Estero Soldado
1972

BRUSCA
FINOLEY
YENSEN
Thomson
Fee
Houston
I  sandy bay entrance
II  mangrove
III  rocky shore
IV  muddy shore/bottom
(FRIDAY) NOV. 10, 1972

Mexico
Sonora, Bahía San Carlos,
Estero Soldado (approx. 10 mi. No. Guaymas)

(3 P.M.)

Departed Tucson this A.M. for Soldado with
Nick Yensen, Bill Fee, Loyd Findley, Roy Houston
& Judy Wellman. Had a nice trip down. Arrived
Hermosillo ± 9 p.m. and had a few beers
at the whore house. It was a nice place although I
don't recall the name. It seemed to be patronized
principally by young kids. (There was a large fireplace,
etc.). Arrived in Estero Soldado around 3 a.m. (Sat.)
and set up camp by small finger.

We had picked up a Canadian guy named
Randy at the border. He came down to
Soldado w/ us for a few days before hitch-
hiking on down to Mazatlán to meet some
of his friends, from there they are driving
on to Central America.
Awoke early to begin work. No formal plans laid out but we want to sample enough of the area, and visit all the parts of the estero to feel we are really familiar with it, enough so that we could sit down and figure out food chains, productivity potentials, impact effects, etc. Had breakfast at the "Creston" motel in San Carlos (good place to eat - in fact, an excellent place to eat. I've had carne asada, Mexican food, and huevos raucheros there - all very good!). After breakfast we drove by the old mangrove area at the yacht harbor, the part north of the turn-off for Lalo Beach (Palm tree Beach).

This area was cut-off completely a few years back. The area cut-off was a small but pleasant mangrove swamp. I can recall seeing this area in 1965 (or '66) when Larry Waldrop and I worked the area. What a change - and all due to tourism and exploitation of the
coastline to support it. Anyway, since the soldado future may go along the same paths as the rest of San Carlos Bay, we thought a view of impounded mangrove areas would give us the proper setting to begin our own work. It did—we all got depressed and paid off at seacoast explorers. The entire area is dead or dying. There is no longer any water circulation at all (so obviously everything would die) and the waters are green-brown and mucky. The mangroves (reds & blacks) are all dead and slowly decaying but instead of being quickly decomposed and reduced by omnivores, borers, etc., they are slowly rotting away by bacterial action; probably aerobic above H2O and near the surface, and anaerobic within the water. With this picture in mind we proceeded to begin our sampling of Soldado.

Soldado is one of the northernmost mangrove stands in the Gulf. I have heard there is a mangrove swamp at Bahia Kino but I've never seen it. Nick says he remembers the like mangrove area to be really large and more of a muddy substrate than Soldado (sounds more like the Topolobampo mangrove region, whereas I would classify the Soldado mangroves as more closely with the La Paz mangroves; although the latter is really clean and beautiful, the substrate being a white coral sand with only occasional outcroppings of mud).
Estero Soldado is really beautiful. The substrate is a sandy mud grading both ways (into pure mud & pure sand) in different regions. The mangroves are all really healthy, the water clear & clean, no H₂S smell is evident & the bottom sediment swells only very faintly of H₂S. Oxygen readings at various places throughout the estero indicate there is no oxygen depletion anywhere (at this time, at least anyway); O₂ readings vary from 5-15 ppm; Water Temp. 15-20°C (shallow pools along shoreline drop it might to about 10°C); Salinity was 35% (same as open bay), higher in pools of course.

Today's work included dropping Roy & Judy off at the far shore to collect rocky shoreline invertebrates. They didn't find much, mostly gastropods, channel, & small stone crabs (Panusus?) & eels. While they did that Nick, Bill, Randy & I made an expedition into the interior of the large mangrove island. It was quite an experience—like never penetrated that deep into mangroves. One of the most striking things we found were lots of beautiful spiders with brilliant colored abdomens fused into a hard "cagoule" with spines along the body margin. If I hadn't seen 'em in the web I would have thought they were little, weird crabs. Because of this fantastic little
We followed a small drainage channel into the center of Spider Island to reach the lagoon in the interior, which was really a trip!! We were completely surrounded by Wangcows of all 3 types (red, black & yellow) & the water was very still & quiet & an odd sensation of complete quietness & inner calm came over me. It was very nice. The fauna & flora was the same as elsewhere in the Estero luse.

