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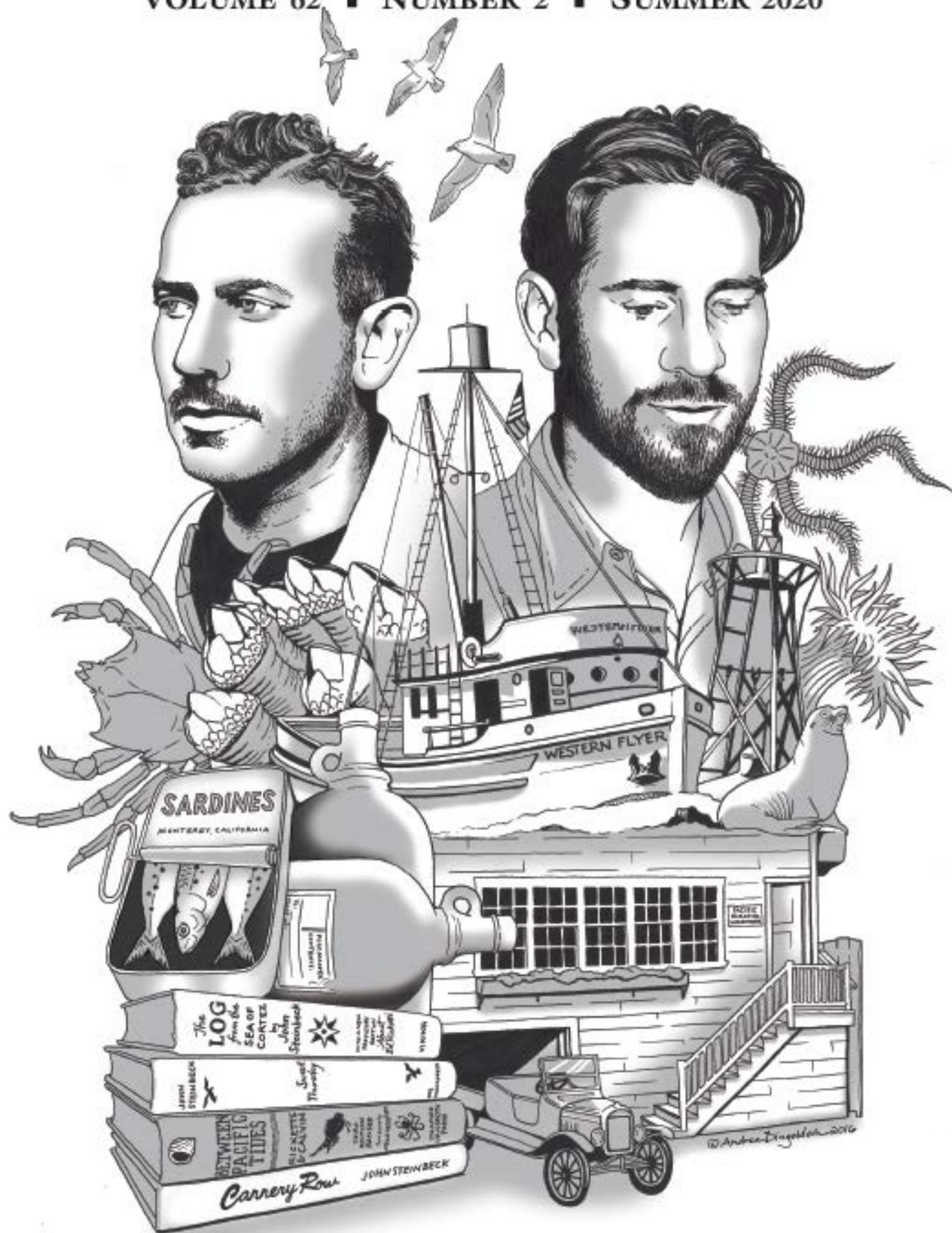
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Publishing the Southwest

DEDICATED TO THE WESTERN FLYER FOUNDATION

It has been 80 years since John Steinbeck and Ed Ricketts sailed aboard the *Western Flyer* into the Sea of Cortez—a voyage that changed both of their lives and forever altered the arc of environmentalism and marine biology in North America. The contributors to this volume were inspired by their reflections on that voyage and those two remarkable individuals. A sublime attribute of the voyage and the book it spawned was the seamless blending of art, science, and philosophy. I thank Andrea Dingeldein for the use of her wonderful drawing, which captures the essence of the Ed Ricketts/John Steinbeck relationship and graces the cover of this special issue (see more of her work at www.thelocalnaturalist.com).

The expedition and the book, and so much that was later influenced by that amalgamation of ideas, also inspired creation of the Western Flyer Foundation, committed to restoring the purse seiner that Steinbeck and Ricketts chartered for their famous 1940 expedition. The boat is being fully restored and will soon be back in the water. This volume of *Journal of the Southwest* is dedicated to that foundation and its goal of cross-disciplinary learning that will be core to the educational mission of the restored *Western Flyer* (www.westernflyer.org). This compilation of essays offers another blend of art, philosophy, and science, influenced by the unique *mélange* that took place between two people and a boat 80 years ago.

My review of the Steinbeck-Ricketts 1940 expedition, with an annotated cruise log and species list, seemed long overdue. Hopefully it will provide grist for the mills of other scientists and writers in the years ahead.

Lindsey Haskin and I explore the influence of Steinbeck and others on Ricketts's thinking during his intellectual growth as a scientist. We walk readers through some of the steps in Ricketts's personal and professional life that helped shape the most influential, enduring, non-degreed marine biologist and invertebrate zoologist that America has ever seen.

Don Kohrs's essay on Ed Ricketts's life up to the 1940 Sea of Cortez expedition is illuminating and carefully researched. It includes his childhood years, the founding of Pacific Biological Laboratories, and the writing/publishing of *Between Pacific Tides*.

Kevin Bailey and Chris Chase explore the long and not-always illustrious history of the *Western Flyer*, the boat that wouldn't die. The *Flyer* had a life of her own, and she became an unexpected, deeply personal symbol of science, adventure, freedom, and camaraderie—eventually taking her place in American history. From sardine and salmon seiner, to bottom trawler, to Alaskan crab fisher, to private and government research vessel, the boat sank twice but is now being faithfully restored by the Western Flyer Foundation.

Katharine Rodger explores Ricketts's influence on Steinbeck's writing, giving the topic a new twist by examining the former's influence on *how* Steinbeck wrote. Rodger explores Ricketts's belief that only when one has mastered the form or craftsmanship of their art—be it poetry, prose, painting, music, or science—can the content or truth of that art be executed with purity. It would seem that both Steinbeck and Ricketts attained that aspiration in their unique creativity.

"Got Squid," a look at the long-term oceanography of the Sea of Cortez through the lens of Humboldt squid, a species not recorded by the Steinbeck-Ricketts expedition, is historical-ecological science at its best. W. F. Gilly and colleagues carefully analyze the history of Humboldt squid records and physical oceanography of the Gulf, coming to intriguing conclusions.

Susan Shillinglaw considers the meaning of Steinbeck and Ricketts's holistic approach and how that is reflected in their book, most pointedly in their admonition that we should look "from the tide pool to the stars and then back to the tide pool again." She examines the significance of "participation" in the intertidal region and the implication of breaking through, a concept vital to both men's thinking.

Richard McCourt and Josie Iselin provide a delightful look at the "other" Sea of Cortez expedition in 1940, that of the Allan Hancock Foundation and pioneering Pacific phycologist E. Yale Dawson. Dawson would go on to produce the algal equivalent of the Steinbeck-Ricketts invertebrate catalogue.

John Gregg's humble yet astute essay describes his deep belief that combining art and science, as did Steinbeck and Ricketts, is needed in modern society. Further, integrating disciplines is a critically needed approach for teaching youngsters how to be more well-rounded citizens and critical thinkers. He also describes how his nearly accidental discovery of the book *Sea of Cortez* helped shape his own life, eventually leading him to track down the *Western Flyer* and purchase it, almost directly off the seafloor.

Richard Astro's overview of the history of scholarly research on Steinbeck and Ricketts, beginning with the story of how he basically "founded the field," is a wonderful ride and perfect closing essay for this volume.

I most graciously thank the many anonymous peers who were kind enough to review the articles in this special issue of *JSW*. Naming you would compromise the review process, but you know who you are.

— R. C. Brusca, Tucson, Arizona
Summer 2020

The 1940 Ricketts-Steinbeck Sea of Cortez Expedition, with Annotated Lists of Species and Collection Sites

RICHARD C. BRUSCA

The tide teaches us to live with mystery and complexity. It lives in the body of a mud shrimp, signaling when to swim and when to burrow. It lives in sandpipers, crabs, and whelks. It lives in the spirit of bores, in the prayers of monks. The tide is vibration, music, time.

—Jonathan White, *Tides: The Science and Spirit of the Ocean*

INTRODUCTION

In March of 1940, modern marine ecology in the Sea of Cortez (Gulf of California) was born with the pioneering expedition of Edward (Ed) F. Ricketts and John Steinbeck aboard the *Western Flyer*, a sardine seiner out of Monterey, California. Although earlier biologists had visited the area, none had done so using an ecological, or “holistic,” approach and none had done so with the intent of undertaking a broad faunal survey (Brusca 2018a). This was the first expedition to catalog the littoral/intertidal fauna of the Gulf of California. As Ricketts wrote in a letter to Steinbeck in 1941, “It seems gratifying to reflect on the fact that we, unsupported and unaided, seem to have taken more species, in greater number, and better preserved, than expeditions more pretentious and endowed” (Ricketts 1941). That assessment was probably accurate.

The science and philosophy of that voyage are eloquently chronicled in their 1941 book, *Sea of Cortez: A Leisurely Journal of Travel and Research*. Initially, they discussed exploring the region by car, but soon realized that the inaccessibility by land of most coastal sites on the Baja

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California Peninsula demanded they charter a boat for the work. Thus, using funds from Steinbeck's successful early writing career, he and Ricketts chartered the *Western Flyer* for the 6-week expedition. The expedition's northernmost collecting sites were in the Midriff Islands, at Puerto Refugio on Isla Ángel de la Guarda, and at "Red Bluff Point" on Isla Tiburón. Thus, they barely "touched down" in the Northern Gulf and did not explore the biodiversity-rich coastlines of northeastern Baja California or northern Sonora. Their southernmost site on the Baja California Peninsula was Cabo San Lucas (at the tip of the peninsula), and on the mainland coast it was the Bahía Agiabampo coastal lagoon complex (on the Sonora-Sinaloa border). Although Isla Tiburón is part of the Comcaac/Seri Indian Territory, there is no evidence that Steinbeck or Ricketts had any actual encounters with the Comcaac People. The vast majority of Comcaac today reside on their communal property in the towns of Punta Chueca and El Desemboque, just north of Bahía Kino. But in the past they traded at least as far north as Puerto Peñasco and Bahía Adair, in the Upper Gulf (Mitchell et al. 2020).

Members of the expedition were Ed Ricketts, John Steinbeck, Carol Henning (Steinbeck's first of three wives), Anthony (Tony) Berry (captain), Sparky Enea (seaman and Captain Berry's brother-in-law), "Tiny" Colletto (seaman), and Hall (Tex) Travis (engineer). Steinbeck paid Captain Berry \$2,500 for the 6-week charter (for the fascinating backstory on the *Western Flyer*, and the deal between Steinbeck and Berry, see Bailey 2015). The agreement was that Ricketts would reimburse Steinbeck one-half the charter price from royalties on their book once it was published, but there seems to be no evidence that ever happened. There is no doubt, however, that Ricketts saw the expedition as an opportunity to acquire specimens for sale through his Pacific Biological Laboratories, and he apparently made as much as \$12,000 by doing so (Bailey 2015). However, none of this was mentioned in their 1941 book.

