

Diurnal Behavior of the
Nocturnal Squidfish
(Holocentrus rufus)

A very creative study, good work. Write-up could be improved considerably (see comments).

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ABSTRACT

V.V.

Squirrel fish (Holocentrus ruber), though nocturnal, are observed exposed outside their shelters during the day. We looked at the abundance of exposed squirrel fish during the day and night, but found no significant differences in abundance. We feel though, that there are more exposed fish at night that were not observed by us due to fish migrations to feed.

To examine the costs and benefits of diurnal exposure, we looked at their behavior during the day. We found that when water turbidity was low, the fish spent significantly more time exposed, and ventured to significantly further distances from their shelters, than when turbidity was high. This may be due to a decreased energy cost of staying stationary or swimming in calm over turbid waters. We found no

turbidity
or
turbulence?

significant correlations between the length of the fish, and the time it spent exposed, or the distance it ventured from its shelter.

We feel that some of the advantages of diurnal exposure are opportunistic feeding, territory defense, and the opportunity to be cleaned. Costs include the risk of predation and energy to remain stationary or to swim.

LT

Introduction:

The squirrelfish (*Abucenturus rufus*) is commonly regarded as a nocturnal fish (Kaplan 1982). The nocturnal behavior pattern of squirrelfish coincides with the activity of nocturnal crustaceans, which make up most of their diet (Vivian and Peyrot-Chausade 1974). Feeding at night reduces the risk of predation for the bright red squirrelfish, because visibility is reduced at night. For protection from predation during the day, squirrelfish find crevices in the coral. Each squirrelfish is reported to be loyal to its particular crevice (Thresher 1980).

However, it was our observation that though these nocturnal fish had shelters, many remained

during ~~this~~ their "inactive time." This exposure during the day leaves squirrelfish vulnerable to attack from such predators as grasshogs and snappers which are active during the day (personal communication from Peter Bayle 1991). In addition, remaining free swimming in the water column represents an additional energy cost in itself, especially in turbulent conditions.

In order for squirrelfish to continue this pattern of behavior, they must be deriving some benefits from being exposed during the day, which outweigh the costs that they incur.

Some possible benefits are:

- 1) opportunity to feed on any passing

crustaceans (Vivien & Peyrot-Clausade 1974)

2) territory defense (Thresher 1980)

3) opportunity to be cleaned by the diurnal cleaner fish

In our study of the squirrelfish in Discovery Bay, Jamaica, we tried to quantify and describe the squirrelfish populations which were exposed during the day as well as populations exposed at night.

Hypothesis I. Because the squirrelfish are nocturnal we hypothesized: There are a greater number of exposed squirrelfish at night than during the day.

Hypothesis II. Due to possible increased energy costs associated with maintaining an exposed position

depends on depth,
& more precise

in turbulent waters, we hypothesized that squirrelfish in the back reef, a more turbulent habitat, would spend more time hidden than squirrelfish in the fore reef, a less turbulent habitat.

see comment above

Hypothesis III. Because it requires more energy for squirrelfish to swim in areas of high wave action, we hypothesized that squirrelfish in the back reef would not swim as far from their crevice as would those squirrelfish in the fore reef.

Hypothesis IV. Based on the assumption that a large squirrelfish might be too large for a grubby or snapper to ~~prey~~^{prey} on, but a small squirrelfish would be potential prey for any size

predator, it would seem logical that

small squirrelfish would experience higher predation pressure than larger squirrelfish.

We thus hypothesized that small squirrelfish would spend more time hidden during the

day and remain closer to their crevice

than would larger ~~sq~~^{squirrel} fish.

Good. Also small ones might be less territorial

proportion it would seem logical that

small experimental would experience higher

proportion pressure than larger experimental

as the independent that small experimental

would spend more time within during the

day and remain closer to their course

than would larger $\frac{1}{2}$ ft.

METHODS

V.V.

We conducted our study in the coral reefs of Discovery Bay, Jamaica, between February 28th and March 4th, 1991. Part of the study was conducted in the Back Reef, in the area between the canoe channel and the reef crest (site 1 ^{in Fig 1} ~~on map~~). The other part of the study was conducted at Mooring 1 (M1) in the Fore Reef (site 2 ^{in Fig 1} ~~on map~~).

