September 24, 1982
Lizard Island
Queensland.

Arrive on island ca 2:45 p.m. A has been here for some time.
He has been watching cuttlefishes. Probably Sepia latimanus. SAM.
There is supposed to be a reef squid here. Sepioteuthis australis. Called "long-finned flying" (sic!) "squid". A has not been able to find it yet. (Is it coincidental that there is no TC here?)

September 26, 1982
Lizard Island

A took films of 2 or 1 Cuttles yesterday, around noon.
Today we went touring around adjacent islands and lagoons ca. 9:30 a.m. – 1:30 p.m. Habitat is beautiful. But the only cephalopod we saw was a single octopus inshore, on sand. Disappeared into hole. There are many other holes nearby. Could this be a "colony"???
This evening I walked along the beach, in shallow water, looking for Sepiolids. No luck.

September 27, 1982
Lizard Island

A rather frustrating day.
We were held up by problems with the motor.
A finally starts tow 12:15 p.m. Beginning Turtle Beach. Nothing. Then we go on to North Reef, where A has seen Cuttles many times before. "Resident" male is still around. Apparently alone now. Not very active. A does some filming. Stop 1:30 p.m.
Then I do some swimming in shallows Mermaid Cove ca. 2:10-2:20. Nothing.
Finally A dives near Granite Bluff(s). Again nothing

September 28, 1782

A makes 30 ft dive off Watson Bay in morning. Sees some wkz. Nothing else. Then we try to night light in adjacent area ca. 6:30-7:30 pm. Technical difficulties. Neither Josh nor squids.

September 29, 1782
Lizard Island

Going to try night lighting again. Near Bird Islet. Lots of mummers but no cephalopods

September 30 1782
Lizard Island

A fulvus his Cuttle at Portia Point again. SAN.
No trace of Sepioteuthis australis

October 2, 1782
Lizard Island

It was too windy to go out yesterday.
Today the wind was still strong, but A did some filming of his Cuttle.

October 3, 1782
Lizard Island

A more of same Cuttle.

October 4, 1782
Lizard Island

Very windy today, but we go out anyhow.
It is too rough to work at Portia Point. So we go into adjacent Mum-

aid Cove. A finds another Cuttle. Apparently single adult ♂ (territorial? breeding?). Apparently same species seen before. Ca. 60 gt down. Actually not very far from North Point Cuttle (perhaps 100-150 gt away).
Apparently alone. Not very active.

October 5, 1982
Lizard Island.

A look at Mermaid Cove Cuttle again. Less wind today. But animal still not very active.

San Blas,
5 May, 1982

Arrived here yesterday evening ca 6:00 p.m. Trip very calm. Rainy season well begun. Water around Nalunaka and Snathoenarituppu is clear.

Start out rather late this morning. Everything calm. Heat is oppressive. Clouds and rain coming up.

10:50 a.m. Lucho sees 3 small lepidots by anchor rope. They are gone by the time that we get into water.

11:00 a.m. A starts towing around Nalunaka, over to "Wichunala", almost to Porvenir, and back. Nothing of real interest. One group of 3 medium lepidots by dock of Nalunaka. Usual place. Group of 10 small lepidots by "Wichunala". Nothing more. Rain comes down in buckets. We stop 12:05 p.m.

Go on over to San Blas point. A starts towing 2:20 p.m. First out to tip, then along shore in direction of base of peninsula. Water is murky at base. Clearer inside. No squids. But perhaps some good areas for work tonight.

So we go back with lights 7:30 - 8:30 p.m. Explore a wide area. Bare sand and TG flats. Almost nothing. Only 2 small lepidots in TG. According to A, they are in Yellow with DM!

It is suggestive that we did not see any more lepidots. Are squids further out from shore now?

Nor did we see any Loligincula. Why?

The "Benjamin" is anchored far off shore (because of the Limulidae) in deep water. After we get back, ca. 9:45, 2 medium-large lepidots show up to feed on sardines circling under lights. Both animals are in Ord+. At least one mid. catches at least two fishes.

Jack says that a similar animal showed up earlier, ca. 7:30.

Cepha., May 5, 1982, II.

9:58 p.m. Now there are 3 Sepiots feeding on sandunes. Probably all 3 medium large. Feeding at different depths. Not coordinated. All 3 in "Basic" Sometimes with White Stripe. Sometimes just plain? May have they assumed this "unusual" coloration tonight? Could it be because the moon is full and particularly bright tonight? Thus encouraging diurnal rather than nocturnal coloration?

There are many peculiar V and contort movements. Apparently just before and after catching fishes.

San Blas,
May 6, 1982.

To Okupukkeys this morning. Sunny, clear, calm, and hot.

We start out to work 9:40 a.m. A Tows around island in usual way. Does some photography. SAN.

I just go to the western end of island, where there are large expanses of shallow sand and TG flats. Swim and walk around, looking for "Sepiolids", until 11:50 a.m. No success.

Who is filling the niche of inshore "Sepiolids" here. Young Sepiots may be in TG, but they certainly do not occur over sand (There certainly would seem to be plenty of potential food around. Large schools of small sandlances are enormously abundant near the shore line here. Ca. 10:00 a.m., most of them seemed to be "asleep" on or near the bottom. This is fine for Gloria's Sepiots. But why don't cephalopods take advantage of the same opportunities? Would they be too exposed to predators?)

There is something queer about the "Sepiida" Apparently much more abundant and diverse in the Old World than in the New. This may be almost as true of the "Sepiolids" as of Sepia itself.

A Tows around Okopukkeys and adjacent island this afternoon.

Cephs., May 6, 1982, II

There are some adult Sepiots around, but they don't seem to be doing anything of interest.

We go exploring again at night. Out to outer islands, and then almost to barrier reef. Lots of TC, sand, coral, etc. No cephalopods of any sort!

San Blas,
May 7, 1982

Stall at Okurpukkeps this morning. Seems some wind.

A tours all around island 8:25 - 9:25 a.m. Nothing at all.

Then goes for dive along reef where some inds. were seen yesterday. He does find the animals again. They are not very active. At best (and rather lubricously) engaged in mild courtship.

We go on to Tiatuppu - Pirgatuppu - Paneturppu area.

A starts tour around Pirgatuppu, beginning reef point along main land side, then channel. Finds group of approximately 25 Sepiots. Medium to large. 10 ft up in 30 ft of water over sand and coral bottom. The animals are very shy. They are all in Ord-Dark (Medium Dark) with very little or no WS. No courtship.

Then they dark off. According to A, they encounter other inds. in upward P. Clustered around tall thin (sponge? coelenterate?) Newcomers assume similar P. When I catch up, all visible inds. are in P and semi-Dark.

I get out of water 1:10 p.m. A resumes tour. Then, at 1:53, back at tip of coral reef point (where we started), we find another group of 17+ Sepiots. Some large. Some medium. Intergrading. A lot of courtship (at last) Inds. are over Acropora at edge of reef fall off, 15 - 20 ft. below surface.

A does lots of filming (4 rolls) until 3:45 p.m.

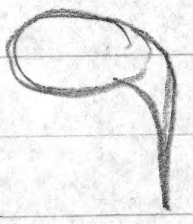
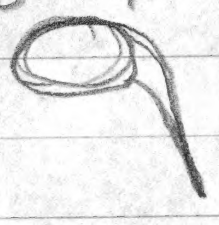
Cepla., May 7, 1982, II.

I try not to interfere with the following. Soon retire to boat. Before leaving, I can follow only one sequence.

A courting party of 3 ♂♂, 1 near ♂, and 1 far ♂ at end of group. ♀ nrs in extreme Pie, with extreme Halter. ♂♂ in something else End + (at least with WS, probably not with Y) far ♂ has RL. RL seems to be permanent or semi-permanent.

Then a third ♂, a second far ♂, joins party. At about the same time, coincidentally (???), A films some 2 performances.

Party of four mds. continues. ♀ Pies and Pies again. All very extreme. Rather surprisingly, this does not seem to discourage her suitors. They press her more and more closely. Near ♂ starts fluttering Rushes forward toward ♀ in apparent copulation attempt. Turns buffy-yellow as he does so. Attempt probably not successful. All members of the party retreat. Come back soon.

NOTE: All or most of the ♀'s Pies were done with arms hanging downward  or  This probably is typical

A says that "pair", not party, eventually separated from group. And then ♂ began to show Lateral Silver.

Go out at night. Around Pantapo 7:00-8:00 p.m. Explore very large areas of TG; and smaller but still extensive areas of almost pure sand. Not a single cephalopod in sight.

COMMENT: We have now done quite a lot of searching in TG at night. And we have found nothing except the 2 small Sepiots near San Blas Point three nights ago. This would suggest (confirm) that small Sepiots leave the flats at night to go out to more open or deeper waters.

In this connection, it may be significant that small sardines also seem to scatter at night.

7:00 p.m. Jack has been running the ship light since sun set. Lots of sardines have shown up, but (again) not a single squid.

It does look as if populations are low now!

San Blas,
May 8, 1982.

Still at Okupukeiya. Heavy rain early in the morning. Gradually clearing up. Getting windy.

We go straight to site where A filmed yesterday. Group is still there. 7:20 a.m. A starts filming again. SAN

I wander about along shore. Mostly T.C. Some sand and coral. See one small blob of ink – that is all.

We botta step 10:45 a.m.

Start again after lunch. A tows Cunguru tuppu. Finds group of large and medium sepiots almost immediately. But they are doing nothing. Resumes tow around Cunguru tuppu. Then over to Icatuppu. Then along flat between Icatuppu and Pametupo. Then along to area of Pametupo. Then along offshore reef.

We stop 1:25 p.m.

What has gone wrong this year?

Later in the afternoon, we go on to Morpeptuppu. A tows all around island 3:25 – 4:00 p.m. Nothing.

Staying at Morpeptuppu for the night

Make a brief tour of shore facing mainland ca 7:30 p.m. No cephalopods. But lots of small B's. Also wind (thus reducing visibility).

Jack runs the ship lights. Occasional visits by small groups of Loligo sp(p). Up to 6 individuals.

San Blas
May 9, 1982

Still at Nargupteppu. Cloudy. Occasional rain.

A does partial tow along islands, all adjacent islands and along farther reef 8:58–7:32 a.m. No squids.

In the afternoon we go to the Rio Sidra area. A tows around both islands, Nusatuppu and Nirgandi, 3:00–4:05 p.m. Sees nothing except some small blobs of ink on the west side of Nirgandi.

Then we go on to mangrove islet (where mixed school of 3 species was seen years ago). A tows 4:13–4:31. Nothing.

We go back to mangrove islet 4:30 p.m. Still nothing.

A few Sepiots come to the ships lights later on.

San Blas,
May 10, 1982

This morning we moved back to the Periyatuppu area. Weather is gray and windless (after heavy rain at dawn).

A Silvis counting party and associates (same group fitted a few days ago) approximately 9:30 a.m – 12:20 p.m and 2:25–4:05 p.m. Apparently with good results.

