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Movement and growth of juvenile (age 0 and 1+) tautog (*Tautoga onitis* [L.]) and cunner (*Tautogolabrus adspersus* [Walbaum]) in a southern New Jersey estuary

K.W. Able *, L.S. Hales Jr.[1], S.M. Hagan

Marine Field Station, Institute of Marine and Coastal Sciences, Rutgers University, 800 c/o 132 Great Bay Blvd., Tuckerton, NJ 08087-2004, USA

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Abstract

The extent to which individual juvenile fish occupy specific sites is largely unknown. This complicates efforts to identify optimum habitats and habitat-specific information such as growth and mortality rates which, in turn, can influence recruitment success. Using tag–recapture information, we examined movements and growth of juvenile tautog (*Tautoga onitis* [L.]) and cunner (*Tautogolabrus adspersus* [Walbaum]) in Great Bay–Little Egg Harbor estuaries in southern New Jersey. Fishes were trapped, tagged with small disks (bee tags), released in an embayment (mean depth = 2.5 m, mean salinity = 28‰) adjoining a tidal creek and recaptured from April through November 1992. Of 729 tautog (25–187 mm TL) released, there were 228 recaptures (31%) of 114 individuals, with a high percentage of recaptured individuals (37%) caught more than once (up to 13 times) during nearly 3 months at liberty. Of 410 cunner (24–99 mm TL) released, there were 95 recaptures (23%) of 66 individuals of which 30% were recaptured repeatedly (up to 6 times) over a 2-month period in summer and fall. Recaptured individuals of both species generally moved relatively little (<22 m) from the common release site even though recapture efforts occurred over the scale of meters to kilometers. Age 1+ individuals tended to travel shorter distance than age 0 individuals for both species. The short distance traveled and high recapture rates indicate that these species exhibited strong site fidelity. The mean growth of both species was 0.25 mm day^{-1} from spring through fall although growth varied between species, age class and season. These movement and growth characteristics indicate that at least some of the 0+ individuals "settle and stay" and 1+ individuals "return and stay" in estuarine habitats. The high site fidelity, in this and other studies, implies that growth rates may be good measures of habitat quality for tautog and cunner at least from spring through fall.

Keywords: Fidelity; Growth; Habitats; Movements; Tag–recapture; *Tautoga onitis*; *Tautogolabrus adspersus*

* Corresponding author. Tel.: +1 609 296 5260x230; fax: +1 609 296 1024.
E-mail address: able@marine.rutgers.edu (K.W. Able).
[1] Current Address: US Fish and Wildlife Service, Ecological Services Division, New Jersey Field Office, 927 North Main St., Pleasantville, NJ 08232, USA.

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1. Introduction

Detailed knowledge of habitat quality is lacking for most estuarine fishes. Movements, residency, and growth are important measures of habitat use and habitat quality for fish nurseries (Beck et al., 2001; Gillanders et al., 2003) but are poorly known. Because the movements of individual fish may be extensive, the importance of specific habitat types and/or sites remain difficult to evaluate. As a result, researchers have resorted to methods that restrict or eliminate individual fish movements (e.g., caging, tethering) to obtain measures of habitat quality such as growth or mortality rates (e.g., McIvor and Odum, 1988; Rozas and Odum, 1988; Able et al., 1999; Duffy-Anderson and Able, 1999; Phelan et al., 2000). Though these studies have yielded some important findings, the relevance of those studies to understanding the ecology of free-ranging fishes remains limited until habitat residency (use of specific habitat type or site for some designated period of time) and its modifiers are understood (Gillanders et al., 2003).

Movements within a single habitat and among different habitats within an estuary are known for the young-of-the-year of a restricted number of species, including *Leiostomus xanthurus* Lacepède (Weinstein, 1983), *Pseudopleuronectes americanus* Walbaum (Saucerman and Deegan, 1991), *Paralichthys dentatus* (L.) (Szedlmayer and Able, 1993), *Menticirrhus saxatilis* (Bloch and Schneider) (Miller et al., 2002), *Pomatomus saltatrix* (L.) (Able et al., 2003), *Fundulus heteroclitus* (L.) (Teo and Able, 2003), *Centropristis striata* (L.) (Able and Hales, 1997), and *Micropogonias undulatus* (L.) (Miller and Able, 2002). These studies of ecologically and phylogenetically diverse species have confirmed that some estuarine fishes may repeatedly use specific habitats or sites for a protracted period, ranging from weeks to years.

The purposes of this study were to (1) assess fidelity to specific sites and movements among sites of juvenile (age 0 and 1+) fishes within the polyhaline portion of an estuary, (2) measure individual growth rates, and (3) examine seasonal and size-related modifiers of all measured parameters. The two species chosen for this study are the two most northerly distributed temperate wrasses on the east coast of the U.S., tautog (*Tautoga onitis*) and cunner (*Tautogolabrus adspersus*). These fishes are abundant and widely distributed in estuaries and the coastal ocean of the mid-Atlantic Bight (Able and Fahay, 1998; Collette and Klein-MacPhee, 2002). Both species spawn from spring through summer between Nova Scotia and North Carolina; eggs and larvae are most abundant in coastal waters. Cunner settle into a variety of estuarine and nearshore coastal habitats (Tupper and Boutilier, 1995; Levin, 1991, 1993, 1994a,b; Able and Fahay, 1998), whereas tautog settle primarily in estuaries (Sogard et al., 1992; Able and Fahay, 1998). It has been suggested that cunner "settle and stay" (Levin, 1994a), while post-settlement behavior is not known for tautog. Although there have been extensive studies of movement/residency of large juvenile and adult cunner (Green, 1975; Olla et al., 1979; Pottle and Green, 1979; Bradbury et al., 1995, 1997) and large juvenile and adult tautog (Cooper, 1966; Olla et al., 1974, 1979), there have been relatively few observations of movements/residency for small juveniles of either species. The exception being those for young-of-the-year cunner which were considered "site attached" (Levin, 1994b; Tupper and Boutilier, 1995). While growth of caged tautog has been evaluated during the summer (Sogard, 1992; Phelan et al., 2000), there are no estimates for individual tautog during the fall and no estimate for juvenile cunner during any season.

2. Study site

The study was conducted in the Great Bay–Little Egg Harbor estuaries in southern New Jersey U.S.A. at approximately 39°30′ N, 74°20′ W (Fig. 1). All tagging took place in an embayment of Schooner Creek, which serves as the Rutgers University Marine Field Station (RUMFS) boat basin. This embayment supports healthy populations of juvenile fishes and has been the site of several studies of natural populations of the juvenile fish assemblage (Sogard and Able, 1991; Smith and Able, 1994; Able and Fahay, 1998). Previous collections in the embayment and adjacent creeks indicated that this area provided suitable habitat for newly settled and older young-of-the-year tautog and cunner (Able et al., 1996).

The embayment, which was dredged in June 1991, ranged from intertidal to 2.5 m depth and the adjoin-