SITE DESCRIPTION

Site 1 in the Back Reef was ^{0.5-1.5m} ~~± 2m~~ deep. Wave action was high and current flow strong. The area had an uneven distribution of coral which formed a dense network containing numerous crevices, tunnels and chambers hidden from view that provided shelters and refuges for a plethora of organisms. Areas void of coral were sandy and contained turtle grass or red and brown algae. Algae was also found covering coral.

Condylactis gigantea sea anemones and *Diadema antillarum* sea urchins were observed exposed in depressions or crevices on coral heads.

Area
measure
of this?

Site 2 in the Fore Reef was 10-15m deep. Wave action and current flow were both less compared to the Back Reef. Here too the distribution of coral was uneven, with aggregations of coral buttresses (2m high and 10m across), separated by narrower sand channels. Sea anemones and urchins were very sparse.

Test of Hypothesis I

We tested our first hypothesis by snorkeling at Site 1. To see if there was any difference in the number of squirrel fish during the day and night we conducted a census. We layed out, ^{a total of} 13 transects, each 20 m long, and sampled censused them ~~fish~~ over a 3 day period.

We ^{used} ~~using~~ the following method for randomizing the location of a transect: one of us would swim in no specific pattern.

A second person, whose back was turned towards the swimmer would tell the swimmer to stop after some time.

The point at which the swimmer stopped marked the centre of the transect. Next, one of us would swim ~~across~~ around this point in a small circle, while a second person whose back was once again turned, would tell the swimmer

to stop. The direction the swimmer was facing on stopping would be the direction of the transect. Two of us would swim away from the central point, each holding one end of a 20 m long string. The taut string, stretched out in a line marked the transect.

Once the transect was layed out, we would leave it for approximately 15 mins. to let any fish we may have scared

away by our presence, return. To census the squirrel fish, two of us swam alongside the length of the transect at a steady speed, on opposite sides of the string, and 1m away from it. Looking directly below us while swimming we recorded all squirrel fish we observed, as well as their approximate length, and whether they were exposed ~~outside~~ or hidden. We ran each transect once during the day, ^{(using flashlights),} and once again at night, ~~for a 3 day period.~~

Test of Hypotheses II, ~~and~~ III and IV

This part of the study was conducted by snorkeling at Site 1, and by diving using SCUBA at Site 2.

On finding a stationary, exposed squirrel fish, we would remain motionless in the area for approximately 1 min, for the fish to get accustomed to our presence.

When the fish was once again stationary and clearly exposed, we would start ^{a 5 min} ~~an~~ observation period. which

During that period we recorded the amount of time the fish spent exposed and hidden (to test Hypothesis II), and the maximum distance it moved from its stationary location (to test Hypothesis III). We also recorded any aggressive encounters it had with other fish (defined by a chase), and the species of the other fish. To see if the squirrel ^{instances of} fish was feeding opportunistically, we recorded all feeding (defined by a short jerky movement towards the coral or ground substrate). We also offered a few of our test fish shrimp to test opportunistic feeding. After the 5 min observation period we obtained a size estimate of the fish by observing 2 points on the coral ^{behind} the fish that corresponded to the location of the tips of its head and tail fin,

and measuring the distance between these 2 points.

(this length was taken to test Hypothesis IV)

All observations were recorded on a slate with pencil,

and timings made with a swatch underwater watch.

To see if Squirrel fish were territorial, returning to

the same shelter every day, we did a ^{shelter} site fidelity study

on 9 fish at site 1 and 7 fish at site 2. We marked

the location of the shelter the fish was positioned near (and

would often swim in and out of), and noted the length of

the fish. We returned to these marked shelters every

day (for 3 days at site 1, and 2 days at site 2), and

noted the size and of the fish closest to that shelter.

To analyze our data we looked at the following:

- 1) The number of exposed fish during the day ^{vs.} ~~and~~ the night.
- 2) The time spent hidden by fish in ^{the} back reef vs fish in the fore reef.

3) The maximum distance moved from the shelter in the back reef vs the fore reef.