We went back after that to pick up Ray & Judy & stopped to work some on the southern point just inside the entrance to the estero. Here there are mud covered rocks unlike those found anywhere else in the Estero. There is also a cluster of large boulders that cover about 100 ft. & are in about 2 feet of water at low tide. The flora & fauna on these boulders
is unique to the region and is probably
rare this far north in the Gulf as
the rocks were covered with a dense
(4'-8'') covering of beautiful green Caulerpa
of the same type Jerry Barnard & I
found on islands in the Southern Gulf
(Pontida & Espiritu Santo Is.). The stuff was
so thick - it was like sitting on a pile
of feathers - and was filled with amphipods
and small crabs (most spider crabs
and isopods, etc.) I should add this genus
of Majids to the handbook as I have
found them also in Punaus. They blend
in so well with their habitat (Sargassum
to Caulerpa) that it is more than easy to
overlook them. A gallon of this Caulerpa was
taken, in fact, to go through back in Tucson.

That wrapped up this day's work. As
things stand now I feel that I have a good
basic feeling of this Estero. I think I know
fairly well what's here and how it operates.

Primary Production:
1. Phytoplankton (abundance not yet determined)
2. Detritus from spermatophtyes

**Rhizophora mangle** (Red mangrove)

**Avicennia germinana** (Black mangrove)
Laguncularia racemosa  
Salicornia spp. (pickle-weed)

- the "succulent halophytes" of Felger (19)
- salt grasses

- other vegetable detritus washed into the
- estero from the open sea (actually Bahía San Carlos)
- and from desert (desertscape).

- macroscopic benthic algae (Spiridia, Caulerpa,
- Enteromorpha, Cladophora) - note: these identifications
- are still tentative!!

Felger listed the following species of "succulent halophytes"

as occurring between the mangroves & desert scrub in
San Carlos Bay:  
Salicornia pacifica (pickle weed)
Allenrolfea occidentalis (pickle weed)
Atriplex barclayana (salt bush)
Batis maritima (pickle weed)
Haytenus phyllanthoides
Monanthochloa littoralis (prostrate grass)
Sesuvium verrucosum (lie plant)
Sporobolus virginicus (spike grass)
Suaeda torreyana

HERBIVORES:
mostly snails - (stylecheilus longicauda;
Cerithidia waat lonica; Cerithium; Regula)

Turbo; Bulla punctulata

some fish - (mullet, Mugil cephalus;
(Sun.) Nov. 12, 1972  
Mexico
Sonora, Bahía San Carlos
Estero Soldado (4 mi. N of Guaymas)

All of us but Roy (slept all day) and Randy (split this morning for Mazatlán) went out about 7 A.M. to do a poison station. This was done at the east end of the channel between Spider Island & Monguero.

![Poison Station Diagram]

The monguero were thick here & very well-formed so that we could swim back into them & crawl back into the dense foliage picking up fish. Loyd dumped about 1 gallon of "chem fish" (stomox) into the area at high slack tide. The rest of us proceeded to swim & climb through the mangroves (reds & blacks & yellows) getting fish as they died. It was a very successful kill with around 30 species being collected.
completely filling a luna can. The current, even though it was fairly weak, carried a lot of stuff down the channel toward the mouth of the estuary, so we collected all the way down. It's very exciting to swim along the edge of the mangroves and watch the Great Blue Herons and Snowy Egrets taking off in slow measured flight, while Slaquilly, terns, and other shore birds fill the distant air with shrill cries of communication. One Scarporna was collected (although not killed by the poison) and only a couple gobies. Mostly snappers, majaran and other small silvery fish.

