Using Sound to Map Fish Spawning: Determining the Seasonality and Location of Spawning by Fishes in the Family Sciaenidae (Seatrouts, Drums, and Croakers) Within Pamlico Sound, NC

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Abstract: Fish produce sounds during courtship, during aggressive encounters with other fish of the same species, and as a response to threats from predators. Particular sounds are species-specific and have been recorded from fishes during spawning in captivity. Such acoustical data may be used to identify and locate fishes that are reproductive in the sea. Weakfish "purring" was recorded along with many sciaenid eggs at all stations near Ocracoke and Hatteras Inlets during May through July. Red drum "knocking" was recorded in September at sites away from the inlets, also occurring with sciaenid eggs in one case. Mapping of sciaenid spawning areas may be possible using acoustical data alone, but may over-estimate egg production.

INTRODUCTION

The sounds produced by fishes have been documented in the past (1,2,3). These sounds are produced by fishes in different ecological and behavioral contexts: courtship and spawning (4,5,6,7), aggressive encounters (8,9), and as a response to threats by predators (10). Many of these observations were made under captive conditions, so that sound spectrographs have been produced that identify the species-specific patterns of sound production. In this paper, nocturnal sound production and planktonic egg production are correlated for weakfish (Cynoscion regalis) and red drum (Sciaenops ocellatus) (Family Sciaenidae), two species for which there are concerns over declining stocks. At this time, it is difficult to distinguish the different sciaenid eggs by morphology alone, so acoustic data used in conjunction with the egg distributions may help locate spawning grounds.

METHODS

Recordings of underwater sounds were made after sunset at ten sites in Pamlico Sound, NC using an InterOcean Model 902 hydrophone. Sounds recorded were classified by ear by experienced listeners, using known calls made in captivity by us or by others (1,3,4) as a guide. Ichthyoplankton net tows were made at each site using a 500μm mesh net with a calibrated flow meter pulled for 5 min behind a boat. Subsamples of eggs were counted under 40 X magnification each night so that they could be classified as sciaenid-type eggs. Egg counts were converted to number/m³ using the volume of water filtered by the nets as determined by the flow meter reading. Sampling locations were relocated with a differentially corrected Global Positioning System receiver on a biweekly basis from May through October 1997.

RESULTS AND DISCUSSION

The maps illustrate where weakfish (Figure 1) and red drum (Figure 2) were heard. The greatest abundance of eggs were collected near the inlets. The weakfish "purring" occurred mostly near Ocracoke and Hatteras Inlets in conjunction with sciaenid eggs during May, June, and July. Red drum "knocking" occurred only in September, and co-occurred with sciaenid eggs only on the western side of Pamlico Sound, away from the inlets. The techniques used here may have applications in the regulation of fishing pressure by fishery scientists on these species, which are declining in abundance due to over-harvest.
FIGURE 1. A map of Pamlico Sound, NC showing the location of the hydrophone stations where weakfish "purring" was heard and sciaenid eggs (density > 1/m³) were collected in the plankton.

FIGURE 2. A map of the hydrophone stations where red drum "knocking" was heard and sciaenid eggs were collected.

REFERENCES


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