MYSIDS & ME:

A temporal study of Mysid feeding behavior

Mari Butler
3/7/89
BIO FSP- Jamaica
Discovery Bay Marine Lab
Prof. John Gilbert
TA's- Hugh McIsaac
Gayle Peartree

Abstract

Mysids are important ecologically in a coral reef environment because of their position in the food chain. They characteristically are found in swarms during the day and scattered throughout the water column at night. This study looks at nightly feedings as a possible reason for this behavior. Gut volumes were quantified from mysids caught at different times during the day. Mysids returning from nightly dispersals showed significantly greater gut volumes when compared to mysids in swarms before nightly dispersals and when compared to a group of starved mysids. The mysids in swarms before dispersal and the starved mysids showed no significant difference in gut volumes. This data suggests that mysids disperse at night in order to forage and perhaps swarm during the day to avoid predators.

Introduction

Mysids or possum shrimps are an important link in any aquatic food chain. They are found in both fresh and salt water all over the world. In particular, they play an important role in the organic budget on a coral reef. They serve as food for a variety of animals and are an important component of coral reef plankton.

The ~~family~~ genus Mysidium has three species in the caribbean which are not easily distinguished. They characteristically swarm during the day and disperse at night in a typical demersal fashion. The purpose of this swarming and dispersal behavior is not certain. This study was performed in an effort to ~~show that~~ see if mysids disperse at night to feed ~~[Conversely, they]~~ and do not feed while they are in schools during the day.

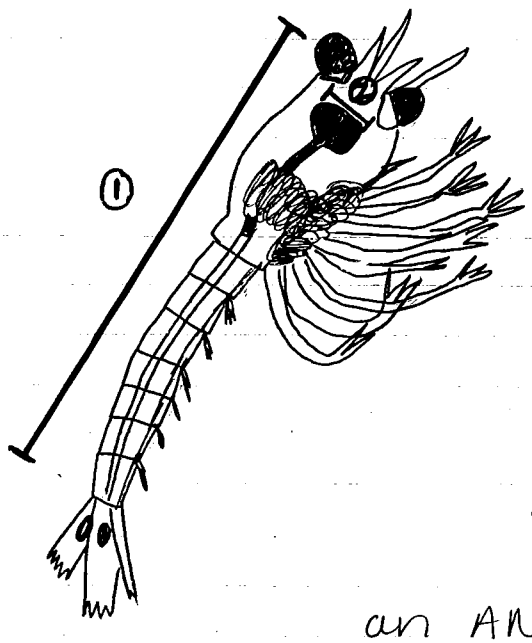
Methods

I collected all mysids used in this study from the back reef in Discovery Bay, Jamaica. I used a hand net with ≈.6mm mesh and snorkeling equiptment to capture each sample from a single swarm located in approximately 1.5m of water. Samples were collected over the course of 4 days from 28 Feb. 1989 – 3 March 1989. Two samples were taken per day. The "A.M. sample" was taken between 6:00 and 6:20 AM when swarms were first observed reforming, and the "P.M. sample" was taken between 4:30 and 5:00 PM. after the mysids had spent the majority of the day in the swarm. Although each sample was not taken from the same swarm, all samples were taken from the same general vicinity in an area with a high concentration of damsel fish territories.

Both the AM and PM samples were preserved immediately after capture in formalin. One experimental sample taken at approximately

6:00 AM on 3 March was not preserved immediately. Rather, it was allowed to sit in a wet table with salt water running through it until 5:00 PM when the mysids were removed and fixed in formalin.

I made the following measurements and calculations:



① Body length
② Gut width
③ Gut volume
$= \left(\frac{1}{2}②\right)^3 \pi \left(\frac{4}{3}\right)$

④ Ratio → $\frac{\text{Gut volume}}{\text{Body length}}$

Ratios for AM, PM, and Exp. samples were compared using t-tests, and an ANOVA-test was used to show consistancy in body size between swarms.

I also dissected several guts from each sample and examined them under a compound scope.

Results

I found the mysids collected early in the morning to have a significantly greater gut volume to body length ratio when compared to mysids collected late in the afternoon (t-test, df=118, t=6.09, p<.001). I also found the experimental mysids to have a significantly ~~less~~ lower volume to length ratio ~~when compared to~~ than Mysids from the PM sample (t-test, df=78, t=2.897, p<.01). There was no significant difference between the ratios calculated for the experimental sample and the PM samples (t-test, df=78, t=1.563, p>.05) (TABLE/s 1 & 2).

An ANOVA test ~~was used to~~ showed no significant difference between the body lengths of mysids collected in ~~each of~~ the seven samples (ANOVA, p<.1736) (Table 3)

Qualitatively, the mysids from the AM samples looked like they had more material in their guts as well as extending down their intestines. I often had more difficulty even locating the guts in the PM and experimental samples.

The gut dissections proved interesting, yet not readily informative. A difference in volume was easily observed between AM samples and PM or experimental samples, yet content was not obviously differentiated. Most of the gut contents appeared to be partially digested material of some sort. Fragments of copepods were occasionally observed in AM and PM samples, but not in experimental samples.