I spend the time inspecting shallows. On Periyatuppu in the morning. On Cinquantuppu in the afternoon. No cephalopods seen in shallows of either island.

NOTE: Shallows are extremely varied. Sand, TG, "rock" shelves. If Sepiolidae and Idiosepiidae are indeed absent from these areas — as does indeed seem to be the case — it is not because suitable physical habitats are not available.

Jack mans the ships lights. No squids attracted

11

San Blas,
May 11, 1982.

Still at Pinyatuppu in the morning. Wind has come up and the sun is shining after a fashion.

A filming period 8:10-10:05 a.m.

I wander about shores and shallows

One possible but dubious (very dubious) of a sepioid-like animal in 3-4 inches of water over sand near beach. Animal immediately takes refuge in adjacent TG. No inking.

I also looked at some fishes. 2 mixed schools (apparently destruct). In 3-4 feet of water over TG and sand with scattered coral heads (plus sponges, etc.) Each school composed largely of dull parrotfishes. Each school also included one Spotted Goatfish. The association between the Goatfishes was close (physically), and sustained for at least several minutes. Goatfishes often in middle. Difficult to tell who, if anyone, was leading whom. The second school also included several individuals of 3 or 4 other species. I couldn't identify them.

We go to Niatuppu (Lemon Cays) later. A starts to row around island 1:30 p.m. It is still sunny, but sky is turning gradually gray. Finds group of approx 10+ mds. far side island 1154. Most of the mds. are large. Vigorous "courtship". 4 ft down in 10-15 ft of water on steep slope of sand & coral.

A films until 3:15.

NOTES:

This group at Niatuppu is much more active, perhaps more advanced in the breeding cycle, than the one filmed at Peryatuppu.

On the other hand, the group at Peryatuppu was interesting because we know that they stayed at (or returned to) the same site day after day.

ADDITION: According to Jamie (?) Wulff, there usually is a group of some 30 (approx.) squids at her study site off Mosquito. But the group

Capb., May 11, 1782, II.

is much smaller now. Down to about 10 small-ish individuals. Jane says that the reduction occurred about 10 days ago.

Could this be disease???

May 12, 1782

Leave San Blas before dawn today.

Go first to Isla Grande. Strong drizzling rain. But it is beginning to clear by the time we arrive. A tows on 12:15 - 1:15 pm. Tow 1 small depot, that is all.

Then we go on to Porto Bello. A tows along east coast outside harbor mouth. Finds 2 groups of large depots. One of a wide. The other approximately 12 inds. Below - heavy surf, over coral, along rocky shore. No filming.

Go first to explore part of inner bay with hand lights 7:30 - 8:10 p.m. Lots of sardines and a variety of small organisms. But no squids. Lots of large sardines at ship lights. But again no shrimp.

NALUNEKA, San Blas

March 10, 1979 - Swim from Smithsoniantuppu to Naluneka's dock & back, nothing, it is windy & visibility is not very good either. Night lite from 7 to 9 p.m., nothing.

NIATUPPU

March 11, 1979 - Tow around both islands, nothing. Later on we run into a group of 23 larges & mediums, nothing is happening, some very mild courtship from some very young mediums males, but nothing else.

PANETUPPU

March 12, 1979 - Tow around nursery, and then on to Tiatuppu & Piriatuppu. We spot some 15- large & med. We photographed some action, courtship & lots of patterns. In the afternoon I photographed a group of some 60 juveniles on sand drop off next to Panetuppu caused by the incoming current from the algal reef. Both this drop off & the protected grass flat are perhaps the reason for it being an ideal area for the young. The grass flat offers protection while the current drop off carries sufficient nutrients necessary to maintain the young. There are very small minnows and lots of macroscopic organisms in suspension. At first glance the impression one gets is that the group of young squid is not in formation, each individual is at a different level giving the impression that they are bits of sargassum slowly sinking to the bottom, one could pass them as so much debris. Upon observing them for a while I notice that there is some structure to the group, the large juveniles are high & nearest to the waters surface they diminish in size, the deeper one goes. I closed a diving tank and swim to a depth of 40-45 ft. There I run into a large group of very small young. They each have an overall length of no more than 15 mm. I don't think they are more than 2 weeks old. I photograph them with Barbara's camera both in color & black and white. These little ones produce the same postures as those of their larger counterparts, however, having fewer & larger chromathophores in relation to their body size cannot produce the same color patterns that the larger juveniles produce, but they certainly try.
While I am photographing, a 20"± mackerel rushes a young squid the mackerel attacks and misses, the young squid inks pales & turns up almost vertically towards the surface, then stops after moving only 5-7 ft from where it released the ink, it bars & takes the contort posture. The mackerel swims in circles within the ink blbs, stops for a few seconds & swims slowlly away in the direction from where it came. I am not sure but when it swam away it gave me the

impression that at times it did not swim on an even reel. Could his sensing organs have been numbened when it came into contact with the ink blobs?

OKOPUKIP

March 13, 1979. - Tow around both islands (Niakalupir). Find over 35+ squids med to large on usual area in Okopukip. We photograph them, lots of action. Barbara may have photographed a copulation. In the afternoon I go back to Panetuppu & photograph the young some more, then return to Okupukip for more photographs. This group is quite active and at first does not seem to be very cohesive. Sometimes the group breaks up into 3 subgroups & go into different directions. There are quite a few animals in full and active courtship, and also quite a few displays of half silver. This area is full of floating debris, sea grasses as well as man made refuse. I notice that every time the group breaks up, the different subgroups invariably seem to be attracted by bits of floating white plastic sheeting. From far some of these bits of plastic look like a half silver display, could this be the reason that they are swimming towards it? Also, I have been able to relocate it by watching for half silver displays. Could half silver be a display used to attract other squids & thus form a group? I think so. Half silver is ok could be also reflective signal it can be detected at one specific area. (other side of the animal)
We go back to the group & do some more photographing. This time I also use the underwater movie camera. The group is still quite active.

MIATUPPU

March 14, 1979 - Afternoon, we tow but find nothing here.

See October notes p. 11 Discussion of anti-predator strategies. Stanille or Ulmet Rufon oxyprora. Is this general?

Guam, Nov. 22 - 26, 1945.

L. lessoniana Guam, Nov 10 - 14, Nov. 22, 1949
Palau, Malakal Island, Nov. 14 - Nov. 20, 1949

Sulang, Guam.
Squid not in Tubules.
Ord +. WS, PCA, trace of Spade. Extreme Y (subway?)
Downward Curl. Downward V-Curl.
Dark with Downward Curl.
Full Dark with little or no WS.
Belly Bar with Downward Curl.
Egg-layers, p. 3 et seq. ♂ larger than ♀!
Yellow-Ord. WS not conspicuous
Trace of "Accentuated testis" by ♂?
PCA with POA, Waving, White-tips. Drawings p. 5 + 6.
Bar on Back. 3 on mantle, Head bar, 1 bar mid fins, 1 bar subterminal fins. I.E. 6 in total. But not quite like same as in *sepioidea*.
Bars punctuated by blotches.
RL with Yellow Ord by both ♂ and ♀.
Head up posture.
Flash of WS in Yellow Ord as alarm signal.
Grey Ord with WS by mid fins
WNRL. Silvery white line along upper front border of mantle.
Fin stripe with retinal.
White fins and trace of Flutter with Grey Ord. Related to Faster Flutter? (probably not!)
General discussion ecology p. 7.
✓ Squids began to show-up around Manila. (Col. Flores)

Bars to mts. in group. Palau
Dark Without WS
Inky.
Sexual spacing as in *sepioidea*.
No blotches ??? Correlated with aliveness etc.?

Ord+, WS, Y, SCA, Spade (not Eulge)
WS dis appears during retreat.
Bright tawny Golden all over. "Full Gold"
Lateral Silver!
Milky light color in milky light water
PH Flecks in Ord. General comment on variability of Ord, p. 17+
Groups + sub-groups?
Is Dark related?
Y, RL, and WT in Dark and Ord-Dark
Full Golden with broad WS. Alternating with Dark. Is Full Golden Utmt?

Bilateral Silver!
A and B subgroups. p 19 et seq.
BB - Trident, sketch, 19
Inc. p. 19 et seq.
Cop. attempt ????
Does the spines lack Z?
Yellowish = Partl of sepioidea? p. 21.
Bilateral double Silver by ♀. Equivalent to Red, p. 21.
(+ Obvious arm spots!) Partly equivalent to Dark Dorsal Stripe
Unilateral DM a trace Sex in tawny yellow
WT in Females
WS usually wider toward rear.
Have Hastate
Pale after catching Reds
DM both sides of body in yellowish. Intraspecific
BB - hard line With WB outside? In semi-Pie (Unilateral silver?)

Agrees DM with tawny and retreat
White Tens agrees. Retreating from rainbows with Red + and WT

Catching copepods. Guam. WT WML
Bluish Moon in gray Ord
BB

Mullosus on B-Law

?

13 chromatic, 6 perianal, 5 movement
For abnormalities or units comparable to Octopus.

Lateral display
Parallel positioning
Fin Beating
Stitchwork fins
Lateral flame
Mid-ventral sudge
Arm spots
Tentacular stripe
Dorsal arm endplaque
Ring
Downward curling
Alert = Colour

Dominance relations (step 7) more obvious than in Sepiola?
Apparent attempts to keep fish from compressing
→ Crowding eggs?
DM element
Lateral flame instead of Z.

Lateral display includes Arm spots, Stitchwork fins, Mid-ventral fins, Lateral flame, Tentacular stripe, and Dorsal arm endplaques. Centrum appears visually dominant → Centrum & mid-V Parallel positioning and Fin beating.

General survey Loligo : spp = plei, pealei, vulgaris, opalescens, forbesi, edulis, bleekeri
Clear and All dark in all species.
Mid-ventral sudge in pealei specimens pealei, vulgaris, edulis, bleekeri. Lateral flame in pealei specimens vulgaris, forbesi.

Alex

Chromatic

1. Clear (= Clarkes) All eyes At night away from lights also calm wide both day and night Also egg-brooding Cy 67

2. All dark (= Dark) All eyes "Relative stress" (= mild burning ?)

3. Ring (= Bars) 3 or 4 transverse rings around the annulus
4 most common Moderate to adult (?) birds
Sometimes with dark head and arms
" " Downward Curl
Disruptive Relative stress Perhaps Lower intensity than all dark

4. Accentuated testis All dark plus white area (= WS ???)
Schooling, aggression, and courtship Often associated with dark. Less Evidence for all ? = RL ???

5. Ventral testis Both ♂ and ♀ Inner dark stripe ?
??

6. Dorsal stripe (= Dark Dorsal Stripe) Med. to adult ♂ and ♀
Also Schooling. Disruptive ?

7. Arm spots. 2 kinds. A dark brown spot base 2 of arm.
B diffuse spotted base 2 of arm. Both usually ♂ Sometimes ♀.
Probably related to RA
Low intensity stress ?