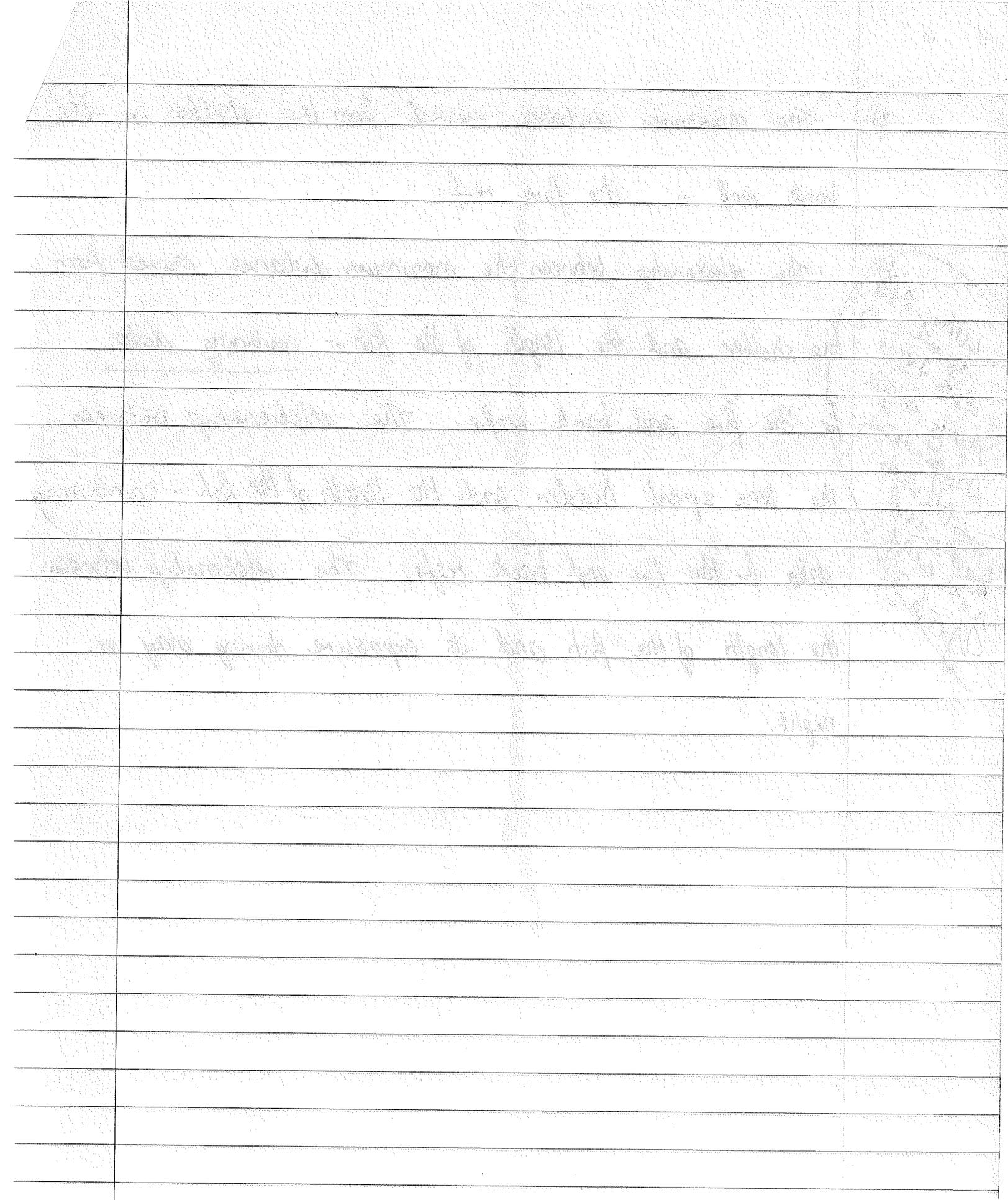
4) The relationship between the maximum distance moved from the shelter and the length of the fish - combining data

for the fore and back reefs. The relationship between the time spent hidden and the length of the fish - combining

data for the fore and back reefs. The relationship between the length of the fish and its exposure during day vs.

night.

Why did
you do
this?
Any size
difference
between
back- and
fore reef
fish?



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Results:

Hypothesis I: there was no significant difference between

the number of exposed squirrelfish on a day transect

and ~~to~~ the number of exposed squirrelfish on a night

transect ($p < 0.10$, $U = 112.5$, $n_1 = 13$, $n_2 = 13$).

