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Mesh Selectivity of West Indian Fish Traps

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ABSTRACT—West Indian fish traps were constructed from three different sizes of poultry mesh. They were hauled every 6-7 days. The 1-inch hexagonal mesh traps caught 17.9 times more fish than the 1.5-inch hexagonal netting, while the 1- × 2-inch rectangular mesh caught 9.5 times more fish. These fish were almost entirely below market size.

INTRODUCTION

West Indian fish traps are the most frequently used fishing device in the Virgin Islands and most of the Caribbean (Sylvester and Dammann, 1972; Munro, 1974). Over 80 percent of the Virgin Islands fishermen use only fish traps in their fishing despite the fact that more than 10 types of fishing are employed (Olsen, et al., 1975). Pot fishing accounts for over 52 percent of the total inshore fishing in Puerto Rico (Juhl and Suarez-Caabro, 1973). Over 9,000 traps are lost each year in the U.S. Virgin Islands (Olsen, et al., 1975) by theft and boats cutting buoys. Some of these traps remain on the bottom killing many fish until the wire corrodes away. Many persons feel that mortality from "drowned" traps may deleteriously affect the fishery. Another trap-related mortality occurs when unusable fish are brought to the surface, causing embolisms in the physoclists.

Fish traps in the Virgin Islands were originally made from woven hoop vine (*Trichostigma octandrum*) and split bamboo, but are now made from poultry wire (Sylvester and Dammann, 1972). Current regulations only allow mesh that is 1.25 inches or larger in the largest dimension. Generally, 1.5-inch hexagonal mesh is preferred although 1- × 2-inch rectangular mesh is used when 1.5-inch wire is unavailable. Since the smaller meshes may retain juvenile and small forage species which embolize when brought to the surface, we initiated the following experiment in order to determine the optimum mesh size. We hoped to gather information about mesh-related mortality which would be used in the formulation of regulations for the fishery.

MATERIALS AND METHODS

Two rectangular (4 feet × 5 feet × 1.5 feet) fish traps were constructed of each mesh size (1-inch, 1- × 2-inch, and 1.5-inch) and set in an area north of St. Thomas (Fig. 1) where previous fishing indicated the presence of concentrations of small fishes. The traps were left unbaited and were hauled every 6 or 7 days. Munro (1974) has shown that total catch is relatively constant in this time period. The depth ranged from 28 to 32 fathoms.

After each hauling, the catch was returned to shore where the lengths of all fishes were measured to the nearest millimeter.

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RESULTS

The traps were hauled a total of 90 times over 15 weeks and caught 1,559 fishes. Three species, *Lutjanus synagris, Rhomboplites aurorubens,* and *Haemulon aurolineatum* made up 96 percent of the catch by numbers. The catch by species for each mesh size is shown in Table 1.

The mesh selectivity was assessed by analysis of variance (ANOVA) of standard lengths of *L. synagris* and *R. aurorubens*. Only 2 of 174 of the other common species, *H. aurolineatum,* were not caught in the 1-inch mesh traps.

The ANOVA results for *L. synagris* (Table 2) indicated that there was significant variability in the standard lengths between the different mesh sizes ($F = 16.6, p<0.001$, df = 2,200). The results for *R. aurorubens* (Table 3) also indicated significant mesh selectivity ($F = 4.14, 0.01 < p < 0.025$, df = 2,1112).

Attempts at freeing the fish showed that some of the *R. aurorubens* and *H. aurolineatum* could have survived if released after being hauled to the surface. The *L. synagris* would probably not.

Figure 1.—The study site was located north of St. Thomas on the outside edge of Bailors Bank in 28-32 fathoms of water.

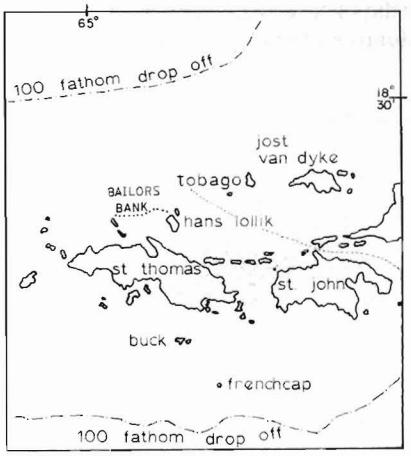

Table 1.—Fish species caught in West Indian fish traps made of different mesh sizes. The results are based on 15 hauls of two traps constructed of each mesh poultry cloth (N = 30 for each mesh size). The study period was from 26 May 1975 to 19 September 1975. Mean standard length is given with standard deviation.

	Mesh size								
	1-inch hexagonal			1- × 2-inch rectangular			1.5-inch hexagonal		
Species	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
Lutjanidae									
Lutjanus synagris	52	15.7	3.6	117	17.4	2.1	34	20.1	3.7
Rhomboplites aurorubens	720	12.4	1.3	379	14.6	1.3	16	15.6	2.8
Priacanthidae									
Priacanthus arenatus	36	9.9	0.8	9	13.3	7.0			
Sparidae									
Archosargus rhomboidalis									
Calamus pennatula	3	14.0	1.0	1	18.0	—			
Pomadasyidae									
Haemulon aurolineatum	172	13.0	0.8	7	14.4	2.6	2	15.5	—
Carangidae									
Caranx fusus				5	43.1	8.7			
Seriola dumerili	1	25.0	—						
Balistidae									
Balistes capriscus	1	14.0	—				3	24.2	7.3
Average for all species	985	12.6	1.3	524	15.5	1.6	55	18.8	3.5

Table 2.—Analysis of variance (ANOVA) of standard lengths of *Lutjanus synagris* caught in West Indian fish traps made with poultry netting of three different mesh sizes.

Mesh	N	$\bar{X}$	F	p	df
1-inch	52	15.7	16.6	<.001	2,200
1-inch × 2-inch	117	17.4			
1.5-inch	34	20.1			

Table 3.—Analysis of variance (ANOVA) of standard lengths of *Rhomboplites aurorubens* caught in West Indian fish traps made with poultry netting of three different mesh sizes.

Mesh	N	$\bar{X}$	F	p	df
1-inch	720	12.4	4.14	$.01 < p < .025$	2,1112
1-inch × 2-inch	379	14.6			
1.5-inch	16	15.6			

DISCUSSION AND CONCLUSIONS

The three mesh sizes currently in use in the U.S. Virgin Islands exhibit considerable selectivity. This selectivity acts in two ways. Within any one species, the smaller mesh sizes retain both the smaller and larger individuals. Since the larger mesh size releases small individuals of species, there is also species selectivity for the larger species.

We do not feel these results indicate differences in fish ingress into the traps. This assumption has been based on many diving observations of traps which contained many small fish which were absent when the traps were hauled to the surface and is supported in part by Munro's (1974) work in Jamaica.

If equal ingress can be assumed, then the 1.0-inch mesh traps killed 17.9 times more fish than the 1.5-inch mesh traps. The 1-inch × 2-inch mesh traps killed 9.5 times more fish than the 1.5-inch mesh traps. This mortality of juvenile and forage species can decimate a fishing ground. If traps are lost ("drowned") it seems possible that considerable mortality could take place over the 1-2 years before the wire mesh corrodes away. This time (for corrosion) is longer for the smaller mesh traps; hence, mortality will be greater.

Currently, Virgin Islands fishermen only use small mesh wire for their traps when the 1.5-inch mesh is unavailable. This choice is largely a matter of cost. The 1.5-inch mesh may be near optimal ecologically and economically since it releases the small species while a larger mesh size would also release marketable fish.

ACKNOWLEDGMENTS

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