Northwest Atlantic Fisheries Organization

Serial No. N780

NAFO SCR Doc. 84/VI/10

SCIENTIFIC COUNCIL MEETING, JUNE 1984

# Aggregations of Cunner, Tautogolabrus adspersus, and Cod, Gadus morhua: Co-occurence with a Dominant Species in A Temperate Marine Fish Assemblage

by

Peter Auster

The University of Connecticut, Marine Sciences Institute, Marine Research Laboratory
P. O. Box 278, Noank, Connecticut, 06340, USA

## Introduction

Heterotypic schools and aggregations of fish have been suggested to be an adaptive response to increase the protection afforded to individuals by schooling when populations are reduced but aggregate abundance is high (Nursall and Pinsent, 1969; Erlich and Erlich, 1973; Ogden and Erlich, 1977; Keenlyside, 1979). The co-occurrence of species of reduced abundance with a numerically dominant species has been shown to increase survivorship, maintain species richness and maintain community stability in benthic faunal assemblages (Birch, 1981). Frank and Leggett (1983) suggest the same effect occurs in heterotypic larval fish assemblages.

In this paper, I report on observations of heterotypic aggregations of cunner, Tautogolabrus adspersus, and cod, Gadus morhua, suggest this occurrence is one adaptive behavioral response to the inshore predator field and discuss how aggregations of this type affect single species natural mortality estimates.

## Observations

On 19 July, 1983, during the course of 4 man-dives, direct underwater observations by biologist-divers were made of several heterotypic aggregations (each > 100 individuals) of cunner and cod at a boulder reef south of Block Island, Rhode Island, USA (41° 07.7'N and 71° 34.0' W). The reef consisted of piled boulders ($\tilde{<}$ 10 m longest dimension) and cobble surrounded by coarse sand in 21 m of water.

Cunner (approximatley 15 cm TL) and cod (approximately 15-20 cm TL)

were observed in loose polarized (parallel orientation) aggregations facing into a slight (.25 kt) current within the reef infrastructure and adjacent to vertical and horizontal boulder surfaces. Aggregations were homotypically segregated with cunners remaining closest to rock surfaces and crevice entrances.

Cunner were the numerically dominant species in the assemblage by a visually estimated factor of at least 10. Both smaller and larger size class cunners were present (from young-of-the-year 2 cm TL individuals to approximately 35 cm adults) and did not participate in the heterotypic aggregation but remained in separate large foraging aggregations close to rock surfaces.

Large cod ($\geq$ approximatley 50 cm TL) were observed singly or in uncohesive groups of 2 to 4 individuals at deeper depths within the reef infrastructure and in large crevices. Pollock Pollachius virens, (approximately 35 cm TL) were also observed individually on the reef at the same depths and within the large crevices that cod occupied.

When a heterotypic aggregation of cunner and cod was approached by larger size class cod, pollock or by divers, the homotypic segregation within the aggregation would break down and individuals would scatter in apparently random directions toward small rock crevices. The homotypic groupings were reformed when the danger had passed. No actual predation by large cod or pollock was observed.

Figure 1 is a conceptual representation of the reef assemblage by micro-habitat type, depth, and position of the various component groups.

## Discussion

These behavioral observations support the contention of others (Erlich and Erlich, 1973; Ogden and Erlich, 1977; Keenlyside, 1979) that heterotypic fish aggregations are an adaptive predator avoidance strategy. When approached by potential predators such as cod and pollock (Bigelow and Schroeder, 1953), individual cunner and cod would scatter toward adjacent shelters in small rock crevices where no large predators could occur. Cunner flooded the prey field over a wide size class range in this reef fish assemblage. Although cunner were numerically dominant, both cunner and cod in aggregation were afforded an advantage during predation attacks if size class were the only prey selection criteria.

The occurrence of these heterotypic aggregations is probably opportunistic as the distribution of these two species does not overlap over large parts of their respective ranges (Bigelow and Schroeder, 1953). Size class differences in both cod and cunner by locality may preclude the formation of such aggregations.

It seems intuitive that daily natural mortality rates vary greatly both spatially and temporally as the physical environment and predatory melieu also vary on a spatial and temporal basis. Interspecific interactions are therefore responsible for an unknown amount of the variability associated with natural mortality rates. Frank and Leggett (1982) found that in co-occurring larval fish aggregations, the dominant species swamped the predator field and reduced daily mortality rates up to 5 times. The previously described heterotypic aggregations may also have the affect of reducing daily mortality rates. These type of interactions may explain some of the variablity associated with population mortality parameters for a variety of species.

Acknowledgements

I would like to thank George Maltezos and the crew of the RV James P. Gallagin II (Connecticut Department of Environmental Protection, Marine Region) for making shiptime available and for logistic support during diving operations, Lee Crockett for diving assistance, Joyce Lorensen for typing the manuscript and Mary Jane Spring for preparing the figure.

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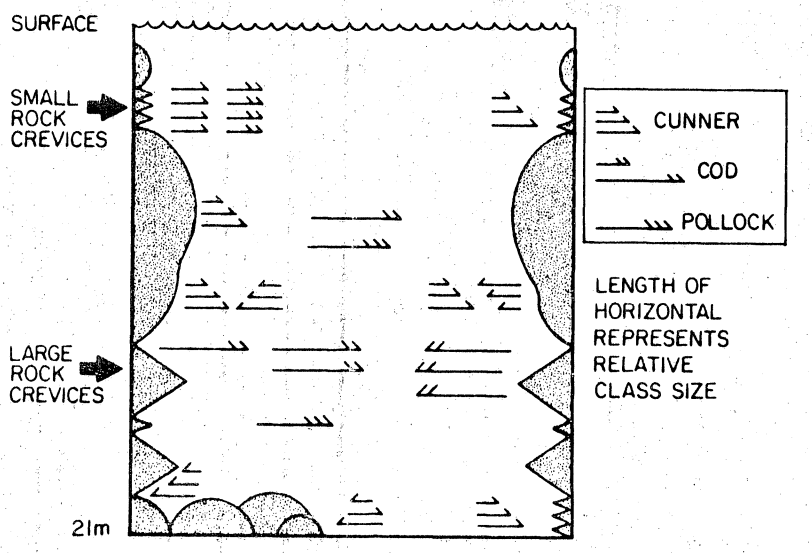


Figure 1. A schematic of the pertinent features of the fish assemblage. The heterotypic aggregation is at upper left. Note non-polarized aggregations of cunner at other areas of the reef. Vertical reef structure is exaggerated.