8. Stickwork fins (= BB). Only ♂?
Intraspecific aggression Often arm spots.

9. Mid-ventral ridge (= Belly Stripe) Usually ♂ Sometimes in weak version in ♀♀ Intraspecific aggression. Also courtship and schooling
Relative stress Often associated with dominance relations

10. Lateral flare Apparently unique. Intra-Courtship Only ♂

Equivalent Electrical Analogues matter 2. III

Intraspecific aggression encounters, including courtship. With parallel positioning. Often "flanking"

11. Lateral Bluish 2 Jaws

A = Jaw Stripe. Both ♂♂ and ♀♀ Become incorporated into Lateral flank as ♂♂'s get older.

B Diffuse rounded spots only in mature ♀♀

Also by counts ♀♀ of Labrozonichis brevis

12. Vertebral stripe. Dark Dull intertidal Variety ♂♂, once ♀. Possibly related to some dim stripes Separate Intraspecific aggression sometimes continuous with mud-ventral ridge. Rare High intensity?

13. Dorsal arm midspines Only ♂♂. Obviously related to PCA components With lateral flank. High intensity? Rare

Silver Eyebrows visible in photos
Also Dusky Spot-cheek?

Pastoral

1. Bottom sitting. Het-ulvolzijl. Exhaustion. Movement after Coges ego.

2. Sexe mundanus. Perlapse V. Kalos non Kili DF. Sexual encounters. Vergaggressie by-result → i.e. pre-attack threat.

3. Forearm upward curling. Sexual encounter precursor. Movement after initiation versus of 2. above threat

4. Downward curling. Both ♂♂ and ♀♀.
Interspecific aggression, interspecific hostility, courtship. ♀♀ before mating (copulation)

5. Downward V curl. Same as in Sept. Sexual dimorphic

6. Downward curling into mantle. ♂♂ Obviously another version of 4. and 5. All three downward curls are rather specialized in form. Seem only one. During prolonged dispute among ♂♂.

Movements

1. Parallel positioning. Het (very) ritualized. Intermittent? By both ♂♂ and ♀♀. Courtship and interspecific aggression.

2. Flexibeating (= flutter?) By ♂♂ only. Only often parallel positioning. Exaggerated form of aggression.

3. Forward push. Het (very) ritualized. By both ♂♂ and ♀♀. Often ending in "splay". High intensity aggression

4. Chaise Instrumenty.

5 Flet Instrumenty.

Cephalopoda

22 November 1975
Guam.

I arrived on the island on the night of November 19th. So did typhoon June! Impossible to work at all during the first few days.

All the local people claim that at least one squid is common inshore. Chuck had an example identified by Gil Voss. It is Sepioteuthis lessoniana. Inds. are frequently seen at several sites; in channels leading to electric plants at Piti and Tanguisson, and over or around reef at Cocos Lagoon.

I looked at Piti channel yesterday. Channel is well protected. Relatively calm, although some swell. Water fairly clear. Bottom: rock and pebble (some sand). Quite a lot of fish. But certainly no squid. I suppose that the squid withdrew to deeper water (offshore) when typhoon struck.

We went to look at both Piti and Tanguisson twice today. Surprisingly enough, conditions were much worse than yesterday. Huge surge and filthy froth. I didn't bother even to go into water.

Several people have also mentioned seeing real cuttlefish in Apra Harbor (this record seems quite definite), and ca. Orote Point (in or near harbor).

23 November 1975
Guam

Visited Piti twice today, ca 8:00 a.m. and 12:45 p.m. Went into water (channel) both times. Heavy swell and lots of froth. Apparently no squid. Also swam in adjacent bay in the morning. In shallows near shore. Sand and rubble bottom. Again

no squid.

Visited Sanguison in late morning. Too rough to go in

24 November 1975
Guam

To Pita channel 7:45 a.m. Sunny, some wind. But still large swell and much froth. Swam back and forth several times Lots of needle fish at surface. A variety of other fishes. But still no squid. Then swam in adjacent bay. Explore "sunks" not far offshore. Sand, boiler, and broken coral bottom. Perhaps 40 ft deep. Lots of fish, including needle fishes and goat fishes. But again still no squid. (NOTE: their habitats, with no TG and apparently little living coral, would appear, to me, to be unsuitable for Sepia latenitis — but the local fish are very much what would be expected in a S. habitat. Doubtless the fish know better than I do.)

Go to Sanguison at mid-day. Still too rough.

Back to Pita ca 2:00 p.m. Rougher and windier than ever. Will the swell never stop?

Try to run lights at night at Pita but bulbs break!

25 November 1975
Guam

Did some exploring today. Around the south of the island.

9:35 a.m. Arrive at Rizal Beach in Agat Bay. Shallow beach stretching to reef about 100 yds from shore. Weather is sunny but windy (surf warnings out). Swim along inner side of reef. Shallow. Sand, broken coral, and seaweed bottom. Water very murky,

No squid. Chunks seems along outer edge of reef. Also no squid. Comment: this looks as if it might be better good habitat for squid and/or cuttlefish in better conditions.

11:00 a.m. Orcs Lagoon. Shallow bay south of Umatac. Immense "TG" flat. (The local "TG" is Enhalus sp., not Thalassia) Then deeper water. Sand bottom. Then nice small "reefs" (coral clumps). Lots and lots of fish. Including great schools. Water clear. Strong wind and current. No squid visible at the moment; but the habitat looks perfect

20 November 1945
Guam

Go back to bay south of Umatac. Work fairly steadily 9:20 a.m. - 12:30 p.m. Generally sunny. Occasional showers. Strong wind. Tide out at first, then comes in strongly. Strong currents and undertow. Cobble area (sand) and around two offshore islands on barrier reef) and range of habitats (sand, rock, coral, TG, in 2-20 ft of water). Lots of fish but no squid.

NOTE: Almost all the fish seen were of medium size. Very few "sandwiches." Is this significant? Does it help to explain absence of squid & cephalopods? Have both squid and sandwiches been damaged by weather?

October 23, 1974
Lucas Islands

Some preliminary explorations today. Weather is sunny with little wind.

Ca 9:15 a.m. Canada Island. Swim near shore. Over gravel bottom, then out over boulders, sand, small coral heads. Little or no visible macro-vegetation. Lots of large fish. But apparently no cephalopods. Stop ca. 10:05 a.m.

About an hour later. Barracuda Island. Swim over extensive but shallow coral reef (continuous, rounded or knobby surface — Porites sp.?) stretching out from rocky cliffs. Again lots of large fishes. Also many schools (5x to 20 or more individuals) of small fishes that look obviously mimicking squids

Pomacentrid ???

generally dark gray.
Dark eye. Subdued spot at pectoral fin. Yellowish on throat. Tail pattern shape shown above, or broader with two dark stripes, giving same effect.
Brilliant, shiny, large white "false eyespots" at base of tail (very near top of body). Often swimming in a jerky manner, with mid at end of dip and fuse. Thus, the general effect, with eyespot, tail fin, and movements, when a fish was swimming forward,

wiss that of a squid swimming backward. (Hood & Dat Jones).
Why should a vulnerable fish mimic a vulnerable squid?
Stop discoveries abruptly when sharks appear.

October 24, 1974
Chiriquí

Made a small dive at San Jose Island (Near Las Ventanas). From beach, ca. 8:30 a.m. Over pebble and rock. Again lots of fishes. But water very muddy (water a strong tan and blowing). No cephalopods visible. But should not be surprised if things like Loligunculla did not appear from time to time.

Obviously Sepioteuthis does not occur along the Pacific coast because there is no Turtle Grass (or Turtle Grass-Littoral Diadema habitat). But why is the habitat itself lacking?

Cephalopods - Africa

August 6, 1976

M Bour and Joal — south of Dakar.
Centers of fishing industry. The sites where a cuttlefish fishery may be established by the Senegalese govt and the Centre Océanographique (Abidjan).
We went down to talk to the local people.
Obviously, cuttlefishes are more or less abundant — perhaps more so at M Bour than at Joal.
We saw individuals caught by local fishermen (some in nets from beach, some from boats). Quite large. Apparently Sepia officinalis (Adebanse says that this is the common species).
Most people agree that cuttlefishes begin to be found ca 100 m offshore (probably also much farther away). Usually on mud (in deep water (50-100 m. ????) usually not bottom).
French scientists at M Bour (like Dorbath's) say that they saw lots and lots of cuttlefishes high in water column near shore "about 3 months ago" (end of dry season and/or beginning of wet season? Mating behavior?
NOTE: Adebanse says that there is at least one other species of Sepia with rugose, shallower and more rounded.

August 17, 1976

M Bour.
Arrange to go out to "offshore" area where most of the local fishermen that specialize in cuttlefishes (and octopi) prefer to work. It is a relatively shallow bank approximately 1 km from the beach of the ORSTOM Station.
Start off ca 7:45 a.m. Reach bank ca 8:10 a.m.
This is obviously a major fishing area. Lots of pirogues (15-20), flags, buoys, etc. Also lots of small pirogues (10-3

men) hard at work.

In the course of the morning (until 11:45 a.m.), I do a lot of swimming at 6-8 sites, in waters varying from 3 to 15 m. in depth. Without seeing a damn thing!?!

This is obvious, because water is very opaque. Full of sand. Visibility at surface is no more than 1½ - 2 ft. It is a little better around & left down (as far as I can dive in the circumstances), but not much.

It is also obvious, nevertheless, that the upper surface of the waters here is remarkably impoverished. It is not only that I do not see any cephalopods. It is also that I don't see any sardines, copepods, floating weeds, or anything else. In correlation, there are very few birds around. Only an occasional pelican (P. rufescens) floating on water or tern (Sterna s.s. and "Thalasseus") flying by.

The bottom (invisible) fauna, by contrast, must be rich. The fishermen are catching a variety of fish plus cuttlefishes and octopi.

As far as I can tell, all the cuttlefishes are Sepia officinalis. And all are large and apparently adult. The octopi are also fairly large. Perhaps all Octopus vulgaris???

Ratio of Sepia to Octopus caught is approximately 3 to 2.

Method of fishing is simple. Pieces of fish used as bait. Placed on circular clusters of hooks (? ?) on line. Line jigged constantly. Bait apparently (?) ? ? ? regularly, cuttlefishes and octopi in much the same way(s). Arms (not tentacles in case of S. ?) impaled on hooks. When animals is gently, still jigging, brought to surface and gaffed.

Color pattern of S. being brought to surface is moderately striped. Presumably "Ord" of the species. As in many published photos. Turns darker (stripes still visible) when the animals are gaffed.

The cuttlefishes release enormous amounts of ink when gaffed. The octopi do not (perhaps they do not release any at all).

Sepia ink also seems to be rather more "liquid" than that of Sepioteuthis. It may really be more of a "cloud" than a decoy.