After the poison station we took the boat across the bay to the easternmost shoreline of the estuary, north of where Ben & Judy collected but with a few rocks. We walked around here picking up clam shells, small crabs (Lepipers ?) and gastropods.
This region of the latter shoreline was strewn with middens—the entire area is covered with clam shells. One point was literally a "shingle beach" of pellicypod cabses. Most looked like Chinese although some definitely resembled a Latifrons and one really looked like a Pismo clam (Tivela). There was a camp on the rise above the bank, probably belonging to a Yagui Indian. In it were a couple hand-made cabses about 3 feet long, probably used to find clams. Lloyd picked up a lot of stuff here.

After this we returned to camp to find Manuel Mollee had come by to see us (at Bathland) but left before we returned. We felt we had accomplished a great deal so celebrated with sardines, tuna & Kitz crackers, followed by a few beers, a little wine and finally a trip to town. In town we met 4 guys from So. Calif. on their way (by train) to Panama. We played some frisbee with them.
Then went up to see their room in the Casa Grande. The Casa Grande is a fantastic old hotel in downtown Guaymas. It is huge, with high ceilings, corridors 15 feet wide, & balconies overlooking the town on one side and the central garden of the hotel on the other side. Unfortunately it is very old and in need of repair, but in its day (perhaps 30 or 40 years ago) it must have been one of the most beautiful hotels in Mexico, indeed in the world.
Nov. 22, 1972  
TUCSON, ARIZONA

Initial Data compilation of Estero 
Soldado material

The "Estero"

Habitats: Mangrove  
1 epifauna  
2 burrowers 

Rocky shore  
III 

mud shore/bottom  
(infauna - epifauna)  

sandy shore/bottom  

Caulerpa covered rocks  

Pelagic (fish)  

(7 habitat areas)
I. Mangrove - Epifauna (on plants)

Entoproct
Growing on mangroves. Species I.D. not possible without sending to specialist. Brown, branching form; 1-2''.

Genus pulchra
(see I - muddy shore)

Balanus trigonus (Darwin)
a cosmopolitan species - abundant on the stalks of the mangrove as well as any other surface the mephit might have settled down on to - rocks, pelecypod valves, etc.

Ascidia sp.
The opaque, solitary ascidians. Uncommon on the roots of the mangrove.

Tunicata:

Species 1 - Bright yellow-orange; very abundant on submerged roots and dead wood. Zooids strongly arranged in petaloid pattern, thin.

Species 2 - Thick encrusting form, possibly Aplidium; uncommon.
II. Mangrove - burrowers (in plants)

Polychaetes:

Amphinomidae (fire worm) - JK says may be new species. Found uncommonly, living in burrows in the wood of thick, dead mangrove roots. They probably move into burrows of other animals.

Eunicidae - Living in burrows in thick mangrove root (same as fire-worm above) but burrow not CaCO₃ lined.

\[
\text{[Diagram of burrowers]}
\]

- Teredo sp.
  - Shipworm - common
  - Lithophaga calyculata (Capricorn)

- Pholas sp.
  - w/ CaCO₃ tube - small tube

? = O - large tube
III. ROCKY SHORE

Tetragrapsus jouyi (Rathbun)

Scarce but present on rocks along shore and also on sandy beaches near vegetation. Seems to come out and about as the sun approaches and passes beyond the horizon. I'm not sure but I suspect these guys (also Ocyepode) are scavengers.

Pachygrapsus transversus (Gibbes)

Uncommon but present in same habitats as T. jouyi (above). Probably omnivores, both predacious and scavenging.

Ophioutrix spiculata LeConte

Rare - few found under large boulders.

Leptodius occidentalis (Stimpson)

Common but not abundant under stones in rocky intertidal shoreline. The species of crabs listed here, plus the two Ucaes, Ocyepode and Goniosus makes a total of at least 7 species of Brachyura, all important in reducing organic debris & detritus.
III. **MUD BOTTOM - INFAUNA**

**SEA ANEMONE**
*tribe Nynantheae*
*Subtribe Athenaria*

A dark purple or black burrowing anemone; a single specimen was found in the fingerlet and subsequently destroyed by improper preserving/fixing techniques.