Hypothesis II: There was a significant difference

between the amount of time squirrelfish spent hidden

on the fore reef and the amount of time squirrelfish

spent hidden on the back reef ($p < 0.001$, $U = 1010.5$,

$n_1 = 34$, $n_2 = 36$).

Hypothesis III: There was a significant difference

between the distance the squirrelfish moved from

its crevice on the back reef and the distance

the squirrelfish moved on the fore reef ($p < 0.001$,

$U = 952$, $n_1 = 34$, $n_2 = 36$).

What about their distribution around shelters?

Direction of difference?

Again, direction of difference?

Hypothesis IV: There was no significant correlation between the length of the squiellfish and amount of time it spent hidden ($p > 0.05$, $a = -6.80$, $b = 3.87$, $r = 0.21$, $n = 69$).

There was also no significant correlation between length of the squiellfish and distance the squiellfish moved from its crevice ($p > 0.05$, $a = 98.57$, $b = -212$, $r = -0.11$, $n = 69$).

There was no significant difference in the size of fish exposed during the day and the size of fish exposed at night ($p < 0.10$, $t = 1.88$, $df = 129$).

For means and standard deviations see Table 1.

For site fidelity we observed 15 out of 17 squiellfish returning to their crevice for the 3 days we

one or two tails?

Discussion:

GLG

but N.S.!

I Hypothesis I: Number of squirrelfish fully exposed day vs. night

Where
are data
to show
this?

Our transect data reveal a trend that there were

more squirrelfish clearly exposed at night than during the day.

There are two possible explanations for this diel pattern.

First, at night squirrelfish are less visible to predators

and therefore safer outside of their shelters. An alternate

explanation is that crustacean availability increases at

night thus drawing squirrelfish out of their crevices

to feed at peak crustacean abundance hours. Two night time

observations of ours lead us to believe that one night

census is actually an underestimate of the exposed

squirrelfish population along the transects. 3) On several

occasions our lights scared fish into hiding and

2) we noticed that the later we ran our night surveys

the ~~less~~ squirrelfish were sighted in the study area.

Accordingly, squirrelfish may migrate out of the coral substrate at night to more productive feeding habitats.

II Hypothesis II: Time spent hidden shallow habitat vs. deep habitat.
(Back reef vs. Fore reef)

Our results indicate that squirrelfish observed in the back reef spent significantly more time hidden than squirrelfish observed at depths of 10-15 m in the fore reef. One impetus for increased hiding time in the back reef is the harsh water conditions created by heavy wave action. Squirrelfish close to the surface like those in the back reef study area contend with the brunt of turbulence created by rough seas, whereas fish at greater depth do not experience as much water turbidity caused by surface conditions. Accordingly, exposed squirrelfish in shallower substrate must expend more energy to maintain their position in the water

column so as to avoid being swept into surrounding
urchins, anemones, and stinging corals and to remain
proximate to their shelters. Squirrelfish in the back reef
are able to avoid the energy costs associated
with remaining exposed in rough conditions by hiding in
crevices which serve as a refuge from the effective
water surge. Alternatively, squirrelfish may display
stronger diurnal hiding in the back reef due to higher
predator density in this substrate.

III. Hypothesis III: Range of movement from crevice shallow habitat vs. deep habitat
(Back reef vs. Fore reef)

We found that squirrelfish in the fore reef ventured
further from their crevice than fish in the back reef.
Due to calmer water conditions in the deeper substrate,
less effort is required for the fish to patrol the area
surrounding their home shelters. One possible benefit of

Also,
higher
predator
density

venturing from the shelter is that by covering a larger range, the fish surveys a larger volume of water for food items.

Hyp: 4
IV. 1 Smaller squirrelfish spend more time hidden and remain closer to crevice

Since smaller squirrelfish are more susceptible to predation, we expected to find that the smaller squirrelfish spent more time hidden and remained closer to their shelter than larger conspecifics. On the contrary, our results do not indicate any correlations between fish size and time hidden or distance from crevice. Our transect data however, do suggest that the mean size of fish viewed at night is less than the mean size of fish recorded during the day.

This result indicates that the majority of the smaller squirrelfish are hidden during the day and therefore

1 No
2 No
3 No

not visible for scientific observation. In addition, large standard deviations in this data may account for insignificant correlation coefficients.