One very large cuttlefish was swayed by a second, slightly smaller, individual as it was being jigged to the surface. From the published accounts (Boycott? Young?), I would suppose that this was an example of a ♂ swaying a (supposed) ♀. If so, the animals may be in reproductive condition now. If so, the names of inds. seen near the surface at other times of the year may be "die-offs". (This is confirmed by a local fisherman, Seth, who talked to D. Seth also implied that there may be 3 or 4 die-offs a year. He suggested that the next should be in September-October.)

JM Bour
Jan. 30, 1977

We have been back here now for almost 2 weeks. Mostly working with birds. Weather is cold and windy (I suppose the "Harmattan"). The water in front of the ORSTOM station still is cold, rough, and murky.

I have, however, been exploring various possibilities.

I have talked with Margret Eat (IFAN). He says that there are 3 more or less common species of Sepia along the coast. S. bertheloti inshore; S. orbignyana rather far offshore in deeper waters; and S. officinalis, intermediate and also overlapping both the other species.

S. bertheloti is distinguished from officinalis by a narrower bone (doubtless among other things).

M thinks that the breeding season of the local Sepia is May-June. He also tells me that Prion recently caught lots of Sepiola and small squids (Lolliguncula sp.) a l'embouchure de la Somone. With lights and net at night. This morning went to look at area. 9:15-11:30 a.m. Tide going out. Windy. Cold. Water murky. Lots of sand in area (Harmattan). Area is rather diverse. Lots of small lagoons and channels. All more or less salt (or salty). Mostly sand bottom. A little mud. A little rock. Some mangrove (inner edge). As a whole, it might be ex-

cellent for certain kinds of cephalopods. But I did not see any squids this morning.

CORRECTION – January 31, 1977. I talked with Jacques this morning. Actually he caught his Sepiola and Lolliguncula off the mouth of the Senegal. In winter 12 m. deep, some time ago. Probably in October.

Apparently the 2 species were together.

February 9, 1977

Going out on the boat of the Centre Oceanographique de Dakar 6:15 p.m. Go to Cap Rouge. About half way to Mar Bour. Put out lights at 6:00 - 8:15 p.m. It is cold. Net when rough flotting (in the way of cephalopods) shows up immediately.

Later on. Lots of Sardinellas, polychaetes, the occasional eel or half-beak. No great circles.

NOTE: Bottom is 9 m. here.

Run another light. Then pull up nets 10:15. A few fish. Second station, halfway back to Dakar, starts 11:40 p.m. Lots of polychaetes, small half beaks, immediately.

Then is off Rufisque. 12 m. of water.

Circling school of small fish shows up 12:30 a.m. Also eels, 1 sole, lots of large polychaetes. But no cephalopods.

Leave this station 2:15 a.m.

Next station started 3:30 a.m. Off Thiaroye 10 m. Lots of polychaetes. Circling fish almost immediately.

Net one side folded up after a few minutes. But light remains on other side. Then net is lowered again.

The concentration of polychaetes here is made in preserve. The animals must be poisonous, or at least distasteful. The local fish (which are also numerous now) apparently will not attack them.

Stop this station 5:30 a.m. Going closer inshore. Off point of Bel Air 5 m. Water is murky and somewhat rough. Only a few half-beaks around. Then an occasional small sardine.

Nothing more —

February 16, 1944

Making another trip. Same route as before. Reach Cap Rouge A. 8:00 p.m. Lower net and set light immediately. Then we go to eat. While we are eating, a lot of quite large sardines appear. Net is pulled up 8:30. At this time, we can only see fish. But there is certainly a squid (Loligo type) in the school. The fact that we do not see it while net is being pulled up would suggest that it must be light (pale) at this time.

When we finally do see a squid, it is already in tube. With sardine about 6" from jaws and arms. Quite large. Probably 1 ft. long. Dark red in color. With silver ocelli all over back (perhaps elsewhere as well). Rather active squid about. We put it back in water. Seems to be O.K. Swims about. Still clasping sardine. Still dark red. Gradually moves away from light. Apparently getting paler as it goes.

This is at least another indication that "Dark" can be either an extreme distress reaction, in some species, and/or a reaction to extreme illumination.

Net is lowered again.

ADDITIONS: Not surprisingly, the squid released ink (3 times) when released in water. This must be one of the species with a large supply of ink.

The local sardines are Sardinella. 2 species. It is certainly a Sardinella that the squid was eating.

Some sardines come in quite light after net is lowered again. But not very many.

9:20. Suddenly a large group of sardines (30-40 inds.?) appears.

Start to feed on small fish (larvae) in apparent frenzy. Then go off again.

Net is pulled halfway up. Heavy light. It is now conspicuous light under water.

Another concentration of sardines comes in 9:31. Again frenzied "frenzy-ing" must be efficient as a hunting technique

Net is pulled up again 9:40 Apparently no cephalopods in this batch. Then net lowered again. A few reds, small fish appear immediately. Then a few sardines again. And eel. Behaving erratically like a particularly active seasnake. Difficult to tell what, if anything it is feeding on. If this small fish, feeding the prey must be very small.

Then big school of sardines 9:55. School comes and goes. Animals apparently not very excited. Mostly feeding low. Difficult to see well.

NOTE: Perhaps remarkably there have been no bait balls so far tonight. And only a few small polychaetes. None of the large type that were so common last week.

Speak of the devil! First (small) bait ball shows up 10:24. 10:31. Now the sardines themselves are being chased by larger fish (perhaps Jack?).

Net pulled up again 10:38 No cephalopods.

On to Refugio. Arrive and lower net 11:45 pm

Large polychaetes are here almost immediately. Water looks considerably darker than at previous station (current is also less strong)

There is at least one eel around.

No other fish at all 12:05 a.m. Then a single bait ball, breaks at 12:13.

Going to net 12:25

Net pulled up 2:00 a.m.

On to next station (Bay Harbor), net down 3:10 a.m. Again dirty water with large polychaetes.

By 5:30 wind has come up, adding to difficulties. And there's still nothing of interest in the water

Net pulled up 6:20 a.m. Nothing in it but polychaetes, 1 sandeel, and a couple of dozen of tiny fish (larvae).

February 17, 1977

On boat again. But doing different stations
8:35. Arrive off Mt Bour. Net lowered immediately. Current is strong. Water does not look very clear. But lots of small crustacean swarm up immediately. Most of them are difficult to identify, some could even be mosquito larvae. Also some small shrimp.
Actually testing with disk, the water turns out to be very clear. Much clearer than usual for region!
Small fish start to come in 9:00 p.m. Then some eels.
We are running 2 lights tonight.
Depth here is 12 m.
Then a few large polychaetes show up. Probably not (quite) the same type(s) seen on earlier nights.
Then a Hyperia. Then some ribbon-like siphonophore colonies.
A bunch of purple sardine-like fish appears, rather lousy.
10:20 Start to pull up net immediately. Lots of amphipods. No copepods.
Going on to next station. Mouth of the Somme. Net lowered
11:55 p.m. Water is a little less clear than at previous station.
Depth is also 12 m.
Lots of small, active, polychaetes appear at surface almost immediately. Then a few small fish. Then a siphonophore colony. Then one sardine. Then more Diphyes. And one small petrel.
1:50. A really big half beak or needlefish appears.
Net pulled up 1:55 a.m.
On to next station Cap Lor Pointe) Rouge (again) Net put down
3:45 p.m. Water seems almost empty.
Only a very few small polychaetes, 1 or 2 "mesopterus", in next 10 minutes.

This situation continues with very little change. Very different from last night!

NOTE; depth here is (again) 11 m. Water is about as clear as at last (second) station.

One big fish 4:53 a.m. Comes and goes. Then an eel appears. Doesn't stay long.

Big school of fish circling 5:37 Very tight, packed. Obviously being preyed on by something. At first low in water, difficult to see. Gradually rise nearer to surface. I can't see what, if anything, is bothering them. Then a second, smaller, group appears. The 2 groups do not merge.

Net is brought up 6:10 a.m. No cephalopods.

February 19, 1977

I did not go out with boat last night. So, of course, something interesting showed up. At first station, Pointe (Cap) Rouge. Presumably usual place (depth) for collections.

3 little cuttlefish-types. Species and genus unknown. They were watched and caught by M. (the visiting German scientist from Kiel)

According to him, there 3 little things came up to the surface, to the light, one by one. I.E. they are pelagic at night and non-gregarious. He says that they were dark when they first appeared.

He captured them and put them in bucket. They stayed dark in bucket. Until one end. managed to find a shady part. At which point, this individual turned pale I.E. the species seem to have an usual cephalopod (or squid?) habit of going dark in light and light in dark.

M says that the 3 inds. kept well apart from one another in bucket. Each in its own "corner."

When the boat got back, M had the 3 cephalopods put in large tank (approx 15'x8'?), in which there are also sandworms, anchovies, and lobsters many other things. They went to bottom. Apparently scattered a little, but probably not far (at first). Presumably just enough to keep out of one another's way.

NOTE: this tank is at the station or center of the Centre Oceanographique at Thiarouye.

I don't hear about the capture until noon. Don't get to Thiarouye until 2:00 p.m.

In the meantime, some changes had taken place. One of the technicians took down out part of the bottom of the tank Scattering the eggs even more

When I arrive, it is very difficult to see the little things (There is a ten ros (rotten egg) over tank. Visibility is reduced.) Finally, see one. On bottom Pretend up against side of tank most of the time. I.E. these individuals probably live on or near bottom at night. And they probably are not (much) more gregarious during the day than they are at night.

The first ind. seen is dark

We go looking for others. Find one of the others at far end of the tank. Can't find the third

Three 2 inds. are picked up and placed into dip net near surface of water. Depth of water in net probably reaches 4" in places.

One ind (the only one I saw) turned very pale when taken out of water

But both inds. turn dark again immediately when released into water of dip net. Both go down to bottom immediately. One retreats into crumbled corner (a "hole") and stays there. Almost completely hidden from me. (Presumably retreat into holes in "natural" and would occur in the wild.) The second settles in middle of bottom. Just "sits", arms swept sideways and under. Arms almost invisible most of the time.

Both inds. retain dark. General effect is dark red. Yellower on center of back. Grayer on front sides mantle. Darkest top eyes. Some body organs visible from above. SEE SKETCH

Same ind. in center goes to corner where the other ind is hiding. Apparently tries to get into hole too. It is not allowed to. No real grappling. But definite some contact of arms. Then the approacher hovers a few cm. away. Going back and forth. Then I scare it away.

As far as I can tell, there is absolutely no change in color by either ind. during either of these encounters!!!

Are these inds. too small (too young) to be able to produce elaborate

color patterns ??? Their chromatophores are, of course, pulsating, enormous. Quite visible to my naked eye.

Ever, one settles down quite as afternoon wears on. One rid. in center. The other still in corner. I think that they are sleeping.

The visible rid. gradually becomes slightly, but only slightly, paler.

NOTE: neither rid. has Lone any fishing while I have been here. Has their supply run out? I must ask M if they fished when captured last night

3:45. I disturb both rids. a little. They are very reluctant to move. So I leave them alone again.