*Probably Cerianthus sp.*
II  MUD BOTTOM - EPIFAUNA

Litaspangia sp.
an erect, branching red sponge. Stands 1-7" high, sturdy stalks. I.D. by G.J. Bakus (Allan Hancock). Dr. Bakus feels this may be either: 1) a new species of a genus now known only from the Red Sea & Australia, or 2) a branching form of the genus Ophlitaspangia, which is the red encrusting sponge found in Puerto Peñasco. This sponge is especially common in the seaside finger of the estero. It is an attractive species attached to pelecypod valves or to the mud bottom itself. This species is apparently never exposed, even at lowest tides.

Uca princeps (Smith)
The common large fiddler crab of the southern Gulf. These crabs are common in certain areas along the muddy shore, especially near vegetation (pickle-weed & mangrove). Their large burrows are exposed at low tide and covered at high tide, and are interspersed among Uca crenulata burrows.
Ocyopode accidentalis Stimpson

Common along the sandy shore near the mouth of the estero & around into San Carlos Bay proper - all along the shore until the houses & hotels start, then they stop. These guys apparently can't stand the near existence of Homo sapiens at all. They will no doubt be gone entirely from San Carlos if this hotel is built as this appears to be one of their last holdouts. Live in deep burrows above high water line (1.5-2.5 ft. deep). I watched them emerging at sunset one night and they would cautiously poke their heads out & look around. If I was within 10-100 ft. (or less) from their burrow they would quickly retreat & simply not come out - even if I held perfectly still. Whether or not they recognize my visual image as dangerous or what I don't know but they definitely were very bothered by my presence.
**Caulerpa** rocks

**Muricea** sp.
A purple sea fan w/pale zooids. Fairly abundant on these rocks and overgrown with caulera. I wonder if this caulera is seasonal? The gorgonians stood 2" - 7" tall.

**Lophogorgia** sp.
Another sea fan, pure white, with long slender branches, about 6" tall. Only one individual recovered.

**Isopods -**
about 4 species ... probably

- **Cirolana** sp.
- **Paracerceis** sp. (2)

Anthuridae

These things will have to wait a while before I can get to them. I want to take my time and do a good job on 'em.

I may send the *Paracerceis* to Iverson at Cal Academy.

**Demospongia -**
see sponge sp. 2 (mangrove epifauna)

**Tunicata -**
see Tunicate sp. 2 (mangrove epifauna)
Aglaophenia diegensis. Torrey
Common but not abundant; this hydroid was
found growing in the Calderpa on the
rocks. Stalks are 1-3" tall. It is probably
this species although I haven't had time
to make slides of the hydrothecum (polyp
cup) to count the marginal teeth, but
it appears to have less than 9, which is
what A. inconspicua and A. pinguin have
(the 2 other common Gulf ostrich-plumes).

Ophiactis simplex (LeConte)
The little 6-armed brittle star (although
this specimen has only 5 arms). This species
is abundant in algal mats throughout the
lower Gulf. The single species we collected
here seems different from all other O. simplex
I remember looking at. The arm bands are
black or gray for one thing; and the body
is like opaque white crystal; the arm
spines are odd-looking. This may be a new
species of this genus!!

Styela sp.
The erect solitary tunicate. This species is
tall (9 cm.) & flat (10 cm. x 3 cm.), opaque tan.
Quite unlike all the California species.
Podochelea sp.
A few individuals seen but none collected.
Resemble species from Morse Beach in having really long legs with puffs of hair on the ends, especially on the chelipeds.

Sterochynchus debilis (Smith)
The little tear-drop crab were abundant in the Caulerpa and a great many were collected but all were broken into little pieces by the time we got back to Tucker. These guys will have to be collected by hand & killed slowly, prior to preservation.
Ophiolithrix speculata  Le Conte
one individual found this trip but several
were noticed in other places in the estero
last trip. A typical specimen.