I site fidelity and possible benefits derived from exposed diurnal behavior

We recorded strong site fidelity both in the back and fore reef study areas. It seems that squirrelfish do benefit by remaining in or near the same home ranges during the day. By maintaining permanent diurnal shelters the fish are relieved of the stresses of searching for a refuge in the face of threatening encounters or harsh conditions. Furthermore, our observations suggest that remaining exposed near a home crevice during the day is advantageous in some ways. We noted two instances of exposed squirrelfish probing in algal growth on coral heads. In addition, exposed squirrelfish readily

ate pieces of shrimp which we dropped near them.

Although squirrelfish are mainly nocturnal feeders,

they may exhibit this exposed inactive behavior in order

to feed on particles passing by in the water column.

Hidden squirrelfish would be unable to detect ^{readily available} food

items in the surrounding environment. Unfortunately,

our methods for examining diurnal suspension

feeding of squirrelfish were too artificial to warrant

further trials. ~~however our methods consist~~

We also noticed two cleaning events, where

exposed squirrelfish were serviced by cleaning gobies.

It has been documented that the removal of cleaner

fish from reefs results in a decline in the health ~~of~~

of the fish population (Linnburgh 1961). As in the case

of diurnal ^{opportunistic} suspension feeding, only the exposed

squirrelfish will have opportunities for to be cleaned.

Thirdly, squirrelfish may remain exposed during their inactive phase in order to defend a territory.

We attempted to quantify territorial displays but were

unable to collect enough data to run statistical

tests. We did however observe ^{3?} the instances of

squirrelfish chases.

VI Final Words

In conclusion, it seems that these squirrelfish

are displaying diurnal behavior which is uncharacteristic

of nocturnal animals. Moreover, our back/fore

reef comparisons indicate that this behavior is

affected by habitat type, here represented by a

depth gradient. Further studies measuring

water turbulence, crustacean abundance, and

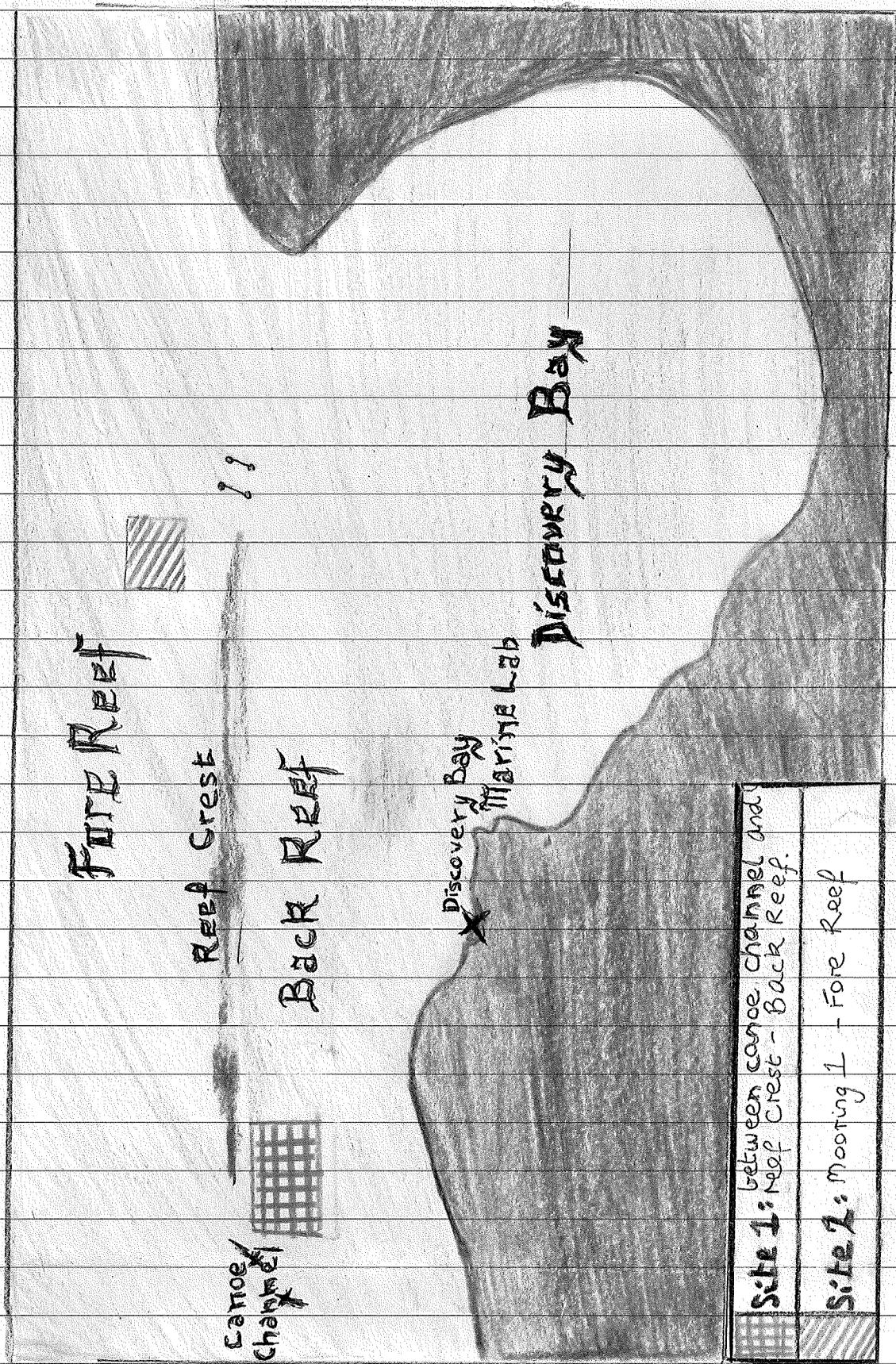
predator abundance both during the day and night at