The visible (Center) rid. turned darker (again) as soon as it was disturbed. In spite of the fact that the disturbance was not accompanied by any change in light intensity. Except, perhaps, my shadow. So these rids. do have a real, naturalistic Dark.

These rids look as if they have triangular, squid-like fins. Rather than continuous cuttlefish-like bands. If they do have cuttlefish-type fins, the chromatophores are cunningly arranged to produce a squid-like effect.

Actually, I have no idea if these animals are cuttlefish or squid. Or whether they are adult or young. Or if their shape is typical of adults or not.

4:01 pm. Center rid. suddenly starts swimming around enclosure. Backward jerks. Somewhat erratic. Looks almost as if it is having a fit. Or perhaps wrestling with "prey" ??? Then goes to corner where the other rid. is still hiding. Stops outside. And then gradually oozes itself into hole. Starting head and arms first. But then turning around. Completes entry, rear first. Then settles right next to other rid. Their rear ends are touching part of the time, separated by only a few mm. at other times. As far as I can tell, the rid. that has always been in hole does not respond in any way. Also (again) as far as I can tell, there is no color change by either rid. at any stage of the grinding process. Both are Dark now. Quite Dark.

NOTE: this corner "hole" probably is the deepest part of the net. The rids. probably are looking for deep, dark refuges. I wonder what depths they sank to while unobserved?

4:15. Now the 2 rids are side by side. Apparently in full side contact. Still same color.

NOTE: Last night must have been the new-moon or just after. D.E very dark. (And I am not sure that the moon had even risen yet at the time the animals were caught.)

4:28. Both inds. move around a little in their corner. No color change. Settle down quite again, about 1" apart. Then one gradually oozes closer to the other. Until they are in near-side contact again. Apparently they avoid face to face or arm to arm contacts.

I still can't find 3rd ind.

PARTIAL CORRECTION: 4:40 p.m. How the 2 inds in dip net are side by side. Both with arms extended in front. D.E. curving under and hiding of arms under head and body does not occur in "holes" (or at least is less extreme). Both inds. move arms slightly almost continuously (jet from funnel?). So their arms must touch occasionally. But only "laterally".

Animals still antsy as before 5:00 p.m.

Unfortunately the dip net is getting a layer of crud on top. I clean it up as best I can. Which is not very well. The process doesn't disturb the animals at all. (I presume that cephalopods, unlike fish with lateral lines, are more or less insensitive to waves on water?)

Disturb the animals more seriously 5:12 p.m. Force them out of their hole. One ind. comes out more or less willingly. It seems to be in relatively good shape. I shall call it "A". The other (probably the first to go into hole) comes out very reluctantly and apparently with difficulty). It looks as if it might have rear end damaged. I shall call it "B". Both inds. go to middle of pot. Then settle down, side by side again. No color change by either. A settles down with arms curved down and to the side. From the front it looks almost like a split E by Lepidoteuthis! Actually it may not be a display or anti-display at all. I think that the arms, or the suckers thereon, may be gripping much of mat. A actually seems to walk or crawl on its arms a few mm.! B, on the other hand, just keeps its arms more or less extended in front. Presumably a sign of weakness.

After some minutes, B gets restless. Gradually, haltingly, goes back to first hole. A remains behind in center.

Neither ind. is showing any sign of getting ready to hunt at dusk!

Going to leave myself 5:38 p.m.

February 20, 1977

Arrive back Rhiannon 8:00 a.m. One of the cephs, presumably B, is dead. Turned very, very pale w/ both. I pick it up and preserve it in formalin solution. Color does not change (at least at first).

The other mid. is in corner hole. Seems to be alright. Dark.

NOTE: The pickled mid. does seem to have wrig-like fins

When I disturb the surviving mid., it moves out to center not as usual. No color change, still Dark. Turns right above bottom. Then immediately settles on bottom, arms curved down just as yesterday. Again no trace of pulsing.

Turns slightly paler after being settled, apparently asleep, 10-15 mins.

When I disturb it again, 9:05, it surrounds itself above surface. Seems darker as soon as it starts to move. Then settles again as soon as possible. And it definitely does crawl along bottom for a few mm while settling in (making itself comfortable). I suppose that it might well burrow into sand if sand was available.

ADDITIONS: three annuals were caught at 8:30 p.m.

M says that one of them did ink after being captured.

O went to Ft Bragg market yesterday afternoon. She says that the fisherman had caught (off shore) lots of large cuttlefish, presumably Sepia officinalis. Only large ones. Up to 6-8 K yesterday. The local fishermen claim that the local cuttlefish can go up to 10 K.

Are these annuals getting ready to breed?

February 21, 1977

Arrive Rhiannon 9:15. No fluid, single ceph still alive. Has been changed to another dip net for some reason or another

Going to try a small experiment. Putting annual in (white) bowl, with sand on bottom and several inches of water above it. Fluid is relatively clear, light, and smooth. Only a few bivalve shells and rocks in it.

Transfer occurs 9:25a m Annual remains Dark (at least on top) throughout. No inkering. Immediately goes to edge of barrier, rests there. On bottom, arms curled down and inward as usual. Rear end against side of barrier. Just rests. Funnel of course, is working steadily. The jets of water form little furrows. First forward, then gradually moving backward along side. Characteristic pattern. Small wall or barricade outside furrows

This does not actually help the animal to get into sand. Every once in a while, it also seems to serve something in arms (grains of sand?) and either tries to scrape them or drop them. It is difficult to see which.

Then the animal moves a few cm. down side of barrier, repeats performance as before.

Again.

Perhaps this species does not burrow???

All this occurs in shady half of basin.

Animal remains Dark about. This is not cryptic, in fact, in these circumstances, against light sand. But it might well be cryptic in many situations in the wild. And now I notice that whole underside of body (annulle) is whitish, white. Below fine line. Lines of demarcation is sharp. Quite conspicuous. I would suppose that I would have seen it, noticed it, if the animal had done this on previous days. So perhaps it is a new pattern. Is it an adaptation to living on continuous substrate. I.E. there is no point to being cryptic on bottom side which can never be seen by anyone

Then animal changes position. Faces diagonally into rim of basin. Lying slightly on one side. Rapid side is Dark to level below fin.

It seems to have stopped making furrows!

When disturbed, it moves 1 cm and then sits as before.

Then tilts to other side. White underside is quite exposed in this position. I.E. white may be permanent Ox perhaps a sign of physical damage?

The annual still is not burried at 10:15.
It may just possibly eat some fruit chopped fish put into water.

ADDITION: Fluland ("M") looked at the annual yesterday afternoon. It was, at the time, resting peacefully, in its corner hole. And Fluland says that it was quite pale. Turned Do the again, as usual, when darkness

Thus, it would appear that ambient light may have little to do with (their) color changes

Back to Shadowgye 1:30 pm Annual has been shifted to a large tank, with sand on bottom, in which might, conceivably, be adequate food. When I arrive it is sitting peacefully on bottom, in dark, in center away from side. This area was rather somber, before I arrived, because tank was partly covered. When I remove cover, annual is left in sunlight. Stays there a couple of minutes, then moves into shade. Sits

This speeds observations, after the dark!

NOTE - this tank is at least several (3?) ft deep. And this annual rises + hovers to the bottom (during the day). Sits about as low as it can (in this respect)

I leave again 1:45 pm

Back again 7:19. Just getting dark. Annual still alive. Still on bottom of tank. Still dark.

Moves about on bottom from time to time. Apparently not swimming. Centered not swimming high in water column 7:32.

Apparently more active now than in daytime.

7:43 Quite dark outside now. Shine light. Annual still on bottom. Makes funny little "hops" away from light. Generally a little prior to any observed between hops. And then pokes much about, briefly, during hops.

Movements are funny, and erratic. It seems quite possible that the annual is not in good condition.

Shine light a few minutes later. Annual very pale now. Rolls over and over. Then lies still. Apparently dead.

April 9, 1975
Islas Secas

Reach Cavada late in afternoon. Going to run light at night.
Light goes until 7:30. Then off. On again 10 mins later. Lots of sardines. One eel (sea-snake mimic?)
Stop 10:15 pm.

April 10, 1975
Islas Secas

Make 2 separate swims this morning. One along shore of Cavada. The other along shore of an adjacent island (name unknown). Sunny and windy. Strong surface. Water very murky. Swim over sand, rock, some coral. Nothing of interest.

This afternoon try a swim around an isolated rock called Las Brujas. Still sunny and windy. Swell. Lots of big fish. But still nothing of scientific interest to us.

Later ca. 3:15 pm. Go back to Cavada. A new side of the island, not the one that we visited yesterday (or this morning). Weather still the same. Swim near shore over a variety of environments, mostly coral (Porites ?) and rock. No squid. But lots of fishes. Most numerous species is the "squid mimic" ("SM"). Literally thousands of SM's, in separate groups of hundreds. 2-10 ft down in 6-15 ft of water over all sorts of coral and rock

Still new squid-like. Frequent changes of direction & swimming movements. (Occasional backward darties? Short, Loligo like squid hunting.) Schools of SM sometimes dispersed. Concentrate when apparently frightened. But I did not see any actual predation. SM's seemed to ignore large puffer-fishes, parrot-fishes, etc. Perhaps some tendency to associate with iridines (brown & yellowish green). Apparently friendly.

Hube Bolton photographs SM.

Going to run light same place tonight.

Lots of fish but no squid

Stop 10:15 p.m.

April 11, 1975

Go into Las Viudas, La Ventana this morning. Water too muddy to work.

Go out to Contreras Islands in afternoon. Anchor off one of the large islands (Contreras s.s.?, Bruneco?) Swim 5:30-6:00 along shore. Rock and coral. Lots of fish. Medium sized barracudas. 1 large white-tipped shark. No squid.

Running light at night.

7:10 p.m. Group ca. 20 small squids appears. Young Loliolopsis? Pattern scattered, 6"-2' apart. Pale. Some traces HD. Apparently not fixated by light. Go straight on by.

Nothing more until 9:15-9:30 p.m. When we stop.

April 12, 1945
Islas Contreras

Still at Bruicaco this morning. Clear. A little wind. We take a long swim, ca. 7:15 – 8:45. First swimming near surface in deep water, gradually going over to shallows and shore. No squid. Then A and Mike go hunting along rocky shore and reef. Lots of fish, but still no squid.

NOTE: A and Mike have been exercising the submarine regularly throughout this trip. Without much success. SAN C.

Later in the morning go over to Isla Hirsillacores swimming in shallows. Water murky in most places. Fairly clear in some spots. Crown-of-Thorns. Fish. No squid.

NOTE: SM seems to be the most abundant fish in both Lecas and Contreras, in shallow water over coral and/or rocks. Why in the world should a species of this type be a mimic of anything? Much less a squid? Is it that squid are more agile, if not faster in the long run???