Astrangia pedersenii  Verrill
the attractive, semi-solitary, stony coral of the
southern Gulf. A clump of 6 polyps
was found, although several other rocks
had smaller clumps (1-3 polyps) on them.
(largest corallite)

\[ \text{15 mm.} \]

Sponge - see sponge species 1 (mangrove epifauna)

Tunicata
Species 1 - Unlike those found elsewhere, this
ascidian is encrusting, red-orange, sort of
spongy (in fact it looks like a sponge until
you examine it under a scope) and does
not have observable zooids. At places
it is thin & slimy and at other places
it grades into a puffy, spongy structure.
The gelatinous matrix is pale green and
in streaks through the red.
Uca crenulata (Lockington)
common along mud banks in many parts of estero. (see Uca princeps).

Goniopsus pulchra (Lockington)
The Gulf "mangrove crab", common & abundant in mangrove areas throughout the Gulf, as well as occurring on rocky shorelines. In both instances it builds burrows into the muddy substrate. In Soldado the burrows are large (1-3" across) and 2-3 ft in length, usually angling into the mud at about 30°. The burrows are in and around the roots of the mangrove, often mixed among Uca burrows. These crabs seem to emerge at low tide & climb up on the mangroves; I don't know if they are feeding on the mangrove leaves or not, but it is very likely they are. They are rarely seen at high tide.

Sculidae
These little polychaetes (probably 3 species) are abundant on all surfaces (mangrove, rocks, shells, etc.) - much the same habitat as Balanus.
Clibanarius panamensis* Stimpson (?)

Tentative I.D., awaiting word from Janet Haig. This species is very abundant on the bottom all over the estero and is surely a major reducer-savenger, playing a key role in keeping the place clean & free of bacterial anaerobiosis (H2S formation). This hermit was found occupying shells from 1cm. to the size of large Turboittellas & Murexes.

Penaeus brasiliensis

= P. californicus, P. brevirostris* (by Schmitt '21, '35)

Young individuals of this species of commercial shrimp are very abundant in the large land-ward finger of the estero. They were all small specimens (1-4 cm.) and were interspersed among larger specimens (6-10 cm.) of Penaeus stylirostris Stimpson. Both species are obviously using Soldado as a nursery ground. The fact that both species are living together may be explained by the size difference. Perhaps the two differ in food requirements or food-size requirements. They may oscillate through the year—i.e. 6 mos. from now P. brasiliensis
may be the large ones, *P. stylirostris* having matured & moved out to sea. This is pure conjecture however, perhaps no explanation of their co-existence is even required!!

The significant factor is that this large estero is an important nursery and probably one of the few last remaining ones around Guaymas. I have heard people speak of the fishing Pressure on shrimps reducing the population but it seems to me the wiping out of their natural nursery is all along the coast is a more significant factor.

*Penaeus stylirostris* Stimpson
(see *P. brasilianus* above)

*Callinectes bellicosus* Stimpson

The blue crab (swimming crab) - abundant in all parts of the estero. An important predator on small fishes & inverts - possible shrimp & *Penaeus*. Very few adults seen (none captured) but imatures abound ½ - 3 cm. wide.
Petrochirus californiensis Bouvier

Only one specimen collected. This species is more common in the northern Gulf and on sandy bottoms. In fact, I would call it quite unusual that this species is in Estero Soldado and this one individual may be an accidental wanderer from the open coast of Bahía San Carlos (although the odds of collecting a single individual is extreme!)

Balanus amphitrite (Darwin)

Abundant on igneous stones along rocky shoreline

Chthamalus anisopoma Pilsbry

Common on igneous stones along rocky shoreline; mixed with Balanus amphitrite but not as abundant. Both species also on shell fragments along shore and down to low tide level.