both study sites are necessary to more accurately

determine what factors govern this uncharacteristic

inactive behavior of squirrelfish.

V.V.



Site 1: between canoe channel and Reef Crest - Back Reef.

Site 2: Mooring 1 - Fore Reef

Fig 1: Sites 1 and 2, in the back and fore reefs respectively, in Discovery Bay, Jamaica Feb 28th - March 4th 1991.

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DRAGON BSB

IF-AT MIII

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FORA RIBET

4-9-10 FORA

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Table 1: A summary of data taken on *Alocentrus rufus* at Discovery Bay, Jamaica March 1991.

Hypothesis	Data Description	n	Mean	Std. Dev.	P value
I.	# fish exposed day	13	1.77	2.05	p < 0.10
	# fish exposed night	13	6.08	5.33	
II.	time spent hidden on back reef (sec)	36	98.29	111.30	p < 0.001
	time spent hidden on fore reef (sec)	34	19.55	54.25	
III.	distance moved on back reef (cm)	36	24.31	37.67	p < 0.001
	distance moved on fore reef (cm)	34	90.88	124.53	
IV.	length of squirrelfish (cm)	69	16.54	5.21	p > 0.05
	max. distance moved from crevice	69	57.23	98.08	
	length of squirrelfish (cm)	69	16.54	5.21	p > 0.05
	amount of time spent hidden (sec)	69	63.52	100.35	
	size of fish exposed at night (cm)	89	12.84	5.36	p < 0.10
	size of fish exposed during day (cm)	42	14.62	4.30	

Table 1: A summary of data taken on the 1st of March 2011 at the University of Exeter, Cornwall Campus.

Time	Location	Temperature (°C)	Humidity (%)	Wind Speed (m/s)	Notes
08:00	Library	18.5	65	1.2	Clear sky, calm
09:00	Library	18.8	68	1.5	Light breeze from the east
10:00	Library	19.2	70	1.8	Light breeze from the east
11:00	Library	19.5	72	2.0	Light breeze from the east
12:00	Library	19.8	75	2.2	Light breeze from the east
13:00	Library	20.1	78	2.5	Light breeze from the east
14:00	Library	20.4	80	2.8	Light breeze from the east
15:00	Library	20.7	82	3.0	Light breeze from the east
16:00	Library	21.0	85	3.2	Light breeze from the east
17:00	Library	21.3	88	3.5	Light breeze from the east
18:00	Library	21.6	90	3.8	Light breeze from the east
19:00	Library	21.9	92	4.0	Light breeze from the east
20:00	Library	22.2	95	4.2	Light breeze from the east
21:00	Library	22.5	98	4.5	Light breeze from the east
22:00	Library	22.8	100	4.8	Light breeze from the east
23:00	Library	23.1	100	5.0	Light breeze from the east

