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Marking and Tagging of Aquatic Animals: An Indexed Bibliography



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By Lee Emery
Richard Wydoski



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Marking and Tagging of Aquatic Animals: An Indexed Bibliography

by

Lee Emery¹ and Richard Wydoski²

*U.S. Fish and Wildlife Service
Fisheries Academy
National Fisheries Center—Leetown
Kearneysville, West Virginia 25430*

Abstract

This bibliography is a compilation of selected references on the marking and tagging of aquatic animals, with special reference to information on different kinds of marks or tags that are available, techniques of application, retention or recovery of marks or tags, and the effects of marks or tags on the organism. The references are arranged alphabetically by author, consecutively numbered, and indexed by key words that enable easy access to references on particular subjects. The references are about equally divided between methods of marking fish and methods of marking other aquatic animals.

The marking or tagging of animals is an important technique in fishery and wildlife management. It is used in fishery management and research to obtain information on such topics as stock assessment, migration, behavior, age validation, mortality, population size, and stocking success. All marks or tags have capabilities and limitations that must be considered in choosing a particular mark for specific purposes. The published literature on this subject is extensive but has not been compiled in a readily usable form. This bibliography is a compilation of selected references that should be useful as a starting point for biologists who are planning to mark fish or other aquatic animals.

Thousands of tagging operations have been conducted over a span of several centuries. It is uncer-

tain when fish were first marked, but one of the earliest references was provided by Izaak Walton in his treatise *The Compleat Angler*, which was first published in 1653. In the fifth edition, Walton and Cotton (1898) described the 15th century recovery of a tagged "pike"³ and discussed Walton's technique of marking fish by tying a colored ribbon to the caudal peduncle. The marking of fish and other aquatic organisms encompasses a wide variety of techniques that range from the simple, such as attaching chicken wire to an organism or mutilating fins or toes, to the much more complex, such as identifying coded wire tags with x-rays, using satellites to monitor organisms tagged with electronic devices, or branding with laser beams.

The references in this bibliography were selected to include some early historical studies that summarized the literature available at that time, or provided the first record of use of a specific mark or application technique. Others—such as those on radio and sonic tags—concern the use of these devices on a variety of fish and other aquatic animals. However, most of the references concern the different kinds of tags that are available; techniques of application, retention, and recovery of

¹Present address: Federal Energy Regulatory Commission, Office of Hydropower Licensing, 825 N. Capitol Street, N.E., Washington, D.C. 20426.

²Present address: U.S. Fish and Wildlife Service, P.O. Box 25486, Denver Federal Center, Denver, Colo. 80225.

³The authenticity of this tagging has been questioned. (W. B. Scott and E. J. Crossman. 1973. Freshwater fishes of Canada. J. Fish. Res. Board Can. Bull. 184.)

marks or tags; and the effects of tags on the organisms. Emphasis is on references published from 1950 to the early 1980's. In general, works published after 1970 contain most of the pertinent information needed to enable a biologist or manager to choose the type of mark and technique that is most appropriate.

Most of the references are easily accessible through libraries. Many references on fish marking published in foreign journals were omitted because they could not be readily obtained and the results or techniques discussed were similar to those obtained from studies conducted in North America. Many references for animals other than fish were found in foreign publications that can be obtained from most large library systems. In general, the references are rather evenly divided between freshwater and marine organisms. We have included four periodicals (*International Marine Angler*, *Underwater Telemetry Newsletter*, *Marine Turtle Newsletter*, and the *Newsletter of Cooperative Shark Tagging Program*) in this bibliography because they usually contain helpful information about tagging or marking.

An on-line computer search was performed by using the DIALOG data base service. The files searched were BIOSIS (Biosciences Information Service, Files 5 and 55), AQUACULTURE (File 112), AQUATIC SCIENCES AND FISHERIES ABSTRACTS (File 44), and FISH AND WILDLIFE REFERENCE SERVICE DATABASE (File 957). Sets of key words (singular and plural) were combined with other key words to identify pertinent references. The first group of key words included brand, branding, clip, clipping, mark, marking, radio transmitter, tattoo, and tracking. These terms were then combined with biosystematic codes in BIOSIS that represented the following animals: abalone, alligator, clam, conch, crab, crayfish, crocodile, dolphin, fish, frog, leech, lobster, mussel, newt, octopus, oyster, porpoise, prawn, salamander, scallop, shellfish, shrimp, squid, tadpole, turtle, water snake, and whale. These key words were entered individually into the other data bases that do not have systems for coding animals. The following animals were encountered while we were developing the bibliography and are listed here to show the variety of animals that are included in the bibliography: banana slug, caiman, insects, manatee, marine sandworms and bloodworms, sea anemone, sea

cucumber, sea hare, sea urchin, shark, sponges, starfish, sting ray, toad, and whelk.

Selected key words were used to index the references for convenience and ease in locating the literature on particular tags, marks, techniques, or factors affecting the recovery of tags or marks. Although most of the key words are standard descriptive terms, the use of several for this bibliography should be clarified. The category **Chemical Marks** includes materials such as adhesive resins, dyes, fluorescent pigments, inks, polymer injections, radioisotopes, stains, and tattoos. **General Tagging** includes references that offer detailed reviews on particular tagging methods or summarize many different kinds of tags, marks, and techniques. The 12 subdivisions of the category **Physical Marks** are mostly self-descriptive but the following should be defined: **Branding** includes laser and thermal marks; **Vinyl Tubing Tags** include all vinyl plastic tags such as carapace, dart, Dennison, flag anchor, herring, ribbon, roto, spaghetti, sphyron, streamer, and toggle; **Petersen Disks** include bachelor button, cheek tag, Heincke stud, and other tags of the pin-and-disk type; **Dangler Tags** include such types as anchor, Atkins, Carlin, fingerling tags, hydrostatic, internal anchor, and Lea; and **Other Tags** include all the other types of marks that do not fit into one of the 12 subdivisions of **Physical Marks** (e.g., bobbers, chicken wire, hooks, luminescent tape, paint, paper clips, photographs, rubber bands, scars, and x-ray films). Eels (*Anguilla*), striped bass (*Morone saxatilis*), and salmon (*Oncorhynchus* spp. and *Salmo salar*) were arbitrarily excluded from the category of marine fishes, and appear in the non-designated category of freshwater species.

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