvania State University Fish Museum.

RESULTS AND DISCUSSION

Of the 100 dealers contacted, we received 87 complete responses, which represented 44 of the 67 counties in the state (Figure 1). Eighty-three percent of the retailers that carried bait-fish sold fathead minnows, *Pimephales promelas* Rafinesque, and 80% sold golden shiners, *Notemigonus crysoleucas* (Mitchill). Seven species not on the Pennsylvania Fish Commission's approved bait-fish list were identified: sea lamprey, *Petromyzon marinus* Linnaeus; alewife, *Alosa pseudoharengus* (Wilson); brown trout, *Salmo trutta* Linnaeus; rainbow trout, *Oncoryhnchus mykiss (Walbaum)*; striped shiner, *Luxilus chrysocephalus* Rafinesque; spottail shiner, *Notropis hudsonius* (Clinton); and black bullhead, *Ameiurus melas* (Rafinesque) (Table 1).

Although alewife, brown trout, rainbow trout, and black bullheads are not approved bait-fish, they can be sold by retailers that possess a fish dealer's license. Sea lampreys are explicitly prohibited from being sold or transported within the state. A fish dealer's license permits the sale and transportation of 93 fish species versus 48 species permitted under the live bait-dealer's license. Although most retailers carry the live bait-dealer's license, several stores located near Raystown Lake possess a fish dealer's license specifically to sell trout as bait for striped bass, *Morone saxatilis* (Walbaum).

Spottail shiners, striped shiners, black bullheads, and sea lampreys were collected from retailers, who supposedly acquired these fishes from wholesalers of bait-fishes captured in lotic habitats in New York. These fishes, termed river-bait, were observed only along the New York border, although Pennsylvania adjoins five other states. The presence of the black bullhead is of particular interest, since

TABLE 1. Bait fish species collected from 46 Pennsylvania bait dealers.

Species	Common Name	% of Dealers with Given Bait Fish on Hand When Visited
Pimephales promelas	fathead minnow	83
Notemigonus crysoleucas	golden shiner	80
Catostomus commersoni	white sucker	17
Salmo trutta ***	brown trout	9
Fundulus heteroclitus	mummichug	7
Notropis athernoides	emerald shiner	4
Semotilus atromaculatus	creek chub	4
Notropis ludibundus	sand shiner	2
Rhyinicthys atratulus	blacknose dace	2
Moxostoma erythrurum	golden redhorse	2
Oncorhynchus mykiss **	rainbow trout	2
*Petromyzon marinus***	sea lamprey	2
*Alosa pseudoharengus***	alewife	2
*Notropis hudsonius***	spottail shiner	2
*Luxilus chrysocephalus***	stripped shiner	2
*Ameriurus melas***	black bullhead	2

*Not collected but visually identified in bait store.
** Not listed on the Pennsylvania Fish Commission approved live bait-fish list.

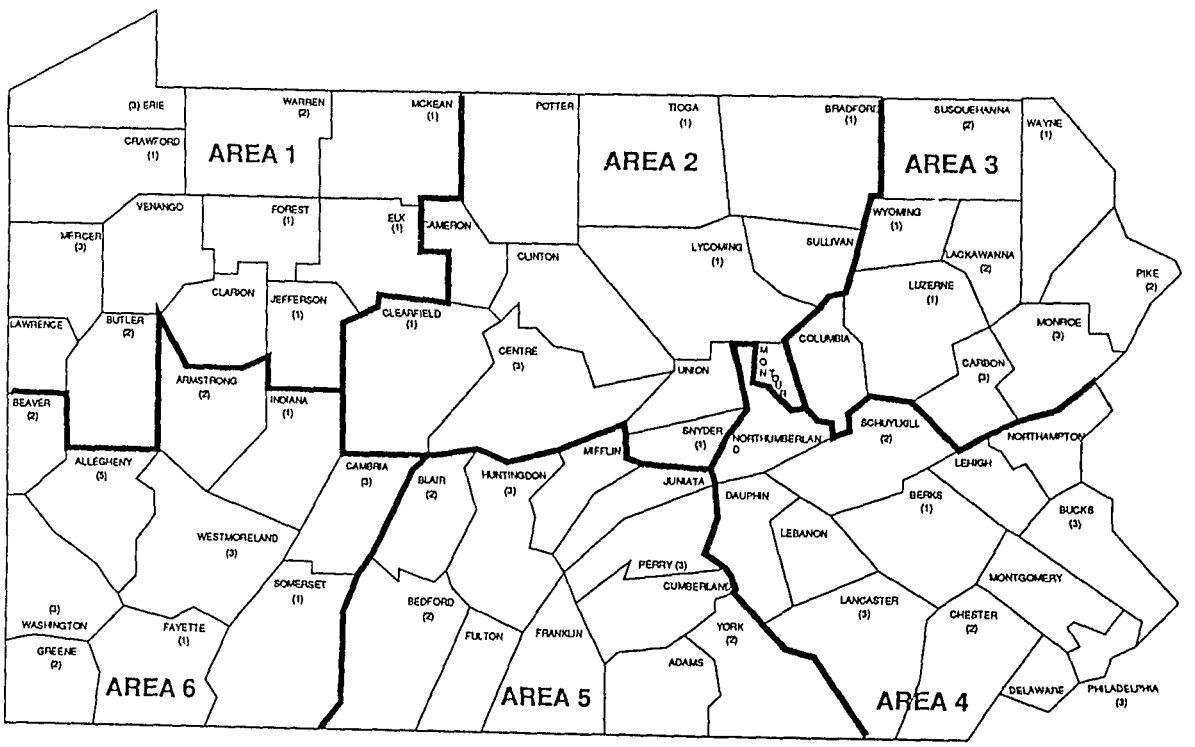

FIGURE 1. Map of Pennsylvania showing the six areas surveyed. Numbers in parentheses indicates number of dealers surveyed in that county.

Cooper (1983) reported no recent records from Pennsylvania and Smith (1985) regarded this species as rare in New York, with the only recent record from the Genesee River.

In addition to the risk of introducing nonindigenous fishes into the open waters of Pennsylvania, diseases and/or parasites may be imported along with fishes (Shafland 1986). For example, five cyprinid fishes sold as New York river-bait were infested with glochidia, the larval stage of freshwater mussels (Unionidae) that parasitize fishes. Hence, it is possible that exotic mussel species may be transported between drainages with bait-fish.

There was no evidence of deliberate importation of nonnative fish species. This study was initiated because we identified the rudd, *Scardinius erythrophthalmus* (Linnaeus), which the Pennsylvania Fish Commission obtained from a bait-store in eastern Pennsylvania in 1990. The rudd is native to Europe and eastern Asia; it is a legal bait-fish in New York, but not in Pennsylvania. Immediately after the rudd was identified, the Pennsylvania Fish Commission published notices reaffirming that the rudd was an illegal bait-fish. We did not observe any rudd during our survey, although three bait-dealers stated that previous to the fliers mailed by the Pennsylvania Fish Commission in 1990, they sold this species.

Based on our survey results we recommend that the sale of river-bait be prohibited within Pennsylvania. Composition of river-bait is likely to include species not on the approved live bait-fish list. While it is probably unrealistic to issue bait-fish licenses on a regional basis within the state, we recommend that a program to educate fisherman about the potential problems associated with the indiscriminant introduction of fishes across drainages be initiated.

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