Sponge # 1

A white, very thin, encrusting sponge; no spicules obvious; oscula small and difficult to see; easily mistaken for a tunicate. One specimen found growing on a large piece of plastic, partially embedded in mud.
Bryozoa — growing on gastropod shell in round, elevated clumps; pure white; somewhat tubular

mag. - 1 cluster

\[ \text{1 cm.} \quad \text{1.5 mm.} \]

Eurytium albidigitum Rathbun

This large predator on Uca was found to be a common inhabitant of the muddy shores where Uca burrows. Eurytium also burrows, making large holes (\( \pm 1.5 \text{ in.} \) wide across) angling down at about 10-20°.
Tunicata:

species 3 - Thin encrusting form; dark; zooids not visible. Dark purple in 80% tissue and formalin.

SEA ANEMONE (class anthozoa, subclass zoantharia, order Actiniaria, tribe Nystantheae)

species 1 - a small brown anemone (1-10 mm) occasionally common in clusters on submerged mangrove roots. They are solitary, w/o acontia, and quite attractive. I.D. may await correspondence with C. Hadd or C. Cutsress.

Balanus tintinnabulum (Linnaeus)

Sponges

species 1 - family Cyamoidae (near Cyamon or Trientalia helianthi, I think). A robust, brown sponge; solid at the base but forming corrugated, folded leaves in the upper 1/2; 3-7 cm tall, 3-5 cm wide. Base also spreads out in an encrusting fashion. A weird sponge, a thick spicular blush is evident in patches across the surface, to 4 mm tall.
I. (cont.)

Species 2 - A very porous demospongia; thick and mat-like in places (to 3 cm. thick) but sending out narrow finging in other places; encrusting

SPIDERS:

*Gasteracantha elipsoide* (Walckenaer)
Abundant throughout Red mangrove areas in symmetrical web. A beautiful spider described in field notes RCB 1122. This species was observed feeding on midges.

*Argiope argentata* (Fabricius)
A large gray spider in a somewhat symmetrical web. The center of the web had 4, pure white, loops of silk, to which the front 2 back 2 legs were placed

I.D. of these spiders was by Dave Richman. He noted both range from S. S. U.S. to S. America
I (cont.)

**Serpulidae** -
2 species of serpulid polychaetes.

**Membranipora sp.**
common; a dark, encrusting zetoprot.

**Sponge species 3** -
A thin, red to red-orange encrusting sponge. Very smooth and almost slimy to the touch. Possibly *Ophiactespongia* but I doubt it.
III (cont.)

**Petrolithes gracilis** Stimpson

the smooth-armed porcelain crab. Uncommon under rocks along rocky intertidal of Estero.

**Ligia occidentalis** (Dana)

Abundant along rocky shore & sandy/mud shore under rocks. No large individuals seen, all 1-2 cm. long. Unusual markings also present on exoskeleton (back & legs), consisting of patterns of black dots in streaks on back - random on legs.

**Alpheus** sp.

A species of "snapping" or "pistol" shrimp, uncommon under rocks; 1-2 cm long. May be **Alpheus normanni** Kingsley (I collected this species in Guaymas-San Carlos Bay in fact - back in '69 or '70).

**Palaeon** sp.

Tentative I.D. - 3 small species taken from rocks along rocky shore or Caulerpa rocks - I don't know which. Talson
and uropods w/ long posterior hairs.

**TELSON**

| pair spines (1 long; 1 short) |

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**Panopeus purpureus** Lockington

one large individual under boulder, in sandy shoreline.

**Panopeus sp.**

three individuals from under rocks 8-12 mm. across carapace. This generic I.D. is tentative.

sometimes these little stone crabs of the genera Panopeus, Tetragrapsus, Pachygrapsus, Euryptium, etc. all start looking alike!

**Grapsoid crabs #1 & #2**

two more different species of grapsoid crabs recovered from under stones along this short stretch of rocky coast.

as of this point I have listed 8 species of crabs along from this isolated, remote, and small rocky area. Amazing!!
III (cont.)

*Balanus tintinnabulum* (Linnaeus)

on rocks; small specimens, < 1 cm diameter.