Blue Crab, *Callinectes sapidus*, Retention Rates in Different Trap Meshes

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Introduction

In recent years, 38.1 mm (1.5 in) square mesh traps have begun to replace the traditional 38.1 mm hexagonal mesh traps in the Louisiana blue crab, *Callinectes sapidus*, fishery and have spread to other Gulf coastal states. Commercial fishermen prefer square mesh traps because they are sturdier and longer lasting than hexagonal mesh traps. However, 38.1 mm square mesh traps retain significantly higher numbers of sublegal (<127 mm carapace width (CW)) blue crabs than hexagonal mesh traps (Guillory and Hein, 1998a; Guillory and Prejean, 1997)

Research to develop more size selective traps with escape rings or mesh size selection has been conducted since the late 1970's (Eldridge et al., 1979; Guillory, 1989; Casey and Daugherty, 1990; Casey and Doctor, 1996; Guillory and Merrell, 1993; Guillory and Prejean, 1977; Guillory and Hein, 1998a, b). While escape vents may significantly reduce sublegal catch, the actual percentage of retained sublegal blue crabs may still exceed the 10% allowable tolerance limit in Louisiana when high densities of sublegal crabs are present. Blue crabs capable of egress through escape vents may be retained in traps because an escape vent may not have been encountered. Guillory and Prejean (1997) showed that 38.1 mm square mesh traps retained excessive numbers of sublegal crabs, but the next larger size (50.8 mm or 2 in) mesh traps allowed an unacceptable loss of small legal crabs. Optimum mesh size selection could supplement, or even replace, escape vents.

The study was undertaken to obtain data on size selectivity of currently utilized mesh sizes and to determine the optimum square mesh size. In this paper theoretical percent retention of blue crabs by size group for commercially available 38.1 mm hexagonal mesh and square mesh and for five different squares are compared.

Materials and Methods

Blue crabs were collected from June through August 1996 in Lafourche and Terrebonne Parishes, Louisiana, from different habitat types and salinity regimes. Ovigerous females and individuals with damaged lateral spines were excluded. Each blue crab was sexed, carapace width (CW) and body width (BW) was measured to the nearest mm with a dial caliper, and each was manually inserted sideways through each of the five experimental squares and through the commercial hexagonal and 38.1 mm square mesh trap wire to determine whether each individual was capable of passage. Blue crabs exit sideways through openings (Guillory and Merrell, 1993), and decapods orient themselves such that the smallest opening an animal can be pushed through by hand is also the smallest opening it may pass through unaided (Stasko, 1975).

The five experimental squares were in 3.2 mm (0.125 in) increments as measured on the inside of adjacent corners: 34.9 mm (1.375 in), 38.1 mm, 41.3 mm (1.625 in), 44.4 mm (1.75 in), and 47.5 mm (1.87 in). Based upon a field evaluation of different trap mesh types, Guillory and Prejean (1997) concluded that the optimum square mesh size would be between 38.1 and 50.8 mm, although there is no trap wire available within that size range. The reported dimensions of the commercially available 38.1 and 50.8 mm square trap meshes are misleading because they are measured from the inside of one corner to the outside of an adjacent corner. The effective size from a retention standpoint is therefore substantially less; the mean inside dimensions of the 38.1 and 50.8 mm square meshes averaged 35.6 and 46.6 mm, respectively. Since the sex ratio of blue crabs varies with season and salinity regime, numbers of male and female crabs were assumed equal in calculating the overall retention curves.

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ABSTRACT—Percent escapements of blue crabs, Callinectes sapidus, *by size and sex were determined for commercially available 38.1 mm square and hexagonal meshes and for five experimental squares. Commercial trap mesh sizes retained excessive numbers of sublegal blue crabs. Based on the criteria of maximizing sublegal crab escapement without an unacceptable loss of legal blue crabs, the 44.4 mm square (as measured from the inside of adjacent corners) was optimum and superior to either trap mesh used by fishermen.*

