

Using Injected Dyes For Marking Fish

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Abstract

An easy, economical method for marking fish by injection of acrylic polymer dyes was studied in the laboratory and the field. Forty-two fish in the laboratory retained recognizable color marks after 8 months and 8 fish that died retained marks at the time of death.

Fish marked in the field with dye and an accessory pelvic fin clip revealed that the dye remained recognizable in 92% of the recaptured fish after 6 months. Fish recaptured in the second year of the study that had been marked in the first year revealed only 32% had retained a recognizable color mark. None of the fish examined showed adverse effects from the injection. The data show that the dye is retained well for 6 to 8 months, but retention of the dye beyond a year is poor.

Introduction

Kelly (1) conducted experiments with over 150 chemicals to determine easily identifiable, long-lasting, weightless, and harmless colored marks. Two of the 13 chemicals found to be durable for 6 months were Naphthol ITR Crimson and Mars Black. Both of these colors belong to the acrylic polymer emulsion family. Arnold (2) tested 2 other members of this family (Cadmium Red Medium and Phthalocyanine Green) and found them to be recognizable after 165 days. Eighteen colors of acrylic polymer, available in paint stores under the brand name Liquitex¹ (Table 1), were used for both the laboratory and field studies. They are inexpensive, non-toxic, and come in metal tubes for easy handling.

TABLE 1. *The 18 dyes used to mark fish in the laboratory and field tests. A + indicates an easily recognizable color, — indicates colors which were difficult to separate from similar colors.*

Name of the dye	Name of the dye
Acra Violet +	Cerulean Blue +
Permanent Green Light +	Yellow Orange Azo +
Indo Orange Light +	Hookers Green +
Phthalocyanine Blue +	Cadmium Orange +
Cadmium Yellow Light +	Raw Sienna —
Naphthol ITR Crimson +	Yellow Oxide +
Mars Black +	Burnt Umber —
Dioxazine Purple +	Titanium White +
Burnt Sienna —	Cadmium Yellow Medium +

¹ "Liquitex" is a registered trade mark used by Permanent Pigments, Inc., Cincinnati 12, Ohio.

Methods

Kelly (1) injected dyes in the surface skin area of the jaw and cheek pad of his test fish. The dye was injected using a 2½ cc disposable plastic syringe and #25 needle (⅝" long). In the present study only the base of the pectoral and pelvic fins was injected. The needle was inserted into the fin base and dye was released until it spread out into the fin rays. Marking technique rather than the amount of dye is more important to produce a long-lasting mark. To be sure the dye will stay, some of the dye must be placed at the base of the fin rays and near the surface of the fin base. If too much dye is applied, the dye that is near the surface will cause the overlying tissue to slough away and the mark will be lost. The mark remains recognizable on the inner surface of the fin base better than on the outer surface.

A disposable plastic 10 cc syringe and #26G needle (¾" long) were used to inject the dye. This Plastipak² unit is very practical and economical.

The dye will stay fluid in the syringe, but the needle will clog if stored a week or more. New needles will occasionally have to be used on the old syringe body, because of the clogging and dulling. The dye can be put directly into the syringe from the metal dye tube and replenished as it is used.

Laboratory Tests

Fish were kept in large, glass aquaria, an 80 gallon plastic tank, and a plastic-lined horse trough in the Indiana State University greenhouse. In the late summer of 1969, 2 bowfin *Amia calva*, 2 grass pickerel *Esox americanus vermiculatus*, 8 carp *Cyprinus carpio*, 10 bluegill sunfish *Lepomis macrochirus*, 15 longear sunfish *Lepomis megalotis*, 2 spotted bass *Micropterus punctulatus*, 1 largemouth bass *Micropterus salmoides*, and 10 white crappie *Pomoxis annularis*, ranging in length from 5 to 14 inches were injected in the pectoral and pelvic fins with a different color in each fin. The fish were maintained on a diet of red worms throughout the test.

Field Tests

Fish in the field were marked with a single color in one fin to designate the time and area in which they were captured. All fish were captured with a battery-powered, DC shocking unit. The fish most often marked were, longnose gar *Lepisosteus osseus*, shortnose gar *Lepisosteus platostomus*, gizzard shad *Dorosoma cepedianum*, carp, bluegill sunfish, longear sunfish, spotted bass, white crappie, and black crappie *Pomoxis nigromaculatus*. Other species were captured and marked, but their numbers were small compared to the abovementioned species.

² "Plastipak" is a registered trade mark used by Becton-Dickinson and Co., Rutherford, New Jersey.

The field tests were conducted as part of a two-year study of thermal effluents in the White River, near Petersburg, Indiana. The study was financed by the Indianapolis Power and Light Company.

Results

The fish kept in the greenhouse retained a recognizable mark after 8 months for all 18 colors. Mortality during this period was 16%. The 8 dead fish retained recognizable marks at the time of death.

In the field the marking program was begun in June 1969 and by October 1969, 179 marked fish had been recaptured. Fourteen of these (7.8%) had not retained the dye and were identified by their clipped right pelvic fin. During the marking and collecting period of 1970, which extended from June through October, 160 of the 1970-marked fish were recaptured and again 14 (8.8%) were identifiable only by a clipped left pelvic fin. Of 113 fish recaptured in 1970 after having been marked in 1969, 77 (68%) were recognizable by the clipped right pelvic fin. The data indicates the dye is useful from 6 to 8 months, but retention beyond 1 year is poor.

Neither Kelly (1), nor Arnold (2) mentioned any infection in the mark site. Gerking (3) noted infection at the marking site in his latex injected fish, but did not discuss preventative measures. Infection was observed early in the study at the mark site in a number of the recaptured fish in 1969. Dipping the needle into 100% ethyl alcohol prior to each injection eliminated the problem of infection at the mark site. In both the laboratory and the field the dyes showed no adverse effects on the condition of the fish.

Discussion

The acrylic polymers are an efficient and economical method for marking fish for short-term projects up to a year in duration. There are numerous fin-color combinations possible for fish identification and to indicate the time and place of capture. Careful technique when the dye is injected will enable the worker to keep the percent of marks lost to a minimum; as only a small amount of dye will produce a recognizable mark. This method was successfully used for fish less than 2 inches, but is easier to apply to larger fish.

Literature Cited

1. KELLY, W. H. 1967. Marking freshwater and marine fish by injected dyes. *Trans. Amer. Fish. Soc.* 96:163-175.
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3. GERKING, S. D. 1957. The survival of fin-clipped and latex-injected redear sunfish. *Trans. Amer. Fish. Soc.* 87:220-228.