Two more swims in afternoon. One, ca. 2:15-3:15, along rocky shore far out point. Second, 5:15-6:15, open water of bay. No squid.

Running light at night. Until 9:15 p.m. Without success.

April 13, 1945
Islas Contreras

Two more swims around Isla this morning. No

Capr., April 13, 1975, I

squid.

As usual, lots of SM's. I have been watching them as carefully as possible. Very tame and bold. Don't seem to worry about predators at all.

Go on to region of Coiba in afternoon. Swim around d Ranchería 4:40–5:30 pm. Coral and rock. Water still murky. No squid.

Going to run light off Ranchería this evening.

One & two "larval" squid may drift by; edit we can't be absolutely certain about them.

A sees Loliguncula (1 vial.) from sub. SAN.

April 14, 1975

In mid-morning, we go from Coiba to Canal de Afuera. A and the kids see 2-3 squid near surface in middle of channel between the 2 islands. Apparently Loligo-types.

Various swims and dives around Canal de Afuera.

A thinks he sees sike ca. 80 ft down near shore.

Run light at night. Nothing

July 22, 1973
Panamá

Marine Lab 2:45 p.m.
We suddenly find that one of the Sepiot eggs has hatched. Tiny young swimming in water. Dark with definite V (tentacles still very short). Plus one dead by drainage tube
2:55. Another hatches! In semi-dark. Arms sort of spread, no real V (yet). For first few minutes, swims forward (very occasionally backward) in short spurts (hatching movements???). Has slight tendency to bump into walls of tank. (The first mid. hasn't bumped once since we started to watch.) Then shows one trace of V.
Inds. perhaps 15 mm. long? Quite plump.
Others in eggs apparently trying to hatch. Making lunging backward movements.
NOTE: Young in eggs are Colorless. Only eyes and something else (ink gland) visible.
Second young bumping steadily against side Exploring? (Natural? By situation in eggs.) No V 3:10 p.m.
3:16. Second has stopped bumping. Still semi-dark. Still no V. First still in Dark and V. Hardly moving at all. Just blinking.
No more hatching for the time being (Note: there was a cover on tank when we first arrived. We have now removed top. Do the eggs naturally hatch at night???)
One turns dark in egg. Then pale again.
Some are actually turning around in eggs. 3:24.
ADDITION: I forgot to mention that the first shot out 2 puffs of ink (blackish) immediately after we arrived, when we poked a finger at it.
3:30. Now both mids are in Dark and V. Just floating (Can't tell if moving fins; but this is difficult to see).
Second mid. stops V.
3:40 Put cover back.
3:50. Take cover off. One in Dark and V. The other more or less pale without V.

3:54 Now one Dark + V, the other Colorless + V

4:10. One consistently Dark, the other consistently Colorless. Colorless are in shadowy part of tank. Dark end is usually on more illuminated side.

Now both Dark and Vagant.

NOTE: All or most of young in eggs still have quite conspicuous yolk sacs.

July 23, 1973
Panama

Early this morning, there were no more eggs hatched. Hatchlings is transferred to adjacent tank, which has unfiltered water, for some appreciable time. STAY. SON. At which point, several more hatch. Then transferred back to original tank (Hastings had unfiltered ~~water~~ since yesterday, after all)

NOTE: According to both A and B, several (or all?) of the young hatched with yolk sac attached. And then shook off yolk sac as soon as possible.

When I arrive, 2:13 p.m., there are at least 8 young in tank. Somewhat variable in color. Usually 5-6 in Colorless, 2-3 in Dark. Possibly usually same ratio in Dark?

Colorless adults are relatively calm. Usually found close together or (in semi-line, only a few inches apart). Either hide under rocks.

Dark ones are more scattered and more active. Dart to one jumping side-sides (Colorless tend to congregate in relatively quiet water near center). One of the Darks is so active from time to time as to be almost convulsive.

Both Darks and Colorless show occasional V-Curls. Perhaps a few V-Forwards. Both also show occasional movements which look like feeding.

Are the Darks more recently emerged - younger and slighter - than the Colorless??

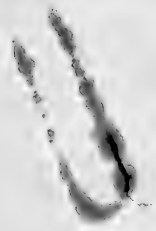
Still some embryos in eggs. One turns Dark briefly, then pales again.

to SAW about distinguishing colors →

Darks presumably alarm under these circumstances
Dgr away for Lulula.
Come back 3:40 pm. Find 7 eels in dark! Some in same
Indigo postures. Some in V, V-Curl. One does E! All explicit incl.
is in Colorless Alive in V-Curl.
All eels. usually quite close together now.
A few minutes later, only 2 Dark. Rest Colorless (apparently)
4:05. See another Colorless on bottom. Just hatched. Or
dying???
Situation unchanged. Leaving 4:55 pm

July 24, 1943
Pauaua'

A says baby squid fed last night.
The transferred eggs in new tank in Bamboo tree are very
And about 5 more hatched during or immediately after the transfer!
SAN. D.E. disturbance facilitates hatching.
Are these young "premature"?
I arrive 2:15 pm. Find approximately 13 young. One in
Colorless, "bumping" along bottom. The rest in more or less Dark
Most with V-Curl, V-Forward, or V-Downward. NOTE: It is
quite light in here now. Some of the Dark may be response to
bright illumination. Just as in the case of adults
Dark eels in mid water or near top. Apparently in two
loose, irregular shaped groups. One of 4 The other of 8.
One of the Darks is very small. Still has yolk sac attached.
But swimming around moderately actively. Apparently normally. (NOTE: Yolk sac uncolored).
Actually there are 2 usually Colorless eels. Doing a lot
of "bumping" One is also "somersaulting"
2:35 Several eels (3 or 4) pass from Dark into what is
obviously "premature" or "premordial" Bar. Just 2 bars on
back. One, toward rear, has lines to a "blob" on each side of
body or on fin. Obviously "premordial" DM! Other has not



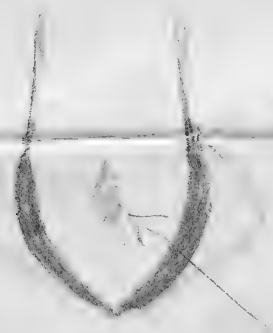
Front of mantle.

Head and anal-dorsal

Don't know if fin shape normal

SOP

As far as I can tell there are no bars below at this time
Well! Well! One of the most "disturbed" ones that is bumping against the side and turning over occasionally. Is in pure C. Colleyi or C. Colleyi plus what seems to be a peculiar sort of "Infantile Fin Stripe". Sharp thin line along base of fins A.e. along entire (all of body). With a connecting line underneath!



Top view

Center spot is ink gland

Bottom

(Not quite sure of shape of line)

Is this "normal"???

3:02 One baby still in egg is turning around quite freely in all directions.

3.30 Now 7 out of the 13 ends are completely Colorless but still look as if has ink gland. Still some Circulation

Leaving 3:35 p.m.

Navigation Test ①

Part A, pp. Hunt's Group Islands. Measure & record by nearest tenth of a mile the distance between each pair of islands. Use a straight edge & a pencil to draw a straight line between each pair of islands.

Part B, pp. Hunt's Group Islands. Measure & record by nearest tenth of a mile the distance between each pair of islands. Use a straight edge & a pencil to draw a straight line between each pair of islands.

Part C, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part D, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part E, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part F, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part G, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part H, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part I, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part J, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part K, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part L, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part M, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part N, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part O, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part P, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part Q, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part R, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part S, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part T, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part U, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part V, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part W, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part X, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part Y, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Part Z, pp. Hunt's Group Islands, including Hunt's Group Islands (pp. 185)

Roughwater (3)

Nov. 6, 72 Third group. 4 large and 5 medium depots.
3 Rorys seen up at lights. Apparently all travelling together. Then single Zeligo type birds alone.

Pup eyelets may be different in Rorys and depots, p. 364

Dec, 72. Arcadia Rorys at lights at night. Also V-eclipsus (Lucanus ?) Intermediating. Then depots. Again no associations

June, 73. Arcadia Rorys at lights at night. Not associated with depots

Then associated with depots.

But Rorys usually are not closely associated

✓ Zeligueneta Large with mixed group large and medium depots Arcadia July 6, 1973

Pickfordiantha adult (?) ½-1 group up in 4th tunnel over TC: Alone

July 5, 1973 Night. Zeligo only in total group of depots and Rorys. Rorys watching then spoke with depots.

July 6, 1973. 1 large, 5 medium large depots. Also 1 previous 5 Zeligueneta, apparently same age.

Aug 73 - Zeligueneta - Rory association Birds at 3 to 4 at night by light

Observation (4)

Amanda Hunt 11, 1944 100 + medium sized Leports and 2 large Rays. At first 2 Rays not together But later join up Then in search at Carib

Foliage partly present. Hyen Temp Amanda Apr 11, 1944. Hemipteropsis Abrasa

Amanda Merzpeterhyen Apr. 5, 1944. 400 + cradles in deep water. Pods just below surface Pedicle both Rays and Leports

Bulletin de la Société [illegible] 1913

Holl-Vedis, Hemiteuphrasia, Stilbum, Hemiteuphrasia. Hyleoeus cratzeri. Nest active in daytime (?). Hosts: Hemiteuphrasia. Bees over entrances. Resinates, pollen, egg, larva, pupa, cocoon.

Tallygumedes. Hemiteuphrasia. Ecologic observations

Hemiteuphrasia associations

Nest of Hemiteuphrasia

Bees of Hemiteuphrasia, Hyleoeus, Halictus, Andrena, Panurgus, Colletes, Nomada, Anthidium, Megachile, Anthophora, Eucera, Melecta, Epeolus, Coelioxys, Stelis, Nomia, Sphecodes, Dufourea, Systropha, Biastes, Crocisa, Ammobates, Melitta, Macropis, Dasypoda, Chrysis, Stilbum, Hedychrum, Omalus, Anthrax, Bombylius, Exoprosopa, Villa, Systoechus, Argyramoeba, Sicus, Thereva, Leptogaster, Dioctria, Asilus, Laphria, Cerdistus, Lasiopogon, Dasypogon, Holopogon, Stenopogon, Pamponerus, Mallophora, Promachus, Tolmerus, Eristalis, Helophilus, Syrphus, Sphaerophoria, Volucella, Merodon, Criorhina, Eristalomyia, Rhingia, Conops, Myopa

Spotted guinea pigs.

Guinea pigs were used which were of three different groups
Guinea pigs with black fur, Guinea pigs with white fur

Spotted Goats fallow-squirrels

Goats many fallow-white Spots on dark background

Women with goats (spotted) with spots. Always same
size as Guinea pigs? Leander, March 9, 1774

Sinclair, Sarles;
Barnard
Hannah Garrigues
Snedeker

Blue Runners, Common Jewels, Neon Goby, Cleaner Shrimp, Fire Fish, Yellow Tang, Blue Hippo Tang, Sailfin Tang

Hot Rock, Live Sand, Aquarium Base

Hot Rock, Live Sand, Aquarium Base,
Neon Fish, Refugium, 75 Gallon Saltwater System

What is your Religion, Carol?

