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ABSTRACT

We summarize the available information for a mass migration of juvenile queen conch in the Bahamas. The migration was observed from April through June, 1987 over a large seagrass meadow and adjacent sand-algal plain at 1-5 m depths. Component aggregations ranged from 40-190 m in length and 1-6 m in width, with a maximum density of 319 conch/m^2. Migrants averaged 101 mm in shell length, which ranged from 67-145 mm, and were of a similar size as non-migrants in the area. The migration was directional towards ebb tidal flow and moved approximately 250 m, at rates of 2.7 - 4.8 m/d, from April until its dissociation in June. Given the characteristics of the migrants and aggregations, we conclude that a key function of the mass migration was as a dispersal mechanism for asynchronously emerged 1+ year class of juvenile queen conch; other potential functions include reduction of predation-induced mortality and efficient utilization of food resources.

INTRODUCTION

Mass migration of juvenile queen conch, *Strombus gigas*, in the Bahamas was recently documented (Stoner *et al.*, unpubl. ms.) and characterized (Lipcius *et al.*, unpubl. ms.). Although the phenomenon was locally dramatic in its extent and persistence, it has been rarely observed previously. Hence, key questions have been raised concerning its occurrence throughout the Caribbean, impact upon queen conch population dynamics, and effects on benthic community structure. To promote further research concerning the features and function of this phenomenon, we summarize the available quantitative and qualitative information for a mass migration of juvenile queen conch.

STUDY SITE

The mass migration was observed over a large seagrass bed and adjacent sand-algal plain bordering Children's Bay Cay and Lee Stocking Island, Exuma Cays, Bahamas. Detailed descriptions of the study site were provided by Herrnkind and Lipcius (1989), Wicklund *et al.* (1991), Stoner *et al.* (unpubl.

ms.) and Lipcius *et al.* (unpubl. ms.). Briefly, the seagrass bed is composed predominantly of turtlegrass (*Thalassia testudinum*) and scattered patches of calcareous algae, and it is bordered by an expansive and shallow (1-2 m depths) oolite sand-algal shoal to the west. The area serves as a shallow (3-5 m depths) nursery habitat with high densities of juvenile queen conch.

INITIAL OBSERVATIONS

The mass migration was first observed in April, 1987 during a reconnaissance scan over the seagrass bed. A survey of the aggregation indicated that it was extensive and required intensive study to characterize its features and function. At that time, the migration had two components: a smaller aggregation approximately 40 m long which was separated by an elongate sand patch from a larger aggregation 160 m long . In April, however, we did not note an extension over the adjacent sand flat because our observations were limited to the seagrass bed. Therefore, the 40 m aggregation was not observed. Further observations and quantitative details pertain only to the 160-m aggregation and a newly observed (June, 1987) 190 m extension over the adjacent sand flat.

CHARACTERISTICS

The following summary is derived from data presented in Stoner *et al.* (unpubl. ms.) and Lipcius *et al.* (unpubl. ms.).

Persistence

The mass migration lasted at least from 18 April 1987 until late June or early July, 1987. It was not re-sighted during intensive surveys throughout the seagrass bed and adjacent sand flat in mid-July and late August, 1987. Thus, the mass migration persisted no less than two months.

Size Distribution

The mass migration comprised juvenile queen conch of 67-145 mm in shell length (SL; mean SL = 101 mm). However, the extension over sand was conspicuously lacking in juveniles less than 100 mm SL, whereas the section in the seagrass bed contained a large proportion in that size range. The sizes of migrants increased slightly through the summer as the juveniles grew while feeding in the nursery area, and this growth generally reflected the size-frequency distribution of non-migratory individuals in the habitat. Given the size and age distributions of queen conch in the Caribbean (Brownell and Stevely, 1981), we conclude that the mass migration was composed predominantly of the 1+ year class which settled in the preceeding year.

Structure and Density

Over the seagrass bed, the conch aggregation varied in average size from 160 m length, 3.2 m width in late April to 110 m length, 2 m width in late June. The extension observed over the sand flat in June averaged 190 m length and approximately 4-6 m width.

Densities in the aggregation over the seagrass bed declined from 319 conch/m^2 in April to 51 conch/m^2 in June. We estimated a gradual reduction from approximately 130,000 individuals in April to complete dissociation in the seagrass bed by late June or mid-July. Over the sand, densities averaged about 22 conch/m^2 in June, with fewer total individuals than over the seagrass bed.

Movement Rates and Orientation

The migrants moved in the direction of ebb tidal flow towards the southeast at a rate of 4.8 m/d in April. By late May the migrants slowed to 3.1 m/d, and 2.7 m/d in late June. The total observed movement of the migrants in the seagrass bed was approximately 250 m from April through June; comparable data for the extension over the sand plain are unavailable.

Migrants were oriented significantly in the direction of the ebbing tide. Non-migrants 10 m or more away from the front or rear of the mass migration were oriented randomly.

FUNCTIONS

The mass migration of juvenile queen conch functions as a dispersal mechanism in the seagrass meadow and adjacent sand-algal plain. Thorough discussions of the evidence for a dispersal function are provided by Stoner *et al.* (unpubl. ms.) and Lipcius *et al.* (unpubl. ms.). Briefly, the following features indicate a dispersal function:

1. Migrants were moving directionally in unison.
2. Densities of juvenile conch were significantly higher behind the aggregation than from it.
3. The size distribution of migrants and non-migrants did not differ significantly.
4. Migrants and conch behind the migration did not differ in their degree of fouling (*i.e.*, they were relatively clean), whereas conch in front of the migration were heavily fouled.
5. The mass migration diffused in structure and declined in density gradually as it progressed across the seagrass meadow and adjacent sand-algal plain.

In addition, the mass migration may follow synchronous emergence of the 1+ year class (Stoner *et al.*, unpubl. ms.), and it may function as a means of reducing mortality rates due to predation in a manner promoting efficient utilization of food resources in the seagrass and sand habitats. Further

descriptive and manipulative field studies are necessary to clarify the evolutionary and ecological implications of the mass migration to the population dynamics of *Strombus gigas*.

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