The landmark Ricketts-Steinbeck voyage to the Sea of Cortez, and the book it spawned, had a profound impact on the lives of the two men and on the American environmental consciousness (see Astro and Hayashi 1971; Astro 1973, 1995; Hedgpeth 1978a,b; Brusca 1993, 2018a; Beegel et al. 1997; Enea and Lynch 1991; Rodger 2002, 2006; Tamm 2004; Brusca 2004; Lannoo 2010; Bailey 2015; Hannibal 2016). In addition, it brought a new awareness of the Gulf of California (and Baja California) to both the public and the scientific worlds. The expedition and book have undoubtedly inspired hundreds of young biologists to

devote their careers to marine biology and field biology. Their book (hereafter, *Sea of Cortez*) was also the first public call for conservation in the region.

The expedition made 24 discrete collections from 21 localities (20 within the Sea of Cortez itself), and captured an estimated 557 species of marine invertebrates, nearly 100 of which found their way to the Smithsonian Institution and are today available in the collections of the National Museum of Natural History. For more than 30 years, until my two editions of the “Gulf Handbook” were published (Brusca 1973, 1980a), the Ricketts-Steinbeck expedition report was the only place one could turn for a synoptic view of life in the Sea of Cortez. The “Phyletic Catalogue” in *Sea of Cortez* lists 484 species (and illustrates 83 of those); Brusca (1980a) lists 1,300 species (and illustrates 720). The only other large compilation of Sea of Cortez invertebrates, the Macrofauna Golfo Project, catalogs around 5,143 species of invertebrates and is available as an online searchable database (<http://www.desertmuseum.org/center/seaofcortez/database.php>). Table 1 gives the numbers of known invertebrate species in the Gulf based on a search of this database (1 July 2020; the tables appear in the appendix at the end of the text).

Sea of Cortez was a biology text, travelogue, adventure story, and philosophical inquiry. It was also testimony to a great friendship between two brilliant men. The book comprises six parts: Introduction, Narrative [the “Log”], Note on Preparing Specimens, an appendix titled Annotated Phyletic Catalogue [“Phyletic Catalogue”], a Glossary, and an Index. The 50 or so drawings of marine life were primarily by Alberté Spratt, an artist from Carmel (California), and the 15 color photographs were by Russell Cummings of Pacific Grove (California), as were most of the 73 black-and-white photographs (although a few were contributed by others). Toni Jackson edited the manuscript, constructed the Glossary, and transcribed the bulk of the difficult text, including both the Narrative and the Phyletic Catalogue.

Until now, there has never been an attempt to assemble a complete, site-by-site list of species from the expedition. This is done here, compiling data from the book, Ricketts’s field notes from the trip (available in Rodger 2006), correspondence between Ricketts and specialists who made identifications for him (many of which arrived too late to be included in their book), specimens collected on the expedition that are now deposited at various institutions, and taxonomic/nomenclatural revisions since 1940.

THE MARINE INVERTEBRATES OF THE SEA OF
CORTEZ EXPEDITION

In the Introduction to *Sea of Cortez* (and in the Phyletic Catalogue, p. 304), Steinbeck and Ricketts wrote that they collected more than 550 different species, including “35 to 55” new undescribed/unnamed species. However, in the Phyletic Catalogue only 484 species are listed. Presumably the “missing 66 species” comprised unidentified specimens that Ricketts had sent to specialists for examination. In a letter from Ricketts to Steinbeck (22 August 1941), Ed wrote, “When complete data comes to hand, I think we shall have collected more than 600 species, of which 60 will have been undescribed at the time they were taken.”

I estimate approximately 557 species were collected (Table 2), about 40 that were new to science and were named and described after *Sea of Cortez* was published (perhaps another dozen or so still remain undescribed). The highest numbers of species (per site; see Table 3) collected were 115 species at Punta Lobos on Isla Espíritu Santo (Collection No. 4, March 20), 95 at Puerto Escondido (Collections Nos. 11 and 12 [inner and outer bay], March 25–27), 99 at Bahía de los Ángeles (Collection No. 18; April 1), 92 at Puerto Refugio on the northern tip of Isla Ángel de la Guarda (Collection No. 19; April 2), and 91 at Bahía Concepción (Collection No. 14; March 28–29).

Today, the invertebrate diversity of the Sea of Cortez is fairly well documented. The Hendrickx et al. (2005) Macrofauna Golfo checklist enumerated 4,847 species, Brusca and Hendrickx (2010) stated over 4,900 named invertebrate species are known from the Gulf, and the Macrofauna Golfo online database lists 5,143 species (<http://www.desertmuseum.org/center/seaofcortez/database.php>; accessed 1 July 2020; see Table 1). Copepods and ostracods are not included in the Macrofauna Golfo database, raising the actual invertebrate count for the Gulf to over 5,200. New species continue to be described, the interstitial/meiofaunal biota and deep-sea faunas are still poorly known, and Brusca and Hendrickx (2010) and Brusca et al. (2005) estimated that only about 70% of the Gulf invertebrate species have so far been named and described.

There are a variety of sources for species identifications and names for the material from the Ricketts-Steinbeck expedition. Ricketts’s unpublished field notes and the Narrative in *Sea of Cortez* provide preliminary names, but these are updated in the book’s Phyletic Catalogue. I have updated those using Ricketts’s correspondence with specialists,

publications by taxonomists after the appearance of the book, and by more recent identifications of specimens housed in museums. The species names in Table 2 are my best estimate of the correct and currently accepted taxonomy and nomenclature. Many of the species in their Phyletic Catalogue were misspelled, and some of these errors have been perpetuated by others (corrected in Table 2). Ricketts was well aware that the book's Phyletic Catalogue had errors or names that needed updating, and he hoped to publish a "second edition" of the Catalogue (letter from Ricketts to Deichmann, 21 February 1942); however, by March 1942 those plans had been scuttled (letter from Ricketts to Deichmann, 9 March 1942; both letters available in Rodger 2002).

Steinbeck and Ricketts correctly judged the Sea of Cortez to be strongly dominated by what they called the "Panamic" fauna, today more commonly called the Tropical Eastern Pacific fauna (e.g., Brusca and Wallerstein 1979; Brusca 1980a; Brusca and Hendrickx 2010). They also recognized the southwestern coast of the Baja California Peninsula as being a region of overlap between the tropics to the south and temperate coastal waters to the north—described in detail in Brusca and Wallerstein (1979), Brusca (1980a), Whitmore et al. (2005), and Brusca et al. (2005). Recognized as early as the 1930s, Bahía Tortuga (aka Bahía San Bartolome, Bahía Tortolo), about 40 km south of Punta Eugenio, is the first place, moving southward along the outer Baja coast, where the number of tropical species appears to outnumber temperate species, while just outside the bay (e.g., Cabo Thurloe) temperate California's giant kelp, *Macrocystis*, makes its last stand (Fraser 1938; Brusca 1980a). Over 700 invertebrate species from the Sea of Cortez extend their range to southwestern Baja California, in the region between Cabo San Lucas and Bahía Tortuga.

Steinbeck and Ricketts provided a discussion of zoogeographic faunal relationships for the Sea of Cortez based on an analysis of the species they collected. They noted the strongest ties to tropical fauna of the East Pacific, and next strongest to warm temperate waters of Southern California. The least close ties were to the tropical west Pacific and the Caribbean Sea. Although they collected only about 10% of the known invertebrate species in the Gulf, their perceptions remain accurate. However, due to the state of invertebrate taxonomy in 1941, the extent of faunal relatedness to California shores, the west Pacific, and the Caribbean was exaggerated in their analysis. They noted, for example, that the Gulf's sponges and tunicates had the strongest ties to "north

temperate zones” (*Sea of Cortez*, p. 308). This was a misperception likely based on the then-poor state of taxonomy for the Gulf species and on many similar-appearing (but actually different) species from California shores. Our understanding of these two taxa remains at a low state today, although the excellent work by José Luís Carballo and colleagues (at Universidad Nacional Autónoma de México’s [UNAM’s] Mazatlán marine lab) is rapidly increasing our understanding of the Gulf’s sponge fauna.

The Ricketts-Steinbeck expedition collected only 14 species of sponges, yet there are 125 currently described from the Sea of Cortez (most having tropical affinities), 60 of which occur in the intertidal regions they were sampling. Similarly, they collected only 10 species of tunicates, whereas at least 43 species are so far known from the Gulf and certainly >100 species actually exist there. The tunicate fauna (“sea squirts”) of the Tropical Eastern Pacific is extremely poorly known. The Gulf’s sea anemone and gorgonian faunas were so poorly known in 1940 that Steinbeck and Ricketts did not even include them in their Phyletic Catalogue from the expedition.

Twenty-two of the 38 known species of littoral sea cucumbers (Holothuroidea) were collected by the expedition. However, some of the identifications (presumably all by E. Deichmann of the Smithsonian Institution) must be viewed with caution. Until very recently, there had been no taxonomists dedicated to studying the sea cucumber species of the Sea of Cortez. Prior to the publication of Francisco Solís-Marín et al.’s (2005, 2009) excellent work on Gulf Holothuroidea, a majority of species records from the Gulf are suspect. And, a number of the names used by Ricketts and Steinbeck have been changed since 1940 (see Table 2).

Similarly, only recently has the gorgonian fauna of the Tropical Eastern Pacific been clarified, through the systematic efforts of Odalisca Breedy and Héctor Guzmán (2002, 2005, 2007, 2011, 2015, 2016a,b,c). The Ricketts-Steinbeck expedition collected four species of Gorgonacea, but at least eight are now known to occur in the Gulf’s intertidal zone.

Just under half of the known invertebrate species from the Sea of Cortez occur in the Gulf’s intertidal zone—2,257 species. Thus, despite their rushed expedition, Steinbeck and Ricketts collected about 25% of the known littoral species—very impressive for just 6 weeks of fieldwork. The main taxa they missed were smaller forms (which are spread through all the phyla but are especially abundant among gastropods) and species whose uppermost occurrence is at or below the 0-tide level.

The expedition consciously avoided the “rarities,” as Ricketts called

them—the small or obscure forms. Instead, they concentrated on the most abundant species, ones they felt were most important in the food web and overall composition of the fauna. In a letter to Steinbeck, reflecting on their expedition but before the *Sea of Cortez* book had been released, Ed noted that “the commoner the animal the more attention we devoted to it, since it, more than the total of all rare forms, was important in the biological economy” (Ricketts to Steinbeck, 22 August 1941, available in Rodger 2002). The goal of the trip was clearly not to see how many species they could collect, or how many undescribed species they might find (though they found many). It was for something larger—to attain an overall sense of the fauna, its ecological and biogeographical relationships to other regions, a holistic view. Or, as Steinbeck (1951) put it, the “project had been to lay the basis for a new faunal geography.”