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Appendix: Tables of Raw Data (March 1991.
for Holocentrus rufus (Discovery Bay, Jamaica)

Observation Summary - Back Reef

Day	#	Hidden	max. Distance from Curia	Aggression	Feeding	Exposing	Length
5/1 rough	1.	100 sec	30 cm	1 parrot (bicolor, parrot, goby, dusky, lg. squirrelfish)	-	-	15 cm
	2.	0 sec	30 cm	1 dusky (sm squirrel, dusky)	-	-	25 cm
	3.	280 sec	40 cm	- (dusky, lg squirrel)	-	-	13 cm
	4.	300 sec	0 cm	- (damsel)	-	-	
	5.	300 sec	0 cm	-	-	1	12 cm
	6.	285 sec	27 cm	- (4 damsel)	-	-	15 cm
	7.	10 sec	0 cm	-	-	2	20 cm
	8.	20 sec	40 cm	- (f. g. g. g., stoplight, striped p.f.)	-	2	17 cm
	9.	115 sec	100 cm	-	-	-	15 cm
3/2 rough	10.	0 sec	20 cm	- (stoplight)	-	-	12 cm
	11.	0 sec	5 cm	- (2 dusky, 4 bicolor, f. g. g.)	-	-	17 cm
	12.	60 sec	90 cm	- (3 goby, stoplight)	-	-	17 cm
	13.	95 sec	40 cm	- (dusky, 3 bicolor)	2	2	13 cm
	14.	50 sec	100 cm	5 lg squirrel (f. g. g., squirrel, bicolor, striped p.f.)	-	-	15 cm
	15.	0 sec	10 cm	1 (wrasse jaw, stoplight)	2	2	10 cm

Day	#	Hidden	Max. Distance from crevice	Aggression	Feeding	Gaping	Length
3/2 rough	16.	240 sec.	0 cm	(6 damsel)	-	-	18 cm
	17.	0 sec	0 cm	(1 damsel)	-	-	15 cm
	18.	230 sec	0 cm	(4 damsel)	-	-	18 cm
	19.	200 sec	0 cm	3 squirrel (4 damsel)	-	-	20 cm
	20.	120 sec	0 cm	(3 damsel)	-	-	25 cm
3/3 rough	21.	10 sec	20 cm	(2 dusky, many bicolor, BHW fish)	-	-	8 cm
	22.	150 sec.	0 cm	(4 damsel)	-	-	12 cm
	23.	290 sec.	0 cm	(5 damsel)	-	-	18 cm
	24.	260 sec	0 cm	(5 damsel)	-	-	15 cm
	25.	285 sec	0 cm	(4 damsel)	-	-	15 cm
3/4 dark clarity	26.	220 sec	57 cm	(2 damsel)	-	-	20 cm
	27.	120 sec	100 cm	(2 damsel)	-	-	15 cm
	28.	0 sec	150 cm	(5 damsel)	-	-	20 cm
	29.	0 sec.	0 cm	(2 damsel)	-	-	13 cm
	30.	0 sec	0 cm	(2 damsel)	-	-	10-12 cm
	31.	0 sec	0 cm	(3 damsel)	-	-	10-12 cm
	32.	0 sec	0 cm	(3 damsel)	-	-	10-12 cm
	33.	0 sec	0 cm	(3 damsel)	-	-	10-12 cm
	34.	0 sec	0 cm	(3 damsel)	-	-	8-10 cm
	35.	0 sec	0 cm	(3 damsel)	-	-	8-10 cm
	36.	0 sec	0 cm	(3 damsel)	-	-	8-10 cm

