Tagging Small Fish with Visible Implant Elastomer

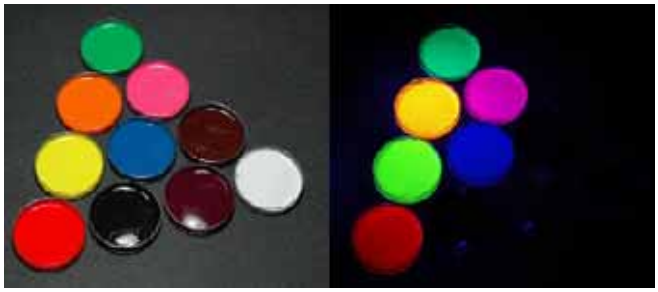
Application Note APE03

Introduction

Ideally, a tagging technique should have no bearing on the behavior, survival or growth of the animal under study. Because external tags typically carry the name and return address of the agency conducting the evaluation, they tend to be large and poorly suited for small fish. A lack of an externally visible tag for small fish was one of the main reasons Northwest Marine Technology (NMT) developed the Visible Implant Elastomer (VIE) tag. To help ensure your tagging study is successful, we've compiled this list of key points to consider when deciding if VIE is appropriate for your research.

Visible Implant Elastomer is a two-part silicone-based material that is mixed immediately before use. VIE tags are injected as a liquid that soon cures into a pliable, biocompatible solid. The tags are implanted beneath transparent or translucent tissue and remain externally visible. In many amphibians, VIE tags are even visible through darkly pigmented skin. VIE tags are widely used for marking an ever-broadening range of finfish, crustaceans, reptiles, and amphibians.

VIE is available in six fluorescent and four non-fluorescent colors. The fluorescent colors are highly visible under ambient light and provide the option of greatly enhanced tag detection when fluoresced with the VI Light. This feature was used to advantage by Buckley et al. (1994) in recovering small tagged reef fishes underwater; and also by Bonneau et al. (1995) in enumerating tagged trout in streams at night.



VIE colors in ambient light (left) and fluoresced with the VI Light (right).

While VIE is primarily used for batch identification, a surprising number of batch or individual codes can be generated by combining multiple tags, tag locations, and colors. For example, researchers tracking seahorses have used this method to track more than 500 individual seahorses at one time. Please refer to “Selecting VIE Colors” on our website (www.nmt.us) or contact our biological services staff before selecting the colors for your project.

Which Tags Have Been Applied in Your Species of Interest?

Before beginning any tag project, we recommend that you conduct a literature review to understand previous tag applications in your species of interest. To see a list of species that have been successfully tagged with VIE tags, please visit the "Selected VIE References by Family" section of our web site at www.nmt.us.

How to Tag Small Fish with VIE.

With care, remarkably small fish can be tagged with VIE. Frederick (1997) reported 100% tag visibility and retention of VIE tags in small (8-56 mm SL) Hawaiian coral reef fishes for observation periods up to 76 days. Dewey and Zigler (1996) tagged juvenile bluegills (34-55 mm TL) with VIE and reported 100% retention for 6 months in three tag sites (the dorsal fin, the point of insertion of the dorsal fin, and the lateral surface of the caudal peduncle). Haines and Modde (1996) tagged age-0 Colorado pikeminnow (mean = 50 mm TL) with VIE, tattoo ink, and fin clips. After 142 days, retention of VIE tags was considerably higher (87%) than tattoo ink (26%) and fin clips (34%). We have come to appreciate that VIE tags can be applied to a wide variety of small fish without compromising their growth, survival or behavior.

If the species you intend to tag is not heavily pigmented, VIE tags will likely be successful. The most common solution for tagging small fish is to place the VIE tags into the fish's body. Typical tag injection sites in small fish include the proximal base of pectoral, pelvic, and anal fins; along the lateral edge of the caudal peduncle; the underside of the jaw; and just off the midline, parallel to the dorsal fin. Tags can be placed in the adipose eyelid tissue of some species, including most salmonids, provided the fish exceed 60 mm TL. Small salmonids 60-100 mm TL may also be tagged in the underside of the jaw. For very small salmonids (e.g., 30-60 mm TL), we recommend placing VIE tags in the body, just below the skin.

Tags in the adipose eyelid tissue of salmonids typically remain visible as the fish mature, while tags placed in other tissues will likely become obscured within a year after tagging. The needle is first injected into the animal just below the dermis, parallel to the skin. While the needle is being retracted, the cavity made by the needle is filled with liquid elastomer. A common mistake is to retrieve the needle too quickly, leaving a narrow tag that can fragment with time and become obscured. Because a VIE tag that is allowed to cure outside the animal is likely to be shed, it is important to end the tag roughly 1-2 mm inside the animal and to wipe away any excess material that extrudes from the needle wound.