Certain other taxa were also undersampled by Steinbeck and Ricketts. For example, they noted a paucity of hydroids in the Gulf, collecting only 7 species (64 species of Hydrozoa are currently known from the Gulf’s littoral zone), and only 4 species of stony corals (at least 17 occur in the Gulf’s littoral). They collected 7 species of flatworms (Platyhelminthes), but 17 have so far been described from the Gulf’s intertidal region, this being only a small fraction of what is actually there (most are yet to be described). Surprisingly, they collected only a single ribbon worm (*Baseodiscus mexicanus*, phylum Nemertea), although 14 have been described from the Gulf’s littoral, many of which are quite common. They collected only 14 of the 50 species of intertidal bryozoans known from the Gulf, 51 of the 377 species of intertidal polychaete worms (Annelida: Polychaeta), 12 of the 60 species of intertidal isopods (Crustacea: Isopoda), 10 of the 114 known intertidal amphipods (Crustacea: Amphipoda), and 10 of the 27 intertidal cirripedes (barnacles).

The expedition focused on larger organisms, mostly animals exceeding 2 cm in length. Thus, they took only 182 of the 927 known intertidal mollusc species, most of which are small. They also undersampled echinoids (sea urchins and their kin), taking only 15 of the 27 littoral species, missing such common urchin species as *Toxopneustes roseus* and *Lytechinus pictus* (presumably because these do not appear on the shore until around the 0-tide level, and much of their collecting was done at tidal levels higher than that). Overall, they collected 65 of the 120 known Gulf littoral echinoderm species.

Their collecting techniques were most successful with the large,

colorful species groups. They collected 54 of the 163 littoral “true crabs” (Brachyura), although some of their identifications are suspect (e.g., they report only one species of *Callinectes*, but three very similar species occur in the Gulf). Similarly, they reported all records of sun stars as *Heliaster kubiniji*, although there are three similar-appearing *Heliaster* species in the Gulf.

The expedition brought back thousands of specimens, and Ricketts worked furiously to get them sorted, identified, and properly curated. He worked swiftly to package and send specimens to specialists around the country. Correspondence between Ricketts and these specialists reveals an amazing level of cooperation and respect for Ricketts by the zoological community at large. The list of cooperating taxonomists reads like a compendium of the top invertebrate zoologists working in North America at the time, three of whom (Ted Bullock, John Wells, and Joel Hedgpeth) lived long enough to make identifications for me in 1969–1970 when I was working on my own compendium of Gulf invertebrates.

Paul Bartsch. National Museum of Natural History (Smithsonian Institution), Washington, D.C. Scaphopod and bivalve molluscs.

R. S. Bassler. National Museum of Natural History (Smithsonian Institution), Washington, D.C. Bryozoa.

S. Stillman Berry. Chitons, cephalopods.

T. H. Bullock. Yale University. Hemichordata: Enteropneusta.

Austin H. Clark. National Museum of Natural History (Smithsonian Institution), Washington, D.C. Brittle stars (Ophiuroidea).

H. L. Clark. Museum of Comparative Zoology, Harvard University. Sea urchins.

Wesley R. Coe. Yale University. Nemertean.

Ira E. Cornwall. Hopkins Marine Station, Stanford University. Barnacles.

Elisabeth Deichmann. Museum of Comparative Zoology, Harvard University. Holothurians (and possibly alcyonarians).

W. K. Fisher. Hopkins Marine Station, Stanford University. Sea stars, sipunculans, echiurans.

C. McLean Fraser. University of British Columbia. Hydroids.

Steve Glassell. Crustacea.

Olga Hartman. Allan Hancock Foundation, University of Southern California. Polychaetes.

Joel Hedgpeth, University of the Pacific (later, Oregon State University). Pycnogonids (sea spiders).

Dora Henry, University of Washington. Barnacles.

Libbie H. Hyman. American Museum of Natural History, New York.
Flatworms.

M. W. de Laubenfels. Porifera. (Not recognized as a strong biologist, but for many years the only sponge specialist working in the eastern Pacific.)

Milton J. Lindner. U. S. Fish and Wildlife Service. Penaeid shrimps.

J. O. Maloney. National Museum of Natural History (Smithsonian Institution), Washington, D.C. Isopod Crustacea.

Harald Rehder. National Museum of Natural History (Smithsonian Institution), Washington, D.C. Bivalve molluscs.

Waldo L. Schmitt. National Museum of Natural History (Smithsonian Institution), Washington, D.C. Crustacea.

L. P. Schultz. National Museum of Natural History (Smithsonian Institution), Washington, D.C. Lancelets.

C. R. Shoemaker. National Museum of Natural History (Smithsonian Institution), Washington, D.C. Amphipods.

Willard G. Van Name. American Museum of Natural History, New York. Chordata: Tunicata.

John W. Wells. Ohio State University. Stony corals.

At least 4 species of invertebrates from the Sea of Cortez have been named in honor of John Steinbeck: *Phialoba steinbecki* (a sea anemone; now *Phymanthus steinbecki*), *Thalassema steinbecki* (an echiuran worm), *Eubranchus steinbecki* (a sea slug), and *Tellina (Marisca) steinbecki* (a clam). At least 10 species from the Sea of Cortez have been named in honor of Ed Ricketts: *Mysidium rickettsi* (a mysid), *Longiprostatum rickettsi* (a flatworm), *Isometridium rickettsi* (a sea anemone), *Palythoa rickettsi* (a zoanthid cnidarian), *Adesia rickettsi* (a sea slug), *Aclesia rickettsi* (a sea slug), *Tellina (Acorylus) rickettsi* (a clam), *Siphonides rickettsi* (a peanut worm; now *Apionsoma pectinatum*), *Macoma rickettsi* (a clam; now *Macoma indentata*), and *Polydora rickettsi* (a polychaete annelid).

DESCRIPTION OF THE EXPEDITION

Reviewing comments in *Sea of Cortez* and Ricketts's field notes (in Rodger 2006) reveals the entire trip was made in haste—"chasing the tides" (a reality intertidal field biologists know all too well). At times,

they even referred to it as a “makeshift expedition” (Steinbeck 1951). The expedition crew worked with such haste that they did not even take much time for photography, although they had both still and video cameras onboard (only one photo seems to have survived the trip). And, although some 8-mm movies were taken, the film was not properly cared for and eventually proved unusable. The *Flyer* had been booked for a 6-week charter, thus the expedition would have collected during two spring tide cycles, when the lowest low tides of the month occurred. However, it had just 24 actual collecting days inside the Gulf. Steinbeck and Ricketts wanted to cover as much ground as possible in that brief time period. (For example, *Sea of Cortez* mentions regretting not being able to go ashore at Mulegé, B.C., due to time constraints; they describe the town as appearing “gay against the mountains, red-roofed and white-walled. We wished we were going ashore there” [p. 195].) The *Flyer* put into only four official ports during the expedition: Cabo San Lucas, La Paz, Loreto, and Guaymas. But they appear to have spent time ashore, other than collecting, only in Loreto (2 days on a bighorn sheep/borrego cimarón hunt in the mountains west of Puerto Escondido, and a brief visit to the town of Loreto to see the Mission Nuestra Señora de Loreto) and Guaymas (3 days). Hedgpeth (1978b) wrote that Steinbeck “was tired and ready to go home and did not care much for Guaymas.” However, Ed’s notes from the trip make it clear that Steinbeck had such a rollicking good time in Guaymas that he suffered from a massive hangover that lasted several days, and that is more likely the reason he wanted to get out of town.

In the section of *Sea of Cortez* dealing with the Guaymas area and to the north, specifically Tiburón Island, there is an interesting discussion of the Seri People (today known by their native name, the Comcaac). However, I am aware of no evidence that Steinbeck or Ricketts actually met any Seris during the expedition. Hedgpeth (1978b) claimed “the Seri are doing well and have a thriving village about 15 miles north of new Bahía Kino.” But, in the 1970s (when Hedgpeth wrote), they were not doing well at all. Like many North American indigenous groups, they suffered from poverty and poor government support, and were caught between the two worlds of their ancestors and modern Mexico. Their primary source of peso revenue in the 1970s was their art—basket weaving and ironwood carving—and they mostly lived a sustainable subsistence from seafoods and land plants. Today, the once-profitable ironwood carving art market, which the Comcaac did by hand, has been

ruined by Mexican ironwood carvers who use power machines to produce imitations of the elegant hand-carved Comcaac work.

The expedition collected almost nothing but shore animals. They paid very little attention to pelagic animals, fishes, whales, or subtidal fauna, although they often night-lighted from the *Flyer*. Interestingly, they did not write of giant (Humboldt) squid coming to their night-lights, something that is common today (see Gilly, this volume). Their collections were largely opportunistic, often rushed or at night, and not always during good low tide cycles. The selection of collecting sites was driven by the tides, by weather, and by the sailing wisdom of skipper Tony Berry, who had never even been inside the Gulf of California before. At many sites, they spent only an hour or so collecting. The collections were not empirically or quantitatively organized (e.g., no formal transects, quadrats, etc. were used), and their fieldwork varied greatly in effort from one site to another. For example, perhaps the most biologically diverse site in the Sea of Cortez is the coral reef at Bahía Pulmo, where Steinbeck and Ricketts reported about 85 invertebrate species. In contrast, Brusca and Thomson (1977) reported over 120 species from there, and this number has grown substantially since that early study (see Reyes-Bonilla and Álvarez-Filip 2008; García-Madrigal and Bastida-Zavala 1999 for brachyuran crabs; García-Madrigal 1999 for anomuran crabs). Further, the precise collecting locations from the Ricketts and Steinbeck expedition are largely unknown, and intertidal terrain (and thus, the littoral fauna) can vary dramatically across distances of only a few meters. For example, in 1940 the common Gulf sea star, *Heliaster kubiniji*, was abundant on rocky shores with barnacle-covered, medium to large boulders, but on the very same shore the terrain may switch within a meter to small, unstable stones that lack good barnacle development and there are no *Heliaster* to be found. For all these reasons, modern comparisons to their site species lists (e.g., Sagarin et al. 2008) should be viewed with caution.

The only sites Ricketts and Steinbeck had planned ahead of time to collect were Bahía Pulmo Reef, La Paz, and Bahía de los Ángeles. All others were to be opportunistic. Even at Puerto Refugio (on Isla Ángel de la Guarda) and Bahía de los Ángeles, two of the most biologically diverse localities in the entire Sea of Cortez, they did not collect all that many species (92 and 99 species, respectively). Steinbeck and Ricketts

were sensitive to the approach they used, noting that “no general survey of the entire fauna has been attempted” (*Sea of Cortez*, p. 291). As noted above, they had one coordinated objective: “to make a survey of the common and obvious animals of a restricted area.”

The expedition took place just before a highly contested presidential election in Mexico, in which PRI-affiliated president Lázaro Cárdenas hoped to hand the office to Manuel Ávila Camacho (who had been his right-hand man during the Mexican Revolution). The PRI had been rigging the elections since the revolution. After the election, it was reported that Camacho won the presidency with 94% of the popular vote! Not everyone in Mexico supported or backed the PRI’s revolutionary legacy, and most regarded the party as highly corrupt. This political situation was creating unrest in the country and, combined with the Second World War (which had just begun in Europe), the circumstances gave Ricketts and Steinbeck further grist for thought and philosophizing about human nature and the human condition. Coincidentally, President Cárdenas visited La Paz in 1940, though he was not there when the *Western Flyer* and her crew visited (Figures 1–4).



Figure 1. 1940 postcard of La Paz. Photo No. 6569 from Archivo Histórico de B.C.S. Pablo L. Martínez, in La Paz, BCS.