Table 1 : Mean Gut Volumes, Standard Deviations, and Sample Sizes of Each Kind of Sample

started 6AM-50pm

sample	AM	PM	Exp.
mean gut volume (mm^3/mm)	.0207	.0140	.0165
standard deviation	.0056	.0065	.0057
n	60	60	20

Table 2: Results of t-tests

Samples Being Compared	Degrees of Freedom	calculated t	p
AM, PM	118	6.09	<.001
AM, exp.	78	2.897	<.01
PM, exp.	78	1.563	>.05

Table 3: Size Ranges for Body Lengths (mm) for each of Seven Swarms Sampled (ANOVA - p >.05)

AM	PM	Exp
3.64 - 4.56	2.64 - 4.88	4.24 - 5.44
4.04 - 5.00	3.24 - 4.96	
3.44 - 4.88	2.72 - 4.64	

Discussion

Mysids have proven to be an important link in the food chain on a coral reef. Besides providing food for planktivores, their own feeding habits range from filter feeders to carnivores to detritivores. The data collected from this study suggest that mysids feed more at night than during the day. It can be clearly seen how this type of feeding schedule might benefit mysids.

According to Mullin and Roman (1986), mysids are better suited for taking up large particles of debris or zooplankton in comparison to bacteria or algae. Since it is a relatively common occurrence for zooplankton to move up the water column at night (Emery, 1968), zooplankton prey are probably more available to mysids who leave their schools at night to forage higher up in the water column.

Alternately, by staying in large schools near the bottom during the day, mysids are probably

avoiding planktivorous fish predators more effectively. The fact that they swarm very often in damselfish territories or between Diadema spines adds to their protection against planktivores. The schooling itself is a known behavioral method of avoiding predation, but schooling requires similarly sized members to be most beneficial (McFarland and Hillis, 1982 in a presentation by Brian Bone, FSP, 1988). An ANOVA was used to compare the size of mysids found in each of the seven swarms sampled. no significant difference was observed. Clutter (1969) in Hahn and Itzkowitz (1985) defined a swarm as a small cohesive unit of mysids and a school as a swarm in motion. A shoal was defined as several swarms. I believe that all my samples may have been taken from the same shoal. This larger group of similarly sized mysids might be extremely effective at avoiding predation especially since there were an abundance of damselfish territories

surrounding the shoal.

I am also confident that the samples taken on different days were from the same population because of their homing behavior. Hahn and Itzkowitz (1985) showed highly stable home sites in which 93% of marked individuals returned to the same sites.

In addition to finding significantly different gut volumes between AM and PM samples, I had hoped to find a qualitative difference in gut contents with perhaps a greater number of copepod fragments in the AM samples. Unfortunately, I was unable to distinguish much of the gut contents. Both AM & PM samples contained what appeared to be copepod fragments in a granular substance, but none were seen in the experimental samples. This may be due to small sample size being dissected. Perhaps it takes several hours or even days for a copepod cuticle to be digested. Mullin and Roman (1986) did, however, show in their study using radioactively labeled food that in some cases labeled fecal

pellets were formed in as little as 20 minutes.

I do not believe that all ~~of that~~ food ingested gets digested that quickly because if this did occur I do not think I would have recorded measurable differences between AM and PM or experimental samples. I believe that if this was the case then AM gut volumes would be greatly influenced by time of last ingestion and distance traveled to feed. According to Hoult and Veal (1988) mysids in Discovery Bay form schools between 5:45 and 6:05 AM and disperse between 6:00 and 6:40 PM. By collecting and preserving the AM samples as soon as I saw the schools form I believe I obtained an accurate measure of night time feeding. In retrospect, I believe an additional study should have been done in which another experimental sample was taken at 4:30-5:00 PM, held in the water table until 6:00 AM, and then preserved. This would have been an interesting comparison.

get clear wrong

The lack of significance between the PM and experimental sample can be explained in two ways:

1.) No feeding occurs during daytime hours on the reef.

2.) Feeding does occur during the day, but not to as great an extent as during the night.

My study does not support one of these more than the other, but an interesting point to consider is that it is very likely that there exists a minimal gut volume below which the gut does not go even when it is totally empty.

In conclusion, samples of mysids of similar body sizes taken from the same shoal at two different times during the day showed significant differences in gut volumes. This suggests a feeding schedule in which mysids swarm during the day near the bottom in an effort to avoid predators and disperse at night to forage.

References

Emery, Alan, R. 1968, Preliminary Observations on coral reef plankton, Limnology and Oceanography, 13(2), p.p. 293-303.

Hahn, Patrick and Murray Fitzkowitz, 1985, Site preference and homing behavior in the mysid shrimp Mysidium gracile (Dana), Crustaceana, 51(2) pp. 215-219.

Hoult, Molly and Genevieve Neal, An observational study of Marine Mysidacean School Distribution and Behavior, Bio FSP 1988.

Mullin M.M. and M.R. Roman, 1986, In situ feeding of a schooling mysid, Anisomysis sp., on Davies Reef - mecor #4, Bulletin of Marine Science, 39(3), pp 623-629.

Sefton, nancy and Steven K. Webster, Caribbean Reef Invertebrates, Sea Challengers Publications, California, 1986.

Mari -

Very good paper

A-

John