If the newly tagged fish are released into cold water (< 50°F), it can take more than 24 hours for the elastomer to cure. To prevent the liquid elastomer from leaking out of the wound, the needle should be injected so that the needle tip penetrates the fish's skin dorsal-ventrally. Because handling is stressful, it is much easier to tag a fish after it has been anesthetized. A sedated fish is less likely to twitch upon needle insertion, minimizing the likelihood that delicate tissue will be damaged. After the tag is injected, gently place the fish back into the water. The needle wound will take several days to heal, so whenever possible, you should avoid moving the fish for at least 10 d after tagging.

VIE Tag Retention and Detection Considerations

Just because a VIE tag can be injected into a small fish, it doesn't insure the tag will be retained or remain visible. Before using VIE tags in your research, it is a good idea to conduct a small-scale study to examine retention rates and tag visibility. A pilot study will also allow you to refine the tagging technique, and to develop an understanding of the logistics of anesthetizing, tagging and releasing the fish. Please contact our biologists at (biology@nmt.us) for advice on conducting a study of VIE retention and visibility.

Color perception is highly variable among samplers. Colors appear differently in ambient light, in clear tissue, in pigmented tissue, and when fluoresced. Tags of different colors can generally be distinguished in ambient light in clear tissue, but those same colors may be confused if the marks are poor or are placed under pigmented tissue. VIE tags are normally visible to the naked eye under normal daylight and interior light conditions. To aid VIE tag detection under low light, or when the tag has become obscured by pigment, researchers can use the VI Light to fluoresce the tags and greatly enhance tag detection.

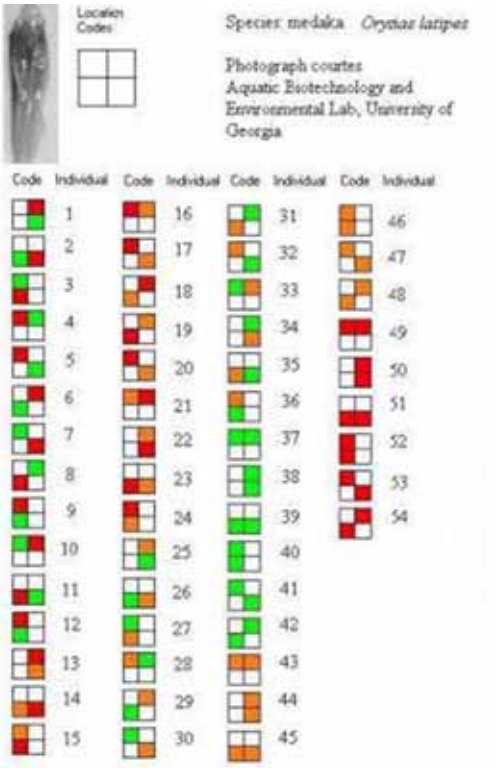
Please refer to our Application Note APE05 “Fluorescing Visible Implant Elastomer Tags and Visible Implant Alpha Tags” for more details on using the VI Light and the VIE Color Standard.

Applying VIE tags in species that stay relatively small throughout life, say less than 200 mm total length, and lightly pigmented, generally offers fewer challenges than tagging fish that grow large. We recommend that VIE tags be injected into transparent or translucent tissue; however, it is very important to consider how this tissue will change as the animal matures. If you're concerned that VIE tags might become obscured in a tag site with time, we recommend that you procure some live specimens of the largest size you plan to study, and examine if a needle can be inserted below the skin and remain visible. In general, if a needle is visible in a tag site, a VIE tag will also remain visible, provided the tag is retained.

Do You Need Batch Tags or Individual Identification?

Many researchers contemplating a fisheries investigation will often ask for individual identification. However, many studies really deal with groups or populations, rather than individuals, and batch tags can provide the answers. For example, a researcher interested in learning the movement patterns of different sized fish within multiple streams in a single drainage could assign each stream a fluorescent color. By placing VIE tags in different body locations, several size classes could be identified.

Some research does require data about individual fish. VIE tags can be used to identify individuals by combining colors and body locations. The schematic right shows an example of how 54 medaka *Orzypia latipes* were coded using three colors of VIE (red, green and orange) with two tags per individual. It is important to note that any tag loss will complicate recognition of individual animals.



If you have questions about how VIE may be used in your research, please contact our biologists at biology@nmt.us.

References

Bonneau, J. L., R. F. Thurow, and D. L. Scarnecchia. 1995. Capture, marking, and enumeration of juvenile bull trout and cutthroat trout in small, low-conductivity streams. North American Journal of Fisheries Management 15:563-568.

Buckley, R. M., J. E. West and D. C. Doty. 1994. Internal micro-tag systems for marking juvenile reef fishes. Bulletin of Marine Science, 55(2):850-859.

Dewey, M.R., and S.J. Zigler. 1996. An evaluation of fluorescent elastomer for marking bluegill sunfish in experimental studies. The Progressive Fish Culturist 58:219-220.

Frederick, J.L. 1997. Evaluation of fluorescent elastomer injection as a method for marking small fish. Bulletin of Marine Science 61(2):399-408.

Haines, B.G. and T. Modde. 1996. Evaluation of marking techniques to estimate population size and first year survival of Colorado squawfish. North American Journal of Fisheries Management 16:905-912.