Figure 2. The municipal pier was gone when the Western Flyer arrived in La Paz on March 21, 1940, and the Flyer anchored “250 yards westward” of where the pier used to be. This photograph, taken that same year, is of another, commercial pier in La Paz. Photo No. 3 from Archivo Histórico de B.C.S. Pablo L. Martínez, in La Paz, BCS.



Figure 3. Photograph of the La Paz malecón, 1940. Photo No. 6584 from Archivo Histórico de B.C.S. Pablo L. Martínez, in La Paz, BCS.



Figure 4. Photograph of President Lázaro Cárdenas and companions in front of the old Hotel Paraíso, La Paz, 1940. Cárdenas was president of Mexico from 1934 to 1940. Photo No. 8454 from Archivo Histórico de B.C.S. Pablo L. Martínez, in La Paz, BCS.

The daily log that follows is based on the published book, *Sea of Cortez*; the field notes of E. F. Ricketts (Hedgpeth 1978b; Ricketts Jr. and Rodger 2004; Rodger 2006); the ship's log of Captain Tony Berry (published in Hedgpeth 1978b); and letters between Ricketts and various taxonomic specialists he corresponded with after the expedition. Note that the transcript of Ed's log from the trip that appears in Hedgpeth 1978b is an abridged and shortened version; the verbatim version can be found in Rodger 2006. (The verbatim transcript is what Ricketts prepared after the trip and sent to Steinbeck to use in writing their book.) Hedgpeth also introduced some errors/*lapsus calami* into Ed's log. For example, March 19 got completely deleted from the Hedgpeth version, with data from March 18 through 20 jumbled up. As a result, information on Bahía/Cabo Pulmo is entirely missing from the Hedgpeth version. Curiously, however, Hedgpeth's site-dated map of the expedition track (pp. 154–155) is accurate.

The “Collection Numbers” appearing boldface in the text below do not occur in *Sea of Cortez*—they are my own bookkeeping convention. Table 4 gives a list of species collected per site. The specimens from the expedition have gotten disbursed and most are now located at the California Academy of Sciences, San Francisco (CAS; at least 92 species lots), and the Smithsonian Institution’s National Museum of Natural History (USNM; at least 225 species lots), and a few are scattered at other institutions. Most of the CAS material was accessioned from its prior holding at Hopkins Marine Station, where it would appear that some specific collection locality and other important data were lost over the years.

It should be noted that there are some errors in the collection locality dates of the Ricketts-Steinbeck expedition provided in Sagarin et al. (2008). Cabo San Lucas was sampled on March 18 (not on March 17); Bahía San Carlos was sampled on two days, March 30 and 31 (not solely on March 30); San Francisquito was sampled only on March 31 (not on April 1); and Puerto San Carlos (Sonora) was sampled on April 4 (not on April 22).

After the Sea of Cortez voyage, the *Western Flyer*, through a succession of owners, went on to work as a fishing boat from California to Alaska. She worked as an ocean-perch trawler off the coast of Washington and British Columbia, a crabber in the Aleutian Islands, a salmon fishing boat in Puget Sound, and a tuna boat off the Pacific Coast of Baja California. She also conducted research surveys for the Bureau of Commercial Fisheries and the International Pacific Halibut Commission. For a complete history of the *Flyer*, see Kevin Bailey’s (2015) excellent history of the boat. In the 1970s, one owner, Dan Luketa, changed the name of the boat to *Gemini* (after NASA’s Project Gemini). Launched in 1937, the *Flyer* was one of at least four sardine seiners made by Western Boat Building Co. that worked in the Monterey sardine fleet at the time—the others being the *Western Sun*, the *Western Pride*, and the *Western Maid*. As a sardine boat in Monterey, the *Flyer* could carry a crew of ten.

ANNOTATED CRUISE LOG

Numbers of species taken at each collecting location are based on identified and named species only (in the Phyletic Catalogue, and subsequent museum and Ricketts correspondence records). Other species might have been present and noted in the Narrative, but not identified

(e.g., “large purple urchins”); these are indicated in the species lists below, but are not part of the numerical species counts. Latitude coordinates are from Ricketts’s field notes.

March 11 (Monday). *Western Flyer* (hereafter, “*Flyer*”) departs Monterey. The *Flyer*, built in 1937 as a purse seiner, was a 77-foot (25-foot-beam) trawler, with a 165-horsepower Atlas Imperial diesel engine. Her maximum speed was 10 knots (12 mph). On board were a 10-foot and 20-foot skiff.

Chapter 4 in *Sea of Cortez* describes the boat’s departure from Monterey, and includes one of my favorite passages. “We sat on a crate of oranges and thought what good men most biologists are, the tenors of the scientific world—temperamental, moody, lecherous, loud-laughing, and healthy. Once in a while one comes on the other kind—what used in the university to be called a ‘dry-ball’—but such men are not real biologists. They are the embalmers of the field, the picklers who see only the preserved form of life without any of its principle. Out of their own crusted minds they create a world wrinkled with formaldehyde. The true biologist deals with life, with teeming boisterous life, and learns something from it, learns that the first rule of life is living.” And, “Your true biologist will sing you a song as loud and off-key as will a blacksmith, for he knows that morals are too often diagnostic of prostatitis and stomach ulcers.... At least he does not confuse a low hormone productivity with moral ethics.”

March 13 (Wednesday). *Flyer* arrives in San Diego; takes on fuel, water, ice, and perishables. Here, Webster (“Toby”) Street and Herb Klein disembark.

March 14 (Thursday). *Flyer* departs San Diego (2:10 p.m.). Captain Berry begins keeping log of trip.

March 15 (Friday). Pass San Martín and Cedros Islands, and Punta Eugenia.

March 16 (Saturday). Pass Bahía Magdalena. **Collection No. 1** (p. 45 in *Sea of Cortez*): Outside Magdalena Bay, Tiny Colleto harpoons a hawksbill turtle (*Eretmochelys imbricata*), on which were barnacle bases, many hydroids, and two pelagic crabs (noted as *Planes minutus* in *Sea of Cortez*, but more likely to have been *Planes major*). The turtle’s gut was filled with pelagic red crabs or langostinos (*Pleuroncodes planipes*). This material constitutes the first collection of the trip. Steinbeck saved the shell, which still exists.

True to his attachment to W. C. Allee’s concept of “community,”

Ricketts's notes from the trip include this passage, "The completeness of the turtle—*Planes minutus*—hydroid—barnacle—*Pleuroncodes*... association is very pleasing. There was the whole thing laid out before us." The Narrative also describes the plankton- and nekton-rich waters of this region, calling it "tuna water." Indeed it is, but over the past few decades overfishing for tuna off the west coast of the Baja California Peninsula has decimated their numbers. Overall, the east Pacific bluefin tuna population is now down to about 5% of its estimated original size. Despite this, the fishing continues (for both bluefin and yellowfin tuna, and skipjack), using drones and spotter planes to identify dolphin schools.

March 17 (Sunday). Arrive Cabo San Lucas cove, just after midnight (morning of March 18; after 4 days steaming from San Diego). In Captain Berry's log, it is noted that Cape Lazaro was seen at midnight, and the course changed for Cape San Lucas. (*Sea of Cortez* incorrectly states they passed Point Lazaro at 2 a.m. on March 18.) The captain's log notes that at 12:45 a.m. (on March 18), estimating they were getting close, Berry slowed the boat to a crawl. And then, all of a sudden, the shore was just ahead. Even with 14 fathoms on the sounding line, Berry wrote in his daily log, "boy, you could throw a rock on the shore." The *Western Flyer* was, at that point, floating over the famous "sand canyons" of Cabo San Lucas, where the slopes of the canyons are at the underwater angle of repose, so steep that the slightest disturbance initiates a "submerged sand-slide." Here, one can swim just a few meters offshore and find themselves over hundreds of meters of water.

March 18 (Monday). *Sea of Cortez* and Ricketts's field notes indicate there is little more to Cabo San Lucas than the cannery and a few fishermen's shacks. Since that time, Cabo San Lucas was targeted by Mexico's national tourism board (SECTUR) for significant development, and today it is a major tourist city. **Collection No. 2 (p. 58 in *Sea of Cortez*):** Collection made on "cliffy rocks" south of the tuna cannery in cove; "fairly open to surf and ground swell from the south." Approx. 22°52' N latitude. One low tide collection, at approximately 0-tide level, made in haste. 53 species were collected. Cogent reflections in *Sea of Cortez* from this locality include: "The reports of biologists are the measure, not of the science, but of the men themselves." And, "A dull man seems to be a dull man no matter what his field, and of course it is the right of a dull scientist to protect himself with feathers and robes, emblems and degrees, as do other dull men who are potentates and grand imperial rulers of lodges of dull men." Truer words were never

spoken. It was in a small cantina in the town of San Lucas that Ricketts and Steinbeck first heard of the legendary liquor Damiana. And it was at this first Gulf collecting site that they encountered Sally Lightfoot crabs (*Grapsus grapsus*) and wrote so eloquently of their antics.

March 19 (Tuesday). Bahía Pulmo Reef. Now Cabo Pulmo National Park. **Collection No. 3 (p. 76 in *Sea of Cortez*):** Collections probably made from shore on innermost reef tract during one low tide only; “rocky and/or coral reef, with no loose boulders.” Approx. 24°26’ N latitude. Bahía Pulmo has long been said to be the only true coral reef in the Gulf (but see below), and it is one of the most species-rich sites in the Sea of Cortez. (In Bahía Pulmo, coral skeletal framework reefs sit atop basalt outcroppings; Brusca and Thomson 1977; Reyes-Bonilla and López-Pérez 2009.) Ricketts and Steinbeck describe the reef being “gradually exposed as the tide went down,” which suggests they were on one of the near-shore reef tracts (the outer tracts remain submerged even at low tide). Collection was made in haste; only one (morning) low tide period was sampled. That the Pulmo Reef was hastily collected is evidenced by the fact that Steinbeck and Ricketts report only 85 invertebrate species. The most abundant mollusc on the reef today is *Conus princeps* (Vicencio Aguilar 1998), but this species was not reported by Steinbeck and Ricketts. The snapping shrimp reported in the Log from this location (as *Crangon malleator*) was described in 2013 as a new species, *Alpheus wonkimi*. The *Flyer* departed for Punta Pescadero (on the peninsula) at 3:30 p.m. (March 19), arriving at 6 p.m. to anchor for the night. It is worth noting that another coral reef (or “coral community” if one prefers) exists at Punta Bonanza, on the southeast coast of Isla Espíritu Santo. Here, a well-developed *Porites capitata* coral reef abuts the rocky shoreline, and in deeper waters of the bay patch reefs and large coral heads abound (*P. capitata*). This coral reef has not been mentioned in any publications that I am aware of although reef researchers in La Paz are likely aware of it.

March 20 (Wednesday). Left Punta Pescadero anchorage ~6 a.m. and steamed for Isla Espíritu Santo, Punta Lobos (SE tip of island). **Collection No. 4 (p. 91 in *Sea of Cortez*):** Boulder “reef” S of Point Lobos (“small boulders on sand”), at base of cliff. Ricketts’s notes list the latitude of this site as 24°29’ N, which must be incorrect as this would be the latitude of Laguna la Salina in the middle of the east coast of the island and considerably north of Punta Lobos. (Punta Lobos is actually 24°28’18” N, 110°17’21” W.) They collected 115 species at Punta Lobos, making

this the richest sampling site of the expedition. The collection included 6–7 new, undescribed species. Among the material from Punta Lobos in USNM collections are type specimens of one new species of sea anemone and 3 new species of sipunculans. The *Flyer* returned to Punta Coyote (= Pescadero Point) for the night due to strong winds around Point Lobos (which are common on the SE side of the island in April). The *Flyer* was to return to Isla Espíritu Santo by happenstance on April 12, where the last collection of the trip was made.