Infauto

Nov. 71, Isla San Lorenzo. In boat. 2 inds. 2 feet below surface in 20 ft. Bot. Sta? V. Infus.

Feb. 72, Pescadero. 1 Only. 3 strip in 4 ft of water over Zostera grass. Then 1 very small. In shallow water inside Monkey Harbor. Bay and V. Then another. 1 ind. down in 1½ ft water Abr. Bay and V. Minerburg Lagoon.

June. 72. Paralitopus nigrum? Babies in group of 40 or inds. Including large-ish inds. In 5 ft water over TG. End, VS, Y, PCA Elsewhere a nursery.

Aug. 72. Between Micropsitopus and mainland. Inds in open water. Over TG. Thin "carinae." 2 inds. Six inches below surface in 5-6 ft water over TG and sand. Considerable difference in size between the 2 inds. Yellow Whitish Split. Ten stripe Inking. Dark. Cuts Y. "Freckles" Pale. V. pp. 307 et seq. Bay General comment 311

Nov. 72 Palinuga 2 ft up in 5 ft water over TG flat P, PH, DM Split. Ten stripe etc. Drawings 344-345 V Split. Bay?

Dec 72 Palinuga 2 very small & not split. Reddish

July 73 Carti" Split Dark cornua. Pale body. 1 ind. 4 ft down in 20 ft of water In turbid water

March 74. Micropsitopus? Bay anchorage

July 74 Plantago?

Distribution in Panama (Description, San Blas).

The San Blas Islands begin at Punta San Blas, a point 100 kilometers Northeast of the City of Colon. It arches parallel and less than 20 kilometers from the Caribbean coast of Panama in a Southeasterly direction for about 160 kilometers to Punta Escoces near the border with Colombia.

The Archipelago is formed by several island groups, each separated from the other by deep channels. The outer groups, those facing the open sea, are protected by a well developed algal reef formed by ~~crustacea~~ CRUSTOSE coralline algae and vermetid gastropods (Glynn, 1973). The area between the algal reef and the Islands is a vast shallow flat of sand and turtle grass, Thalassia testudinum with sparcely scattered heads of coral. The islands and cays are located at the leeward end of the sand flats. The islands' leeward side is a steep, sometimes vertical, face of firm strata formed by hard luxuriant corals to depths varying from 5 to 30 meters.

The inner islands, devoid of an immediate algal reef, are structured similarly except that their steep coral face is on the seaward side and the shallow sand flats usually occur on the side facing the mainland. Each island is surrounded by patches of sand shallows and T. testudinum flats on one side and fringing coral reefs that drop sharply to a bottom of coral rubble and sand to depths of 5 to 30 meters.

All field observations and pertinent data were gathered in the San Blas Archipelago. However, in order to verify the occurrence of the species throughout the Caribbean coast of Panama, eleven stations were examined starting at the San Blas Islands and extending to Almirante Bay in Bocas del Toro province, bordering with Costa Rica. S. sepioidea was evident in all stations.

Cop. + Court

May 71, Porvenir ✓
June 71, Miatupo C.? ✓
July 71, Miatupo ✓
Feb. 72, Miatupo C. ✓
Mar. 72, Ogupuksip ✓
Apr.-May, 1972 Miatupo. C. ✓
Apr.-May, 1972. Ogupuksip. C. ✓
June, 72. Yalumega C. ✓
June, 72. Piniatupo ✓
June, 72. Miatupo C.? ✓
June, 72. Ogupuksip. C ✓
July, 72. Yalumega C.? ✓
Aug, 72. Yalumega ✓
Aug, 72 Miatupo C. ✓
Aug, 72 Ogupuksip ✓
Aug, 72 Morgeptupo ✓
Oct., 72. Ogupuksip C. ✓
Nov., 72. Ogupuksip. C. (Not as common as earlier) ✓
Nov., 72 Piniatupo ✓
Dec., 72. Piniatupo. ✓
Dec., 72. Ogupuksip C. ✓
Jan., 73 Ogupuksip C. ✓
Jan., 73. Canta ✓
Feb., 73 Miatupo? ✓
Feb., 73 Canta ✓
~~March, 73 Miatupo?~~
March, 73. Canta C.? ✓
March, 73. Miatupo C. ✓
May, 73. Sail Rock. ✓
May, 73 Miatupo C. ✓
May, 73 Ogupuksip C. ✓
July, 73. Yallumega C. ✓

Babies

Nov. 71, Salar
Feb. 72, Pico Teo.
June 72, Panetupo region?
Aug., 72. Between Morgeptupo and mainland.
Nov., 72. Yalumega?
Dec., 72. Yalumega?
July, 73. Canta
March, 74. Morgeptupo?
July, 74. Miatupo?

Egg-laying

May 72, Piniatupo (Holander's end)
July 73, Yalumega.
July 74, Soledad Mandinga (Minutupo)

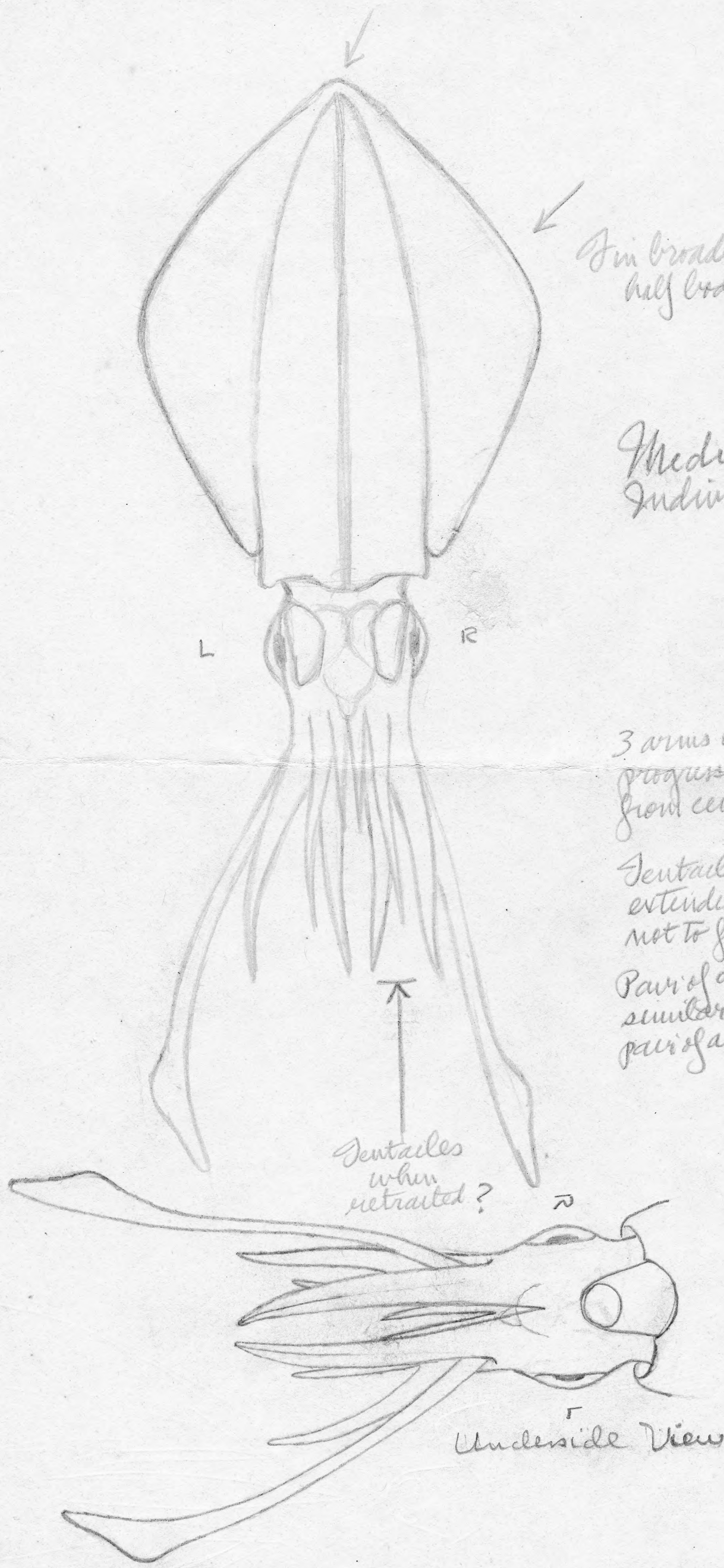
July, 73. Ogupukup. ✓
July, 73 Horgeptupo. ✓
July, 73. Harascantupo Pipiqua? ✓

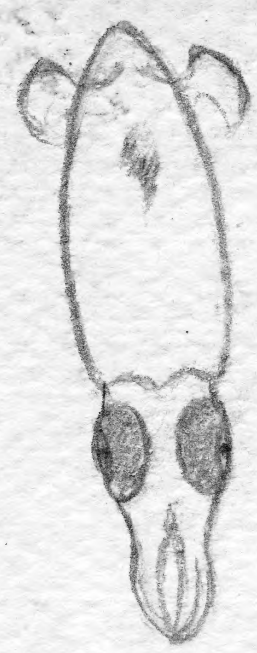
✓ Aug., 73. Coces Cay, Banks del Toro.

March, 74. Ogupukup C. ✓
March, 74. Island adjacent to Horgeptupo C. ✓
Apr., 74. Costa ✓
Apr., 74 Quinquintupo ✓
Apr., 74. Ogopukup C. ✓
July, 74. Piriatupo C. ✓
July, 74. Ogopukup C. ✓
July, 74. Hallescandupqi C. ✓
July, 74 Soledad Mandinga ✓

May 18, 1971 MM ✓
June 11 – June 13, 1971. Botti ✓
July 24 – July 26, 1971. Botti ✓
~~Feb. 2 – Feb. 4, 1971. A.R. (?)~~ ×
Nov. 20 – Nov. 24, 1971. Botti ✓
Jan 29 – Jan. 30, 1972. A.R. ✓
Feb. 16 – Feb. 18, 1972 Botti ✓
Feb. 22 – Feb. 25, 1972 Botti ✓
March 22 – March 25, 1972 Botti ✓
Apr. 27 – May 7, 1972. Botti ✓
June 21 – June 25, 1972 Botti ✓
July 29 – July 30, 1972 A.R. ✓
Aug 24 – Aug 30, 1972 A.R. ✓
Oct. 1 – Oct. 8, 1972. Botti ✓
Nov. 3 – Nov. 11, 1972 Botti ✓
Dec. 4 – Dec. 10, 1972 Botti ✓
Jan 24 – Jan 27, 1973 Botti ✓
Feb. 16 – Feb. 21, 1973 A.R. ✓
March 22 – March 25, 1973 A.R. ✓
May 18 – May 23, 1973 A.R. ✓
June 30 – July 6, 1973 Botti ✓
Mar. 9 – Mar. 14, 1974 Botti
Apr. 3 – Apr. 9, 1974. A.R.
July 6 – July 12, 1974 Botti

