SIZE-DEPENDENT EFFECTS OF VISIBLE IMPLANT ELASTOMER MARKING ON CRAYFISH (*ORCONECTES OBSCURUS*) GROWTH, MORTALITY, AND TAG RETENTION

BY

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ABSTRACT

Many methods have been used to mark crustaceans. However, crustaceans often lose tags during the molting process and some tags may interfere with growth rate, behavior, and mortality of the organism. In this study, four Visible Implant Elastomer (VIE) colors (red, orange, green, and yellow) were used to tag adult [average CL = 25.0 ± 0.6 mm (1 SE)] and juvenile [average carapace length (CL) = 13.2 ± 0.6 mm (1 SE)] crayfish, *Orconectes obscurus* (Hagen, 1870), to assess long-term tagging effects on size-specific growth, mortality, and tag retention. The number of molts, average growth per molt, and total growth were not significantly different between tagged and control groups. Additionally, mortality between tagged and control crayfish was not significantly different in adults or juveniles. There was 100% retention of tags and all remained visible until death or the end of the experiments. Although some tag fragmentation occurred, VIE appears to be an effective tagging technique for adult and juvenile *O. obscurus*.

RÉSUMÉ

De nombreuses méthodes ont été utilisées pour marquer les crustacés. Cependant, les crustacés perdaient souvent leurs marques au cours de la mue et certaines marques pouvaient interférer avec le taux de croissance, le comportement et la mortalité de l’organisme. Au cours de cette étude, quatre marques de couleur, Visible Implant Elastomer (VIE) (rouge, orange, verte et jaune) ont été utilisées chez les écervisses *Orconectes obscurus* (Hagen, 1870), adultes [CL moyenne = 25,0 ± 0,6 mm (1 SE)] et juvéniles [longueur moyenne de la carapace (CL) = 13,2 ± 0,6 mm (1 SE)], afin d’évaluer les effets à long terme du marquage sur la croissance en taille, la mortalité et la rétention de la marque. Le nombre de mues, la croissance moyenne par mue, et la croissance totale n’étaient pas significativement différents entre les groupes marqués et les groupes-témoins. De plus, la mortalité chez les deux groupes n’était pas significativement différente chez les adultes et les juvéniles. Il y avait 100 % de rétention des marques et toutes restait visibles jusqu’à la mort ou la fin des expériences. Bien qu’une certaine fragmentation des marques existe, le VIE semble être une technique de marquage efficace pour les juvéniles et les adultes de *O. obscurus*.

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INTRODUCTION

Characterization of spatio-temporal patterns of organismal movement, dispersal, and habitat use is an important aspect of population and community ecology (Turchin, 1998). In order to evaluate these patterns in the field, populations and/or individuals must be identifiable upon recapture. Mark-recapture techniques using either internal or external tags are commonly used to address these types of questions/objectives.

Many methods of marking and tagging have been used with crayfish, including radio transmitters (Robinson et al., 2000; Bubb et al., 2002, 2004), microchips (Wiles & Guan, 1993), carapace branding (Abrahamsson, 1965), color coded rods (Weingartner, 1982), pleural clips (Hazlett et al., 1979; Light, 2003), colored ink (Black, 1963), fluorescent pigment (Brandt & Schreck, 1975), external plastic tags (Gherardi et al., 1998, 2000), uropod, telson, and pleura punches (Guan, 1997), coded wire tags (Isley & Eversole, 1998), and visible implant alpha tags (Isley & Stockett, 2001). Unfortunately, many of these techniques are not practical for use in the field and some require expensive equipment.

Additionally, tagging can be problematic when used with organisms that possess an exoskeleton, such as crustaceans (e.g., crayfish). These organisms go through multiple molts during their lifetime in order to grow and often lose their tags during this process (Brandt & Schreck, 1975; Guan, 1997; Gherardi et al., 1998, 2000; Isely & Stockett, 2001; Jerry et al., 2001). Additionally, tags may interfere with organismal behavior (Guan, 1997) and movement, and may also influence growth rates (Guan, 1997; Brown et al., 2003) and mortality (Brandt & Schreck, 1975; Brown et al., 2003). Thus, evaluation of both tag retention and effects of tagging on the study organism is necessary before using a given marking technique.

Visible Implant Elastomer (VIE, Northwest Marine Technology™) has been used to mark fish, amphibians, reptiles, and crustaceans [including lobster (Homarus gammarus (L., 1758), Uglem et al., 1996; Linnane & Mercer, 1998; Jasus edwardsii (Hutton, 1875), Woods & James, 2003), shrimp (Litopenaeus vannamei (Boone, 1931), Godin et al., 1996), freshwater prawns (Macrobrachium rosenbergii (De Man, 1879), Brown et al., 2003), crayfish (Cherax destructor Clark, 1936, cf. Jerry et al., 2001), and blue crab (Callinectes sapidus Rathbun, 1896, cf. Davis et al., 2004)] (table I). It is a non-toxic compound that cures into a pliable, biocompatible solid. It is injected under translucent or transparent tissue for maximum visibility and small marks can be applied to tag small and large organisms. The product is available in fluorescent and non-fluorescent colors that can be used to individually mark a large number of organisms.

The objective of this laboratory study was to evaluate long-term retention of VIE tags and effects on growth and survival for juvenile and adult crayfish, Orconectes