March 21 (Thursday). Bahía la Paz. **Collection No. 5 (p. 109 in *Sea of Cortez*):** “Rocky flat being drowned in sand,” ½ to 1 mile NE of city of La Paz; many coral heads exposed above the sand. Ricketts and Steinbeck note that the “animals were mainly sand flat forms” and “completely protected from waves.” Approx. 24°10' N latitude. The list of animals collected reflects both sandy and rocky substrates. 73 species were collected, and among those in the USNM collections are type specimens of 2 new anemone species.

With Jonathan White (author of *Tides: The Science and Spirit of the Ocean* and *Talking on the Water: Conversations about Nature and Creativity*), I revisited the Ricketts-Steinbeck La Paz site on 4 March 2020, 80 years after the *Flyer's* visit (Figure 5). During our 1.5-hour examination of the site, at a -0.12-m low tide, we found only 15 of the 73 species collected by Ricketts and Steinbeck. Visually the site, which is now along the paved and lighted malecón roughly in the center of the city, looks pristine. Closer examination, however, reveals black anoxic sediment 2–4 cm beneath the surface, indicating nutrient over-enrichment, likely from the many storm drains emptying on the beach along the malecón. So far as we could discern, there were no living coral heads in the area, and the dead ones were all very small, 3–8 cm in diameter (*Pocillopora capitata*). Ricketts and Steinbeck also did not mention live corals at this site. Missing from the site (but collected by the Ricketts-Steinbeck expedition) were all of the larger invertebrates, e.g., large snails, echinoderms, octopuses, etc. Only two small, juvenile *Arbacia incisa* were found, submerged, at about the -0.5 tidal level. Predominant species were fire worms (*Eurythoe complanata*), sulfur cucumbers (*Holothuria lubrica*), and the ophiuroid *Ophiothrix spiculata*; the first two of which were under almost every rock. The rock-boring shrimp *Neaxius vivesi* was also common. Interestingly, Ricketts and Steinbeck did not record fire worms or sulfur cucumbers from this site. Their report of Sally Lightfoot crabs (*Grapsus grapsus*) from this site remains a mystery,

as there is no appropriate habitat for this species in the area. They likely took *G. grapsus* at a rocky site a few kilometers away and combined it with their La Paz sample list. We also did not see the common Gulf fiddler crab *Uca crenulata*, even though the uppermost beach habitat, next to the malecón itself, appeared suitable for this species. The anoxic layer a few centimeters below the surface might now be excluding this once-common La Paz Bay species. No sea stars of any kind were seen. It is likely that the larger-bodied species are periodically harvested by locals for food and for the curio shop trade in La Paz. Also, echinoderms throughout the Gulf have not fully recovered from the devastating Gulf “echinoderm wasting disease” event that began in 1978 (Dungan et al. 1982).



Figure 5. Ricketts-Steinbeck collecting site No. 5, La Paz, page 109 in Sea of Cortez. Photo taken March 2020 by R. Brusca.

March 22 (Friday). Bahía la Paz, El Mogote. Good Friday; the crew went to church this morning in La Paz. Afternoon **Collection No. 6** (p. 119 in *Sea of Cortez*): “Sand and muddy sand at El Mogote, the peninsula NW of La Paz. Completely protected from waves.” El Mogote is a huge, long sand spit that forms the outer shore of La Paz Bay; the bay side of the sand spit is lined with mangroves. Here 76 species were collected, and among those in the USNM collections are type specimens of a new anemone and a new echiuran. In that evening’s notes, Ricketts and Steinbeck wrote, “Tiny returned to the *Flyer*, having collected some

specimens of *Phthirivius pubis*, but since he made no notes in the field, he was unable or unwilling to designate the exact collecting station.” Likely it was in La Paz’s then-infamous El Ranchito district.

Of El Mogote, Ricketts and Steinbeck wrote (p. 120): “As the tide came up we moved upward in the intertidal toward the mangrove trees, and the foul smell of them reached us. They were in bloom, and the sharp sweet smell of their flowers, combined with the filthy odor of the mud around their roots, was sickening. We sat quietly and watched the moving life in the forests of the roots, and it seemed to us that there was stealthy murder everywhere. The roots gave off clicking sounds, and the odor was disgusting. We felt we were watching something horrible. No one likes the mangroves.” Judging from the species list, they did not actually penetrate into the dense mangrove forest of El Mogote, where a very high species diversity exists. They likely just skirted the outer boundary of the vegetation. And yet, from these collections a new species of spoon worm (Echiura) was later described and named after Steinbeck by W. K. Fisher (*Thalassema steinbecki*).

March 21–22. La Paz, “misc. rocky shore collections,” lumped as **Collection No. 7**: 21 species collected, and among those at the USNM are 2 that proved to be new species of zoanthid anemones later described by the Swedish biologist Oskar Carlgren.

March 23 (Saturday). The *Flyer* steamed this morning from La Paz to the SW shore of Isla San José and anchored in the large Bahía Amortajada (near the small islet of Islote Cayo; approx. 24°51’15” N, 110°35’ W). Around 5 p.m., **Collection No. 8 (p. 127 in *Sea of Cortez*)**: “collecting on barren looking rocky reef or islet, probably Cayo Islet, ½ to ¾ mi. W of anchorage, cliffy rocks and great boulders. Exposed to Gulf waves.” Ricketts gives the latitude of 24°53’ N. Just 20 species were collected. Steinbeck and Ricketts described Islote Cayo (100 yards wide, a quarter mile long; see U.S. Hydrographic Office Publication No. 84, p. 130) as “burned” and being very low in diversity. Noted were “a few small *Heliaster*,” *Grapsus grapsus*, “*Aletes*,” sea cucumbers, and sea hares. This was one of their least productive collection sites. The *Flyer* remained anchored at Isla San José this night.

March 24 (Easter Sunday). Morning: Isla San José, Bahía Amortajada. **Collection No. 9 (p. 131 in *Sea of Cortez*)**: The Narrative describes collections made at the lagoon during morning tide (fiddler crabs and mudflat snails), but the Phyletic Catalogue reports only two species of

rocky shore gastropods from this site. The lagoon (at the SW corner of Bahía Amortajada) is quite large, extending from $\sim 110^{\circ}35'$ W to $110^{\circ}32.7'$ W, and there is no indication where exactly they collected, although they spent only 1 to 1.5 hours in the lagoon. It is unclear why so few species are reported from this Easter-morning collection; perhaps some specimens were lost (although there is no clear indication of this). Had Ricketts and Steinbeck walked a few meters inland from the littoral, they would have discovered considerable evidence of aboriginal inhabitation—abundant kitchen middens, grinding stones, ancient fire pits, etc.—and a beautiful desertscape of *Bursera*, cardón, and other large succulents. Francisco de Ortega might have been the first European to visit Bahía Amortajada, in 1633 (de Ortega 1970), reporting abundant freshwater springs, a discovery that was corroborated by the USS *Narragansett* in the 1870s (Belden 1880). It was likely this freshwater source that facilitated inhabitation by Native Americans from the Baja Peninsula. Ortega also reported “many Indians of the same language and character as those of the Port of La Paz.” In 1709, Father Juan María Salvatierra noted, “we have proof that the Indians of [Isla] San José slew the unlucky [pearl] divers who came in from a boat from Colima” (de Salvatierra 1971). Today, 7 of Mexico’s 56 extinct and endangered Native American languages occur in Baja California (Fujita and Bonzon 2006; Vidal and Brusca 2020).

Afternoon: Around noon, the *Flyer* departed Isla San José and steamed to “Bahía San Marcial,” anchoring just S of Punta San Marcial (“Marcial Reef” of *Sea of Cortez*; “San Marti” of ship’s log; Bahía San Marte on modern maps). **Collection No. 10 (p. 152 in *Sea of Cortez*)** made just south of anchorage on a rocky reef extending about $\frac{1}{4}$ mile from shore. Approx. $25^{\circ}30'30''$ N, $111^{\circ}01'$ W. Some of the afternoon collecting was also done on the boulder shore, “exposed to Gulf waves.” This site comprised a late-afternoon effort, and also an early-morning effort (4 a.m. the next morning, March 25): 62 species were collected, and among those in the USNM collections are type specimens of *Mysidium rickettsi*, described by Elizabeth Harrison and Tom Bowman in 1987. It was here that Steinbeck and Ricketts commented on the “great schools of tuna beating the water by the millions” (p. 154). The so-called Easter Sunday Sermon in the *Sea of Cortez* (Chapter 14, p. 131) was one of Ricketts’s three philosophical essays (“Essay on Non-teleological Thinking”), published largely verbatim.

March 25 (Monday). Brief (~1 hour), early-morning collection made again at San Marcial (**Collection No. 10, Cont.**). Steamed for Puerto Escondido.

Collection No. 11, Puerto Escondido Outer Bay and inlet channel (p. 156 in *Sea of Cortez*): 79 species collected. Steinbeck and Ricketts described Puerto Escondido, a large natural harbor about 25 km south of the city of Loreto, as “mostly completely protected, rocky pools and reefs, and mangrove swamp area. Some of the collecting here was done in the channel which leads into Puerto Escondido proper, where the tidal currents run strong, and some inside the completely protected cove, but mostly in a smaller cove outside, open only to the anchorage.” The entrance to Puerto Escondido is 25°48’10” N, 111°18’30” W. In the species lists, I have tried to distinguish species collected in the outer bay (and the connecting channel) from those collected in the inner bay.

This afternoon, a local rancher (Leopoldo Perpuly) and his Loreto guests (a “customs man” named Manuel Madinabeitia C., a schoolteacher from Loreto named Gilberto Baldibia, and two “Indians”) invited Steinbeck and Ricketts to go on a borrego (bighorn sheep) hunt in the mountains with them the following day (March 26). The group rode mules and horses into the mountains where they camped overnight, returning to the *Flyer* the next morning (March 27). No sheep were sighted, but a good time was had by all. In the mountains, they collected horsehair worms (Nematomorpha), possibly *Chorodes occidentalis* Montgomery (identification presumably by J. T. Lucker; USNM No. 159124). An entry in *Sea of Cortez* from late in the day March 26 (p. 168) notes that, for their Sea of Cortez expedition, they “took 2160 individuals of two species of beer”; they don’t mention what the species were.

March 27 (Wednesday). **Collection No. 12, Puerto Escondido Inner Bay (p. 170 in *Sea of Cortez*),** made before dawn: Rocky intertidal, sandy bay, 24 species collected. Steinbeck and Ricketts noted Puerto Escondido was one of the richest sites they visited (and it still is rich, despite the construction of a small marina that has taken place, in fits and starts, over the past 25 years or so). The combined outer and inner bay collections yielded 95 species, making this the second-richest collecting locality of the expedition. Ricketts’s notes point out it was a good low tide, which no doubt facilitated their collecting success.