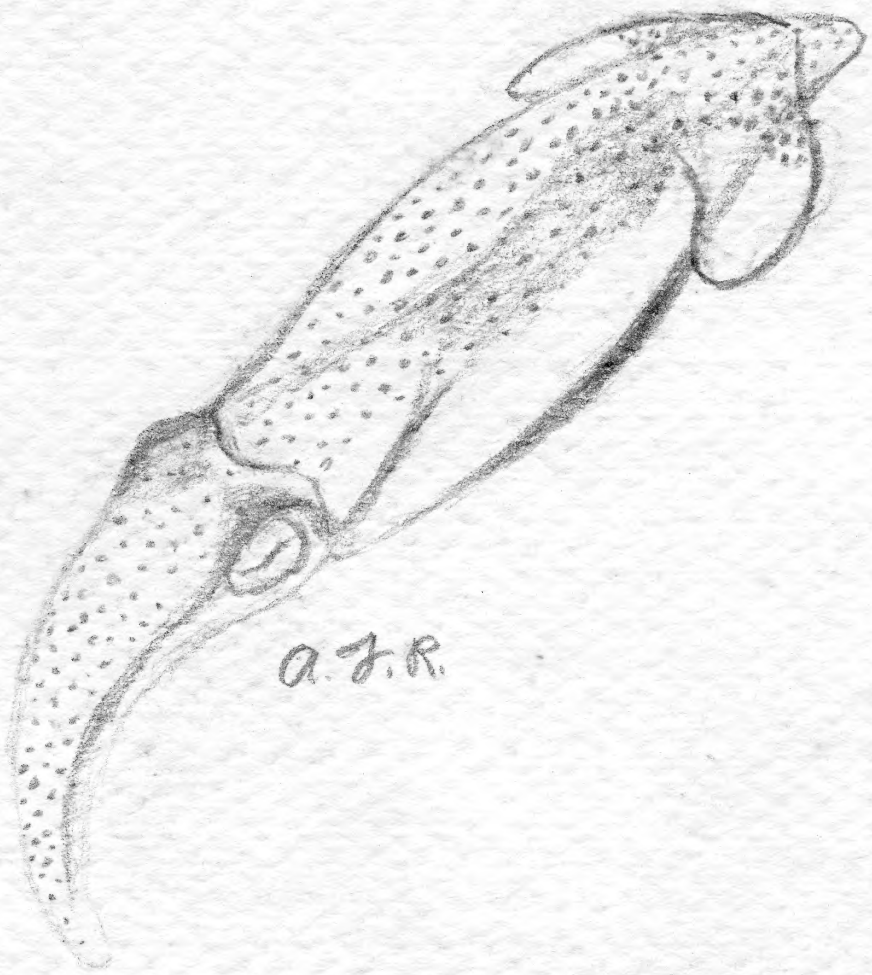
Florida to Venezuela


Jin broader than half body
Medium Individual
3 arms on top, getting progressively broader from center outward
Tentacles drawn extended (but not to full extent)
Pair of arms below similar to outer pair of arms above
L
R
Tentacles when retracted?
R
L
Underside View



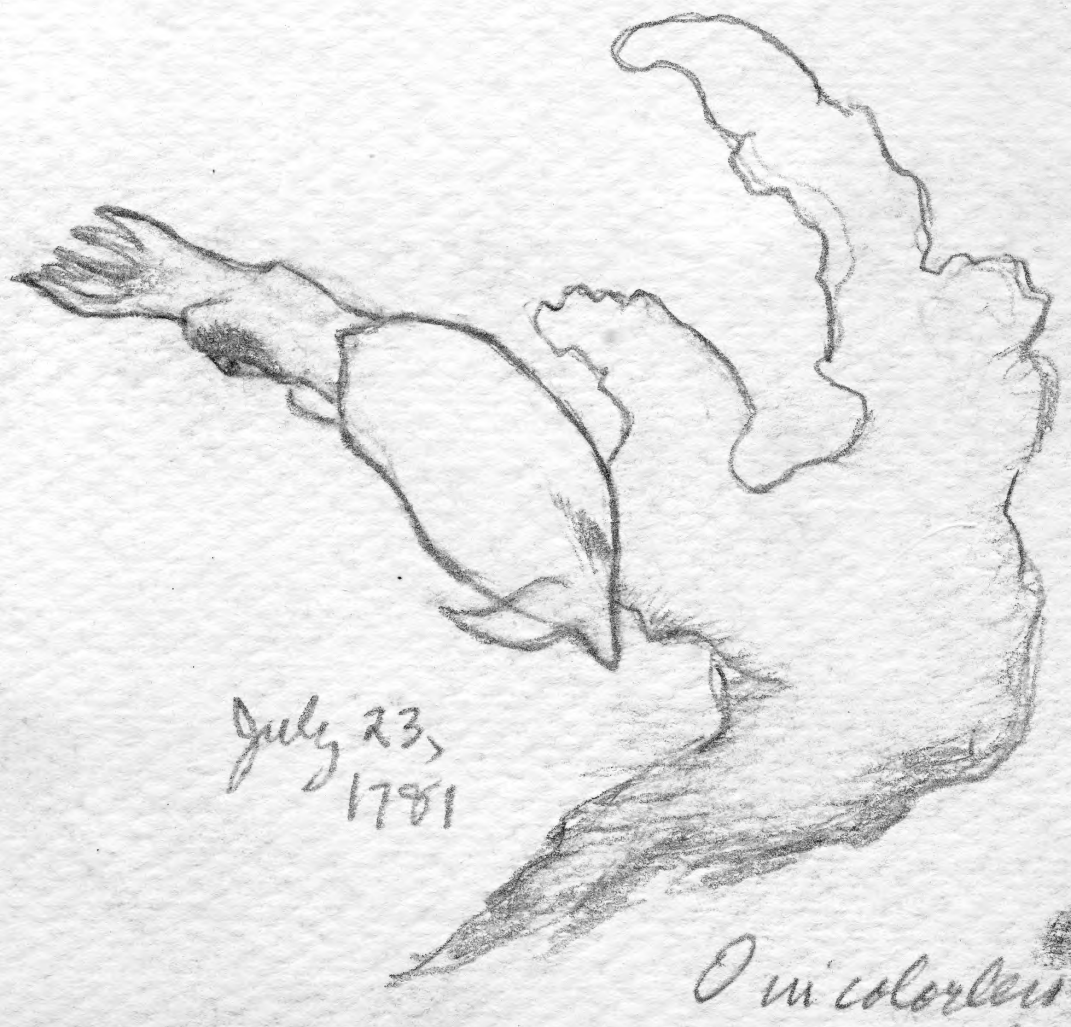
Dorsal view
of one form of
arm "blob".
Blob can be more
retracted at times.

Is there a special
"Dark Eyebrows"
pattern ???



Tail shape
may need change.

A.J.R.



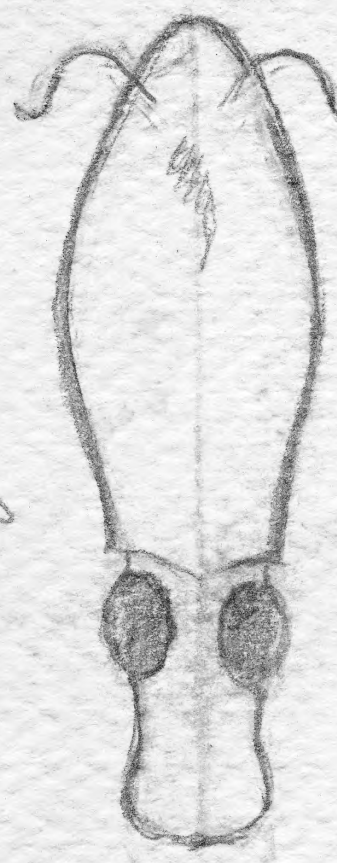
Spots perhaps
too large for pure
colorless.

July 23,
1781

Oui colorless
or coral.

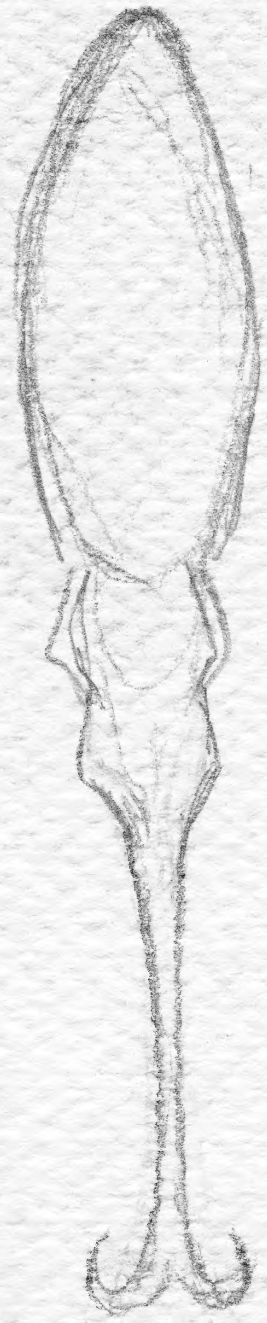
July 24, 1981

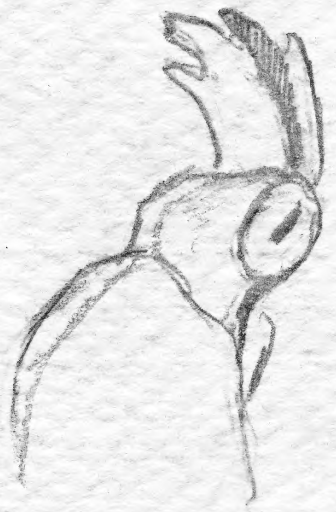
OO Buffy + Blob



Head to absolutely symmetrical

O in dark



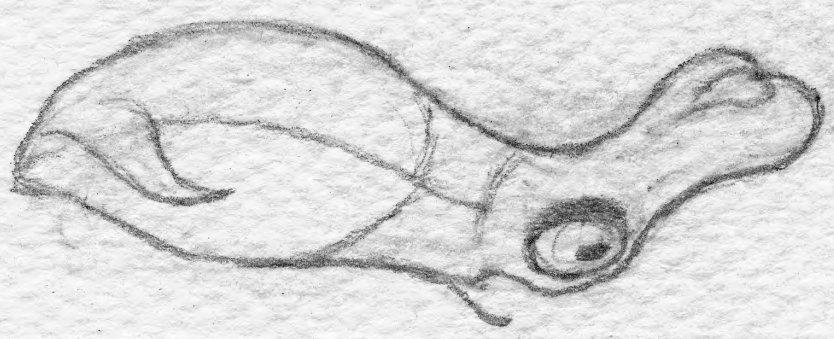


Upward curl effect with dark stripe

OO Lopsphere

NOTE: Fins may be too large

July 23, 1981



O attached laterally