Results and Discussion

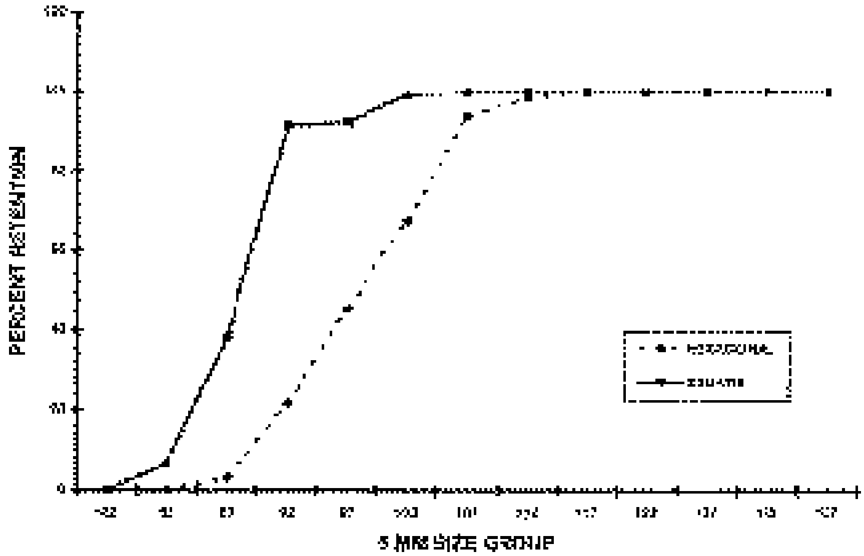

Figure 1.—Percent retention of blue crabs by 5 mm carapace width size group in commercially available 38.1 mm hexagonal and square meshes.

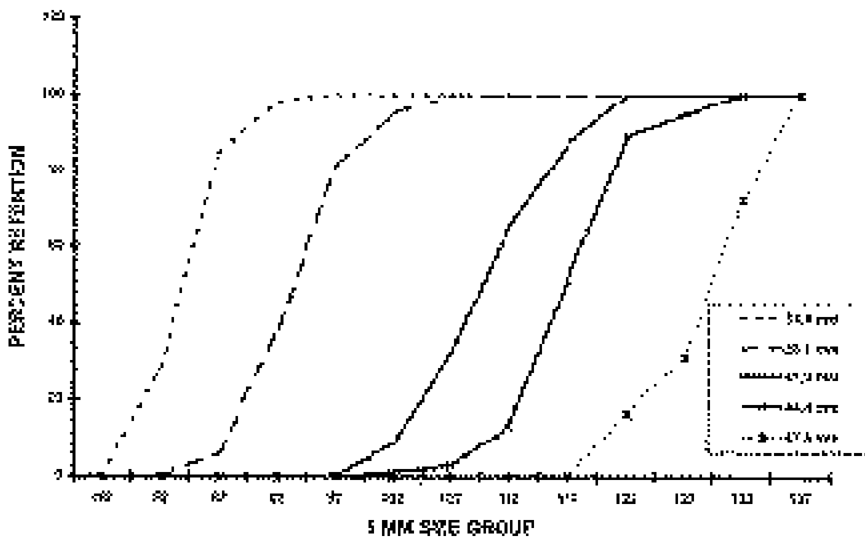

Figure 2.—Percent retention of blue crabs by 5 mm carapace width size group in five experimental squares.

There were pronounced differences in percent retention of blue crabs by 5 mm CW size group between the hexagonal and 38.1 mm square mesh trap wire (Fig. 1). The greater retention of sublegal blue crabs with square mesh than in the hexagonal mesh was evident—the 90% and 100% retention points were attained in the 92–97 mm and 107–111 mm CW size groups with square mesh and in the 107–111 mm CW and 117–121 mm CW size groups with hexagonal mesh. Results from several field evaluations (Guillory and Hein, 1998a; Guillory and Prejean, 1997) have verified that 38.1 mm square mesh traps retain significantly higher numbers of sublegal (<127 mm carapace width, CW) blue crabs than hexagonal mesh traps. Unvented hexagonal mesh traps, however, may still have sublegal catches of over 50% (Guillory and Merrell, 1993).