After the morning collection in Puerto Escondido, the *Flyer* steamed a short distance up the coast to Loreto, arriving ~11:30 a.m. While

visiting Loreto late in the afternoon, they came upon “the destroyed mission,” which was Mission Nuestra Señora de Loreto, the first mission built in the Californias (founded by Padre Juan María de Salvatierra in 1697, and completed in 1752). The Narrative makes no mention of Mission San Francisco Xavier, in the Sierra de la Giganta west of Loreto, which was founded in 1699 (the first mission in Baja to have glass windows, and with still-standing 300-year-old olive trees). Since 1996, the coast and islands around Loreto have been a national park, Parque Nacional Bahía de Loreto.

After leaving Loreto, the *Flyer* steamed to Isla Coronado, anchoring on the N end. This island is now part of Loreto Bay National Park. **Collection No. 13 (p. 176 in *Sea of Cortez*):** 59 species collected, including type specimens of *Palythoa insignis* (a zoanthid anemone). Ricketts’s field notes say they collected on the “NE shore of long westerly-extending point,” which, today, is the island’s main access beach for tourists from Loreto.

March 28 (Thursday). This morning the *Flyer* departed ~9 a.m. for Bahía Concepción, Punta San Rosalía, “about 15 miles S in Concepción Bay...along the western shore of Peninsula Concepción that forms the eastern boundary of the bay” (east shore of Bahía Concepción; approx. 26°40’ N). Late-afternoon arrival and collection made (~5:30–7 p.m.). **Collection No. 14 (p. 185 in *Sea of Cortez*):** Sandy beach. A total of 91 species was collected over two efforts (Thursday evening and Friday morning), including some from a “crab net” set at night in 4 fathoms; they also dragged a net along the bottom from the boat for a short distance.

Bahía Concepción is one of the best examples of a mini-extensional tectonic basin in the Gulf (and one of the largest fault-bounded bays in the Gulf). This huge and beautiful bay, 40 km (25 miles) in length and 270 km² (105 square miles) in area, formed along the eastern edge of the Baja California Peninsula as the Gulf was opening, and its long and narrow shape is the result of a half-graben created by northwest-southeast trending faults, the eastern one (Bahía Concepción Fault) lying on Peninsula Concepción. Around the bay are Oligocene to Miocene igneous rocks—andesites, basalts, tuffs, and breccias. There are also two areas on Peninsula Concepción where Cretaceous (75 mya) granodiorite outcrops. The shallow bay, mostly 25–30 m (80–100 feet) deep, was probably a non-marine basin during most of the Pleistocene, when sea levels were much lower (during glacial cycles).

March 29 (Friday). Morning: second collection in Bahía Concepción, near head of bay, on E side (approx. 26°35' N). Collections made by hand (wading in the water) and with net dragged from boat. **Collection No. 14, Cont. (p. 193 in *Sea of Cortez*)**. Departed Bahía Concepción in early afternoon for Caleta San Carlos/San Lucas Cove (south of Santa Rosalía), arriving around 5 p.m. En route, the *Flyer* passed Mulegé and Steinbeck and Ricketts note (p. 195) that they wished they had time to stop there.

The USNM houses at least 14 identified species from the Bahía Concepción collections of the *Western Flyer*. However, none of these are sand dollars, which Steinbeck and Ricketts collected in great abundance. These probably ended up being sold by Ricketts through his Pacific Biological Laboratories (PBL). Steinbeck and Ricketts were likely very impressed by the echinoderm fauna at this site, both the numbers of individuals and the presence of 7 species of echinoids.

Caleta San Carlos/San Lucas Cove (27°13' N, 112°13' W), late afternoon: **Collection No. 15 (p. 200 in *Sea of Cortez*)**. The cove comprises a protected saltwater lagoon formed by a sand bar. Sand flats of coastal lagoon explored on foot with shovel. Light hung off boat this night; small squid, nereid worms, crustaceans, and a “transparent ribbonfish” captured.

March 30 (Saturday). Morning collection, **Collection No. 15, Cont. (p. 200 in *Sea of Cortez*)**: Caleta San Carlos/San Carlos Cove. This was a ~3-hour collection (8:30–11:30 a.m.), and 59 species were taken. Steamed north midday for San Carlos Bay/Bahía San Carlos, passing Santa Rosalía en route. Arrived San Carlos Bay/Bahía San Carlos 6 p.m.

Afternoon collection, **Collection No. 16 (p. 203 in *Sea of Cortez*)**: San Carlos Bay/Bahía San Carlos. Collections made on rocky shore (and perhaps in back-beach lagoon). 27°52' N, 112°46' W. This afternoon collection was for only ~1 hour due to inaccessibility issues. After dark, night-light used from boat (captured squid, a larval mantis shrimp, nereid worms, crustaceans, and “transparent fish”). The majority of specimens were taken on the following day (March 31).

Note that the expedition collected at three “San Carlos” collection sites; these two in Baja California and the other being on the coast of Sonora and referred to by Steinbeck and Ricketts as “Port San Carlos” or “Puerto San Carlos” (although today the latter is commonly called Bahía San Carlos).

March 31 (Sunday). Morning collection in San Carlos Bay/Bahía San Carlos, Baja California Sur (**Collection No. 16, Cont., p. 205 in *Sea of Cortez***). “Boulder shore; gravely foreshore.” Poor tide this morning led to collections in upper-mid and high intertidal zones only, for ~1 hour. From these two San Carlos Bay/Bahía San Carlos collections, only 56 species were collected. It is not clear how they acquired a specimen of *Sicyonia penicillata*, which is an offshore penaeid shrimp; perhaps they found it dead and washed ashore. Here, *Sea of Cortez* notes that the three most common animals they have encountered in the Gulf are the sulfur cucumber (*Holothuria lubrica*), the brittle star *Ophiothrix spiculata*, and the sun star (*Heliaster kubiniji*). The first two are still the most common larger invertebrates in the Gulf’s intertidal region. *Heliaster kubiniji*, however, was decimated in an echinoderm “wasting disease” that struck the Sea of Cortez in 1978, and has still not recovered from those losses. It has been suggested that a 1978 El Niño event spawned the epidemic that killed most *Heliaster* (and several other echinoderms) in the Gulf, although W. Gilley (pers. comm.) notes that 1978 was not a strong El Niño year. Although young *H. kubiniji* began to be common in the 1990s, by 2017 the species was scarce again. Adult *H. kubiniji* have been found only since the late 1990s, and they are restricted almost entirely to offshore islands and the Baja California Peninsula. Dungan et al. (1982) remains the only scientific report on the die-off event.

In the afternoon the *Flyer* steamed to Bahía de San Francisquito, arriving ~6 p.m. Evening **Collection No. 17 (p. 211 in *Sea of Cortez*)**. Approx. 28°25' N latitude. Rocky shore with sand patches. Strong winds and cold seawater led to an abbreviated collection effort. 30 species taken. From this collection came the commensal pearlfish, *Proctophilus winchellii*, which lives in the hindgut-anus of sea cucumbers (p. 215). It was this day’s entry in *Sea of Cortez* (p. 217) that included the oft-quoted phrase, “It is advisable to look from the tide pool to the stars and then back to the tide pool again.”

April 1 (Monday). The *Western Flyer* steamed this morning to Bahía de los Ángeles, arriving ~3:30 p.m. This area is now a biosphere reserve (Reserva de la Biosfera Bahía de los Ángeles y Canales de Ballenas y de Salsipuedes) that includes the Ballenas Channel and Guardian Angel Island. **Collection No. 18 (p. 219 in *Sea of Cortez*)**. Approx. 28°55' N latitude. A 1-hour collection (3:30–4:30 p.m.) from rocks in W side of bay yielded 88 species (including USNM type specimens of a new

zoanthid species, *Palythoa ignota*, described by the Swedish biologist Oskar Carlgren in 1951). Granite boulders on sand. After that, the group took their skiff to the tidal flats at the north end of bay, where 8 species were collected (including specimens of a rare cerianthid, *Botruanthus benedeni*, now in the USNM collections). Altogether, 99 species were collected from the Bahía de los Ángeles area, making it one of the three richest collection sites of the expedition. Judging by material in the collections at USNM and CAS, other sites/samples were taken in and around the Bahía de los Ángeles area (though not specifically noted in *Sea of Cortez* or Ricketts's field notes), thus all of these collections are herein considered Collection No. 18. This is one of the few locations where *Sea of Cortez* notes algae (*Sargassum johnstonii* and *Padina durvillaei*).

From the *Flyer*, Steinbeck and Ricketts could see the spring on the hill above the settlement at Bahía de los Ángeles. This same spring still provides the water for the small village. Bahía de los Ángeles and the Canal de las Ballenas are home to the coldest seawater in the entire Gulf of California, due to year-round upwelling around Isla Ángel de la Guarda. Here, for reasons that have not been explored, many species of animals and algae reach greater sizes than anywhere else in the eastern Pacific—a phenomenon I have referred to as “cold-water gigantism.”

April 2 (Tuesday). The *Flyer* steamed this morning to Puerto Refugio, at the north end of Isla Ángel de la Guarda, arriving ~2:45 p.m. Approx. 29°30' N latitude. **Collection No. 19 (p. 224 in *Sea of Cortez*)**; extensive collection made in Puerto Refugio during good low tide: 92 species collected. “Crab nets” set from boat took *Chloecia viridis*, and a hand net captured a nudibranch (“*Chioraera leonina*” = *Melibe leonina*).

April 3 (Wednesday). This morning, the *Flyer* steamed around the northern tip of Isla Ángel de la Guarda and across the Gulf to anchor off the SW corner of Isla Tiburón, at “Red Bluff Point” (presumably what is now called Punta Risco Colorado, as Ricketts gave the latitude as approx. 28°45' N). Evening **Collection No. 20 (p. 234 in *Sea of Cortez*)**. Collection made from 6:00 to 7:45 p.m.; 58 species taken, including type specimens for what Oskar Carlgren would, in 1951, describe as *Palythoa rickettsi* and *Bunodosoma californica* based on the specimens housed at the USNM. It was here that Steinbeck and Ricketts saw what was likely to have been Mexico's endangered fish-eating bat, *Myotis vivesi* (p. 226). Ricketts's field notes state this site was on the “SW corner of Tiburón

Island.” However, the southwest “corner” of the island would likely have been Punta Willard, where a prominent lighthouse stands (which is not mentioned in his notes or in the Log). It seems more likely they collected on the southern point of the island, at Punta Risco Colorado (or possibly at Punta Monumento or Punta Ast Ah Keem).

April 4 (Thursday; incorrectly labeled April 22 in *Sea of Cortez*, p. 238). The *Flyer* steamed from Isla Tiburón toward Guaymas this morning. Arriving after dark (~6:30 p.m.), they anchored at Puerto (Bahía) San Carlos, Sonora (a few miles north of Guaymas Bay). This was the first stop on the “mainland” coast; due to night conditions, only a brief collection was made in “Puerto San Carlos” (today known as Bahía San Carlos/San Carlos Bay). 27°57' N, 111°35' W. **Collection No. 21 (p. 239 in *Sea of Cortez*)**. 46 species collected, including type specimens of *Bunodactis mexicana* (since relegated to junior synonymy with *Anthopleura dowii*), *Aiptasiomorpha elongata*, and *Mysidium rickettsi*, all now in the USNM collections. Curiously, they do not mention the substantial mangrove forest that then existed at this site. Bahía San Carlos has been converted into a large boat marina since Steinbeck and Ricketts were there, although some of the mangrove lagoon remains healthy and intact (locally known as El Esterito). The Escuela de Ciencias Maritimas y Tecnología de Alimentos Guaymas that Hedgpeth (1978b) describes at the Miramar area of Guaymas has long been closed, and the resort-like development in the area is now concentrated in the area around the town of San Carlos (in the first bay north of Miramar).