Observation Summary - Fore Reef

Day #	Hidden	Max. Distance from center	Aggression	Feeding	Loping	Length
$\frac{3}{2}$ rough 1.	0 sec.	60 cm	1 butterflyfish	-	1	25 cm
2.	0 sec	45 cm	(3 damsel, surgeon)	-	1	10-12 cm
3.	300 sec	0 cm	-	-	1	10 cm
4.	0 sec	0 cm	-	-	-	15 cm
5.	30 sec.	80 cm	(damsel)	-	-	28 cm
6.	0 sec	100 cm	(damsel)	-	-	23 cm
7.	0 sec	30 cm	(damsel)	-	-	18 cm
8.	23 sec	10 cm	-	-	-	18 cm
9.	105 sec	0 cm	-	-	-	28 cm
10.	0 sec	20 cm	(damsel)	-	2	30 cm
11.	0 sec	10 cm	-	-	1	15 cm
12.	75 sec	5 cm	(damsel)	-	-	12 cm
13.	0 sec	5 cm	(damsel)	-	-	20 cm
$\frac{3}{3}$ rough 14.	0 sec	200 cm	-	-	-	20 cm
15.	0 sec	50 cm	-	-	-	30 cm
16.	0 sec	0 cm	(damsel)	-	-	13 cm

Day	#	Hidden	Max Distance from crevice	Aggression	Feeding	Gaping	Length
3/3 wavy	17.	0 sec	0 cm	-	-	-	13 cm
	18.	35 sec	50 cm	-	-	-	15 cm
	19.	0 sec	0 cm	(damself)	-	-	18 cm
	20.	0 sec	0 cm	(damself)	-	-	20 cm
	21.	0 sec	50 cm	-	-	-	13 cm
	22.	45 sec	400 cm	(yellowish wrasse)	-	-	12 cm
	23.	40 sec	130 cm	(surgeon, frequent)	-	-	18 cm
	24.	12 sec	200 cm	(stoplight, dusky)	-	-	12 cm
	25.	0 sec	130 cm	1 long spine (l. spine, dusky goby)	-	-	15 cm
3/4 dark clown	26.	0 sec	300 cm	3 dusky (redband, l. spine, l. rose puffer)	-	-	20 cm
	27.	0 sec	100 cm	(surgeon)	-	-	15 cm
	28.	0 sec	500 cm	(surgeon)	-	-	25 cm
	29.	0 sec	300 cm	(chromis, dusky)	-	-	20 cm
	30.	0 sec	75 cm	-	-	♀	20 cm
	31.	0 sec	0 cm	(l. spine sp) (l. damself)	-	-	20 cm
	32.	0 sec	240 cm	(BHO, chromis, xhu)	-	-	18 cm
	33.	0 sec	0 cm	(2 damself, parrot)	-	-	20 cm
	34.	280 sec	0 cm	(2 damself, l. spine)	-	-	12 cm

H = hidden
E = exposed

Transects - Summary of Data for Back Reef

		Day			Night		
	# fish	Size (cm)	Where	# fish	Size (cm)	Where	
2/28 1/6 6:40 pm	1	13	H	11	7-10	H ⁽²⁾ , E ⁽⁹⁾	
	2	17	E, H	3	15	E	
	1	18	H	3	25	H ⁽¹⁾ , E ⁽²⁾	
2.	0	-	-	2	7	E	
				6	10	H ⁽²⁾ , E ⁽⁴⁾	
				4	15	H ⁽¹⁾ , E ⁽³⁾	
				5	20	E	
				1	25	E	
3.	2	15	E	14	7-10	E	
	1	15	H	1	10	E	
2/2 with 7-7:30 pm	1	12	E	1	15+	H	
	1	15	H	8	7-10	E	
	2	20	H, E	1	15	E	
5.	2	10	H, E	1	12	E	
	3	12	E				
	1	15	E				
6.	0	-	-	3	7-10	E	
				1	15	E	
				2	25	H, E	
7.	1	10	E	2	12	E	
	1	15	H				
8.	0	-	-	1	20	E	

3/4
cloudy
calm 9.
8-8:30 pm

Day

Night ← 8-8:30 pm

# fish	Size (cm)	Where
1	7	E
2	10	H, E
1	12	E
1	15	H, E
2	20	H, E

# fish	Size (cm)	Where
1	8	E
1	10	E

10.

0	-	-
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2	8	E
2	15	H, E

11.

1	12	H
2	15	H

1	12	E
3	15	E
1	30	E

~~12. 2 15 E
1 20 E
1 25 H~~

12.

3	10	E
1	15	H
2	20	H, E
2	25	E

2	15	E
1	20	E
1	25	H

13.

2	10	E
2	15	H
1	20	H

1	10	E
3	15	E