Retention curves for the five experimental squares are plotted in Figure 2. The 41.3 mm and smaller squares retained very high numbers of sublegal blue crabs, while the 47.5 mm square allowed an unacceptable loss (69%) of small legal (127–131 mm CW) blue crabs. Based on the criteria of maximizing escapement of sublegal blue crabs and retention of legal blue crabs, the 44.4 mm square was superior. The 44.4 mm square had relatively low retention rates of sublegal blue crabs but high retention rates of legal blue crabs—52% and 89% of 117–121 mm CW and 122–126 mm CW blue crabs, respectively, and 95% and 100% of 127–131 mm CW and >131 mm CW blue crabs, respectively. Other data on trap selectivity supports this conclusion. Commercially available 38.1 mm square mesh traps retain excessive numbers of sublegal crabs while 50.8 mm square mesh traps have an unacceptable loss of legal crabs (Guillory and Prejean, 1997; Guillory and Hein, 1998a).

Sex-related differences in retention rates are illustrated with the 44.4 mm square (Fig. 3). The retention rates of males were higher than females of comparable size groups. For example, 100% of males but only 17% of females were retained in the 122–126 mm CW size group. The decreased retention of female blue crabs is due to their smaller carapace length than males of comparable carapace width (Guillory and Hein[1]).

[1] Guillory, V., and S. Hein. 1997. Lateral spine variability and weight-size and carapace width-size regressions in blue crab (*Callinectes sapidus*). Unpubl. manuscr. on file at La. Dep. Wildl. Fish., P.O. Box 189, Bourg, LA 70343.

Management Implications

The retention curves generated in this study do have important implications concerning gear management: 1) the mesh sizes currently used in the fishery are very inefficient with respect to escapement of sublegal blue crabs, 2) the most effective square mesh size is 44.4 mm, and, 3) a 44.4 mm square mesh trap would be superior to commercially available trap meshes. The potential adverse effects of both capture and harvest of sublegal blue crabs in traps (McKenna and Camp, 1992; Murphy and Kruse, 1995; Guillory, 1995; Guillory and Hein, 1998b) and the high retention of sublegal blue crabs in commercial traps, especially the 38.1 mm square mesh traps (Guillory and Hein, 1998a; Guillory and Prejean, 1997; and this study), provides justification for gear management measures to reduce sublegal catch.

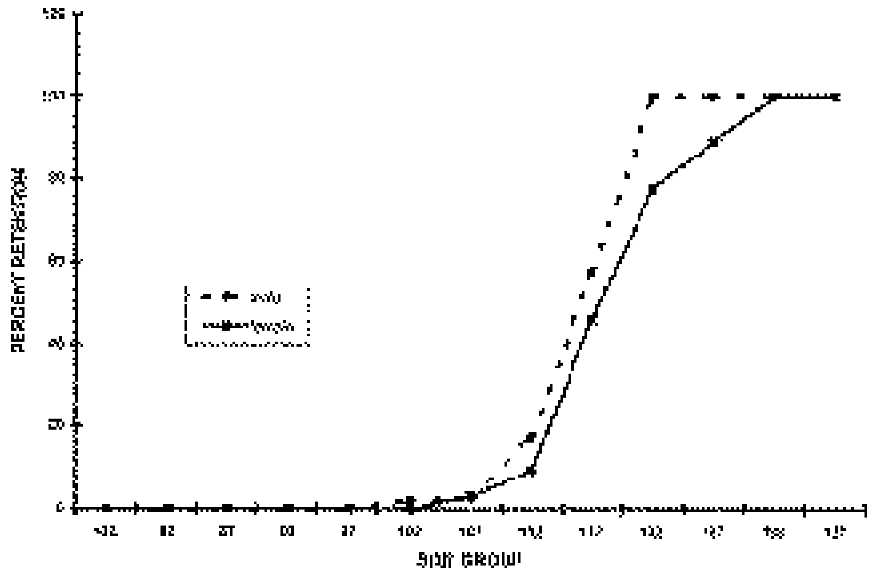

Figure 3.—Percent retention by sex of blue crabs by 5 mm carapace width size group in a 44.4 mm square.

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