April 5–8 (Friday–Monday). The *Flyer* steamed into Guaymas harbor late on the morning of April 5, and she departed Guaymas 4 p.m. on April 8 (Monday), anchoring just outside the harbor, at Isla Pajaros (“south of the Lobos light, and about 5 miles from Estero de la Luna”; approx. 27°53' N latitude), for the night. The 3-day/3-night stay in Guaymas included considerable debauchery (and hangovers).

According to Ricketts’s transcribed notes from the expedition (Ricketts Jr. and Rodger 2004), the *Velero II* was docked in Guaymas when the *Flyer* arrived there on April 5. Ricketts ran into the “skipper” in town and had drinks and other exploits with him, leading to an invitation to lunch on the *Velero II*, which Ricketts and Tiny attended. Neither the book (*Sea of Cortez*) nor Ricketts’s notes from the trip give the name of the “skipper.” There is a bit of mystery here. Captain George Allan Hancock had replaced the *Velero II* (as the expeditionary ship of the

Allan Hancock Foundation, University of Southern California) with the *Velero III* in 1931. And, although the *Velero III* undertook an expedition to the Gulf in 1940, it spanned the period of January 17 to February 20 (Allan Hancock Foundation Collecting Stations 1030-40 to 1119-40; Fraser 1943a,b,c; Brusca 1980b), so it was not the same ship Ricketts visited in April 1940 in Guaymas. During the rest of 1940 the *Velero III* made only short trips in Southern California and northwestern Baja California. Captain Hancock skippered all of the ship's voyages. In 1941 the *Velero III* was acquired by the Maritime Commission and turned over to the U.S. Navy, to be converted to wartime use as the USS *Chalcedony*. After the war, the ship was purchased by the American Independent Oil Company and eventually converted into a luxury cruiser for the sheik of Kuwait. I have been unable to determine the fate of the *Velero II* after Hancock replaced it with the *Velero III*.

Hancock, the founder of the University of Southern California's Allan Hancock Foundation, was a citizen scientist and seaman in Los Angeles with a long history of philanthropy. Among the ships he owned (and captained) were the *Cricket*, *Velero I*, *II*, *III*, and *IV*, and the *Oaxaca*. These plied the waters of west America from Alaska to Chile and, due to Hancock's interests in science, provided marine specimens to research institutions throughout California. Hancock had a special love for the Sea of Cortez. Among the many guests Captain Hancock entertained aboard the *Velero II* was Albert Einstein, just after he had received the Nobel Prize in physics. The *Velero III* was the first ship Hancock had built specifically for oceanographic research, and it played the decisive role in the establishment of the Allan Hancock Foundation at USC (Brusca 1980b). The expeditions and taxonomic publications of the once glorious but now defunct Allan Hancock Foundation stand above all others in documenting the biodiversity of the Gulf. Between 1942 and 1983, the Hancock Foundation publications on Pacific marine life produced an astonishing 22,469 pages of primarily invertebrate taxonomic text that stands as a watershed in marine biodiversity research. In *Sea of Cortez*, Steinbeck and Ricketts comment on the high price of publications of the Hancock Foundation, noting that they are "too expensive for the private worker to purchase, the price of Volume 2 alone being \$17.50."

April 8 (Monday). The *Flyer* departed Guaymas harbor at 4 p.m., piloted out by Captain Corona, who also happened to own three shrimp boats. Corona gave Steinbeck and Ricketts "two giant shrimps" (both

were the commercial blue shrimp, *Litopenaeus stylirostris*), a mounted crab, and two dried seahorses (*Hippocampus ingens*, now on Mexico's endangered species list). On leaving the harbor, Corona stopped at some of the shrimp boats he owned, prompting Ricketts to write in his field notes that the Mexican shrimp boats "merely show the big Japanese boats where the shrimps were located. Then they come over with their big fine equipment and clean out the beds." They anchored this night outside the harbor, opposite the Pajaro Island lighthouse. Ricketts wrote in his field notes, "we got to talking about telephones, of which there are several hundred in the states of Sonora, Sinaloa, and Nayarit."

April 9 (Tuesday). The *Flyer* pulls up anchor and heads south, spotting the Japanese shrimping fleet (11 trawlers, plus a large "factory ship," perhaps 10,000 tons; p. 248). Although no intertidal collecting was done while the *Flyer* was in Guaymas, Ricketts did bring back specimens of 2 penaeid shrimps (*Farfantepenaeus californiensis* and *Litopenaeus stylirostris*) and 2 specimens of flat lobster (*Evibacus princeps*), from the Japanese shrimp trawler they boarded (which had a mixed Japanese and Mexican crew). They also took various other invertebrates from the trawling fleet, but these are not discussed in *Sea of Cortez* and I have found no specimens in the USNM or CAS collections. However, in correspondence between Ricketts and S. Stillman Berry, it is apparent that they collected the squid *Lolliguncula panamensis* on board the trawler. In addition, the captain of the trawler they visited gave them a gift of two freshwater shrimp, which they concluded were *Macrobrachium jamaicense*.

After boarding the Japanese factory ship, the *Flyer* steamed on to an anchorage S of the Lobos lighthouse (~5 miles from Estero de la Luna). In his field notes, Ricketts wrote: "The Japanese very obviously will soon clean out the shrimp resources of Guaymas. In addition to which, they kill probably many hundreds of tons of fish per day, of which no human use is made and for which only the scavengers, such as sea gulls, can be thankful." And, "soon the Japanese will have cleaned out the fishing banks, a purely Mexican resource will be depleted, and the Mexicans will have nothing but the taxes they collected." And, "If the shrimp are going to be depleted anyway, and to hell with the future, the way California sardines are going, and the way much of United States timber has already gone, at least the depletion ought to be by Mexicans or for the immediate benefit of Mexico." In this ecological thinking, Ricketts was far ahead

of his time. However, as it turns out, penaeid shrimps grow to maturity so fast, and are able to feed by scavenging on almost anything, that they are hard to “over-fish.” However, the bottom trawls used to capture them destroy the seafloor and all life on it, and that is the principal problem with their use.

Note: Here the dates in *Sea of Cortez* get messed up; April 10 is missing. It is reconstructed here from the typed trip notes of Edward F. Ricketts (“Verbatim transcription of notes of Gulf of California Trip,” provided by Ed Ricketts Jr. and Dr. Katharine A. Rodger, 2004).

April 10 (Wednesday). Went ashore in Estero de la Luna (about 40 miles S of Guaymas) in the early morning (6 a.m.), **Collection No. 22 (p. 253 in *Sea of Cortez*)**. Approx. 27°18' N latitude. Only 34 species were collected, but including what would become type specimens of the sea anemone *Calamactis praelongus* and the crab barnacle *Chelonibia patula dentata* (now in the USNM). Ricketts felt this was a “surprisingly sterile” site. In the afternoon, the *Flyer* steamed south (noting passing the mouth of the Río Mayo) to outside the entrance to Estero Agiabampo, where they anchored 5 miles offshore.

April 11 (Thursday). This morning, the *Flyer* edged closer to shore, and the crew entered Estero Agiabampo by skiff. Approx. 26°20' N latitude. **Collection No. 23 (p. 261 in *Sea of Cortez*)**. Collected from ~10:30 a.m. to ~12:30 p.m. Surprisingly, only 14 species were taken in 2 hours' time. Here, they found a population of the temperate north Pacific eelgrass *Zostera marina* (identified by E. Yale Dawson). Dawson noted that this was the southernmost record for this flowering plant on the Pacific Coast. Today, in the Gulf, it occurs only in the Canal de Infernillo (Baja California) and from Kino Bay (Sonora) south sporadically to Altata in Sinaloa. *Zostera marina* is unique in the Gulf because it is an annual; it is a perennial in the rest of its range. Its seeds were an important food resource for the Seri/Comcaac People. Eelgrass in the Gulf is an important food for wintering black brandt and green sea turtles.

The *Flyer* steamed all night for Baja with the intent of heading toward Isla San José. However, with Tiny and Sparky at the wheel they went off course, and by Friday morning they were at Isla Espíritu Santo!

April 12 (Friday). Waking up at Isla Espíritu Santo ~10 a.m., Steinbeck and Ricketts took the opportunity to collect at Bahía San Gabriel (NW side of island). Approx. 24°26' N, 110°21' W latitude. **Collection No. 24 (p. 266 in *Sea of Cortez*)**: 78 species collected in ~2 hours, 14 of

which are in USNM collections, including type specimens of 2 new sea anemones and 2 new zoanthids. Ricketts's field notes mention: "There is a fine big patch of coral almost emerging in the center of the bay. Mangrove islands and swamps on some of the boulder patches." After spending only a few hours in the beautiful San Gabriel Bay, the *Flyer* steamed on for Cape San Lucas.

Jonathan White and I revisited the Ricketts-Steinbeck Bahía San Gabriel (Isla Espíritu Santo) site on 5 March 2020. During our 2-hour examination of the site, at a -0.25-m low tide, we found 24 of the 78 species collected by Ricketts and Steinbeck. *Palythoa* sp., *Porites californica*, *Holothuria lubrica*, *Ophiocoma* spp., *Cataleptodius occidentalis*, and *Ligia* were all abundant. A single *Isostichopus fuscus* was found, but it was dying of wasting disease. Notably absent from the site were the very common swimming crab *Callinectes bellicosus*, Sally Lightfoot crabs (*Grapsus grapsus*), *Eriphia squamata*, *Ophioderma* spp., *Aplysia californica*, and cerianthid anemones. Species found by Brusca-White, but not by Ricketts-Steinbeck, at this site included *Holothuria impatiens*, *Porites californica*, and *Astrangia* sp. Although Ricketts and Steinbeck noted a "fine big patch of coral" in the center of the bay, we saw only isolated, though sizable, coral heads. However, the south shore of the bay, in front of the mangrove-lined 19th-century pearl oyster lagoon, has a large growth of *Porites californica* (erect, lobate form) of considerable extent (about 50 m in length along the shoreline). The sand beach of this bay is composed almost entirely of degraded coral.

Isla Espíritu Santo is well known for its richness of marine life, and it also gets ~25,000 visitors annually. In 2003, contributions from the Nature Conservancy, World Wildlife Fund (Switzerland), FUNDEA (Fundación Mexicana para la Educación Ambiental), and the Walton Foundation provided funds to purchase the island and donate it to CONANP (Mexico's National Park Service). The David and Lucille Packard Foundation donated over a million dollars for a trust to be used for protection of the island. Conflicts with ejido landowners ensued, but the island seems to be well protected today. It is part of the Islas del Golfo de California Área de Protección de Flora y Fauna and also the UNESCO Islas del Golfo de California Biosphere Reserve (declared in 1995). And in 2007, the island was declared a national park (Parque Nacional Archipiélago Espíritu Santo). Curiously, Steinbeck and Ricketts do not mention the old pearl oyster lagoon in the bay, even though they

collected along the edge of the mangroves that surround this structure. Sagarin et al. (2008) also do not mention the pearl oyster operation. The pearl oyster cultivation system in Bahía San Gabriel was built by Don Gastón Vivés in the late 1800s. There is also ample evidence of prehispanic people (Pericú sites) on the island. Radiocarbon dates from 40 sites on the island show occupation from about 9,000 BC to the 15th century AD. At one site, shells with ages of 36,550 to 47,500 years have been found, but Tom Bowen (pers. comm. 2016) suspects these were already ancient when Native Americans collected them.

April 13 (Saturday). The *Flyer* departs for the Pacific, passing the light on Cabo Falso at 3 a.m.

April 17 (Wednesday). The *Flyer* arrives in San Diego, after a stormy 4 days at sea.

April 18 (Thursday). John and Carol Steinbeck, Ricketts, and the *Flyer's* crew enjoyed a day in San Diego. Steinbeck's Hollywood-actor friend Max Wagner and his girlfriend, Alberta, and Tiny's girlfriend from Monterey, showed up for the celebration.

April 19 (Friday). John and Carol stay on the *Flyer* to steam to Monterey. Ricketts drives to Los Angeles with Alberta and Max. They arrived at Max's studio ~6 p.m., socialized with folks, and then went to the "RKO lot ~9 p.m." This night, Ricketts and Max and Alberta "made the rounds" of the Hollywood nightclubs. In his field notes, Ricketts says, "Jack [*sic*] Wagner is a good man." Ricketts spent the night at Alberta's sister's home, in Compton (central Los Angeles).

April 20 (Saturday). Ricketts, Max, and Alberta knocked around Long Beach and San Pedro, and searched for some fishing boats from Monterey that they thought might be there (*Sea Giant, New Roma*). Ricketts spent this night again at Alberta's sister's home. The *Western Flyer* arrived in Monterey this day.

April 21 (Sunday). Ricketts visited the beach (Long Beach) this day, and then took the overnight train for Monterey ~5:30 p.m. Had dinner in Santa Barbara en route.

April 22 (Monday). Ricketts arrived in Monterey early this morning. His field notes end on this day. In them, he reveals his sentimental nature (and his love of women and desire for a successful intimate relationship) with these comments:

I had kept up good spirits throughout but feel depressed and lonely now. Part probably hangover, part let-down from the last few days, which were fairly happy, but most probably due to seeing how when people come back from a trip, everyone has some one person who sidetracks everything else just for him.... I have been companions with terribly nice people like Jan [Alberta's sister?] and Alberta—and had a fine time—but their depths were for someone else, and they had little or nothing to give me.... I suppose the answer is that it's nice to be loved best and only; and who hasn't that, lacks an important part of life.

APPENDIX: TABLES 1–4

Table 1. Named/Described Species of Invertebrates Known from the Sea of Cortez (as of 1 July 2020)

Phylum	Total Number Known from Gulf*	Occurring in the Intertidal Zone	Endemic to the Gulf (% of group)
Annelida (Polychaeta)	774	377	101 (13%)
Annelida (Echiura)	4	2	1 (25%)
Annelida (Sipuncula)	13	10	0
Arthropoda (all)	1,134 Crustacea = 1,107	544 Crustacea = 526	134 (12%) Crustacea = 134 (12%)
Brachiopoda	5	2	4 (80%)
Bryozoa	170	50	10 (5.9%)
Chaetognatha	20	11	0
Chordata	43	9	3 (7%)
Cnidaria	279	111	47 (16.9%)
Ctenophora	4	0	2 (50%, both possibly undescribed species)
Echinodermata	276	120	18 (6.5%)
Hemichordata	3	3	0
Mollusca	2,251	927	471 (21%)
Nemertea	17	14	2 (11.8%)
Platyhelminthes	22	17	9 (40.9%)
Porifera	125	60	27 (21.6%)
Xenacoelomorpha	3	0	2 (67%)
TOTALS	5,143**	2,257 (44%)	831 (16.2%)

*1,040 species occur in the Upper Gulf of California and Colorado River Delta Biosphere Reserve (Reserva de la Biosfera del Alto Golfo de California y Delta del Río Colorado); this number is 20.5% of all Gulf species.

**Note: The 1940 Steinbeck-Ricketts expedition collected ~557 species.

Table 2. Annotated List of Species Collected by the Steinbeck-Ricketts Sea of Cortez Expedition (Higher-Level Taxonomy Following Brusca et al. 2016)

TOTAL = ~557 species

Abbreviations Used

Sea of Cortez = the book, *Sea of Cortez: A Leisurely Journal of Travel and Research*

Narrative = Narrative (or “Log”) section of the book *Sea of Cortez*

Phyletic Catalogue = Annotated Phyletic Catalogue (Appendix) of the book *Sea of Cortez*

Gulf = Gulf of California/Sea of Cortez

USNM = Smithsonian Institution’s National Museum of Natural History

Phylum Porifera (sponges): 16 species

Class Calcarea (3 species)

Leucetta losangelensis (the most common calcareous sponge in the Gulf, and one of the most common sponges in the Eastern Pacific)

Leuconia heathi (a questionable identification of this California species)

Leucosolenia coriacea

Class Demospongiae (13 species)

Aaptos vannamei (a questionable identification of a “black sponge”)

Chondrosia reniformis

Cliona californiana (as *C. celata*, and as *C. californiana*)

Geodia mesotriaena (the most commonly encountered sponge of the expedition)

Geodia sp.

Haliclona ecbasis (this species has apparently been reported from the Gulf by no one else)

Hircinia variabilis (questionable identification)

Hymeniacion sp. (there are 3 species in this genus known from the Gulf: *H. sinapium*, *H. adreissiformis*, and *H. rubiginosa*; the last is known from Puerto Refugio and likely the species Steinbeck and Ricketts found there)

Spirastrella sp. (reported as “a white encrusting sponge”; probably *S. coccinea*, a common Gulf species)

Stelletta clarella (reported as *Stelletta estrella*)

Tedania ignis (possibly *T. nigrescens*)

Tedania “*ignis*”

Tethya aurantia

Phylum Cnidaria/Coelenterata (sea anemones, corals, hydroids, etc.): 49 species

Subphylum Hydrozoa (6 species)

Aglaophenia diegensis (one of the most common hydroids in the northeastern Pacific)

Aglaophenia longicarpa

Obelia dichotoma (found on the shell of a sea turtle off Point Abreojos, west Baja, as well as intertidally)

Obelia plicata

Plumularia setacea (a wide-ranging hydroid species, Galapagos Islands to British Columbia)

Sertularia versluisi

Subphylum Anthozoa (43 species)

ANEMONES (28 species)

Aiptasiomorpha elongata

Alicia beebei

Andvakia insignis (a burrowing anemone; as *Pachycerianthus insignis*, a junior synonym)

Anthopleura dowii (specimens taken from Puerto San Carlos, Sonora, were described by Carlgren in 1951 as a new species, *Bunodactis mexicana*; however, Daly [2004] showed Carlgren’s specimens to have been *Anthopleura dowii*, thus making *B. mexicana* a junior synonym of *A. dowii*; Daly further reckoned that Brusca’s (1973, 1980a) records of *Bunodactis mexicana* were actually an undescribed species, which he named *Isoaulactini hespervolita* Daly, 2004)

Anthothoe panamensis

Botruanthus benedeni (burrowing anemone)

Bunodosoma californica

Calamactis praelongus (holotype)

Calliactis polypus (this anemone has been reported worldwide; in the Eastern Pacific, so far as is known, it is found only on the shells of gastropods inhabited by the hermit crab *Dardanus sinistripes*)

Cerianthus sp. (5 cerianthid-like burrowing anemones are currently known from the Sea of Cortez: *Andvakia insignis*, *Cerianthus vas*, *Isarachnanthus panamensis*, *Pachycerianthus aestuari*, *Botruanthus benedeni*)

Epiactis irregularis (holotype)

Epizoanthus californicus (syntypes)

Epizoanthus gabrieli (holotype)

Harenactis sp. (burrowing anemone, family Haloclavidae; this genus has only 2 described species—*H. argentina* and *H. attenuata*—the latter being a Southern California species that is today not known from the Gulf)

Palythoa complanata (holotype; type locality; noted in the Narrative as “In superficial appearance it was identical with...*Zoanthus pulchellus*” of the Caribbean)

Palythoa ignota (syntypes)

Palythoa insignis (syntypes)

Palythoa pazi (syntypes)

Palythoa praelonga (syntypes)

Palythoa rickettsi (holotype and paratypes)

Phialoba steinbecki (syntypes)

Phyllactis bradleyi

Phyllactis concinnata

Phymactis clematis

Telmatactis panamensis

Zoanthus danae

Zoanthus depressus (holotype)

Zoanthus dowi

GORGONIANS (4 species)

Pacificgorgonia adamsi (as *Gorgonia adamsi*; “lacy sea fans”)

Leptogorgia alba (as *Lophogorgia alba*, a junior synonym; white gorgonian from the Japanese shrimp trawler)

Leptogorgia rigida

Muricea austera

SEA PENS & SEA WHIPS (3 species)

Pennatula sp. (a sea pen; although not mentioned in the Phyletic Catalogue, Ricketts’s field notes and correspondence with E. Deichmann note “*Pennatula* sp., La Paz, under cement wharf”; there are a few reports of *Pennatula phosphorea* from the Pacific, but these might be incorrect identifications as this appears to be an Atlantic species)

Ptilosarcus undulatus (= *Leioptilus undulata*)

Stylatula elongata

CORALS (8 species)

Astrangia pedersenii (solitary coral and one of 11 *Astrangia* species in the Gulf; considered a junior synonym of *A. haimeii* by Squires 1959)

Pocillopora capitata (Reyes [1992] considers *P. robusta* and *P. porosa* to be junior synonyms of *P. capitata*; many species of *Pocillopora* have been reported from the Gulf, but their taxonomy and nomenclature are still not well resolved)

Pocillopora capitata capitata (probably a misidentification of *Pocillopora meandrina*)

Pocillopora meandrina

Porites californica (sometimes reported as *P. porosa*, a junior synonym; Steinbeck and Ricketts correctly noted this was the commonest coral on Gulf shores, occurring as dome-shaped encrusting heads 8 inches in diameter)

Porites cf. *nodulosa* (in the Gulf, *P. nodulosa* has been considered to be restricted to the Cabo Pulmo-Cabo San Lucas corridor; Reyes [1991] considered it a synonym of *P. panamensis*)

Porites cf. *porosa* (= *P. panamensis* of most, but not all modern workers; this species is protected by Mexican federal law)

Porites sp. (as “probably *P. porosa*”)

Phylum Ctenophora (comb jellies): 1 species

Pleurobranchus areolatus (almost certain a misidentification of *Pleurobranchus digueti*)

Phylum Platyhelminthes, Class Turbellaria (free-living flatworms): 5 species

Latocestus sp. (presumably an undescribed species)
“*Planocera*-like forms”

Stylochoplana plehni (= *Leptoplana californica*)

Stylochus sp. (possibly *S. atentaculatus* described by Hyman in 1953)

Stylochus (?) sp. (possibly *Stylochoplana panamensis*)

Phylum Nemertea (ribbonworms): 1 species

Baseodiscus mexicanus (the largest and most distinctive nemertean in the Gulf, and apparently the only species collected by the expedition)

Phylum Bryozoa/Ectoprocta (moss animals): 14 species

Antillesoma antillarum (as *Physcosoma antillarum*, a junior synonym; a cosmopolitan bryozoan species)

Bugula neretina (one of the most widespread bryozoans in the Gulf; also ranging from central California to Panama)

- Cellepora* sp. (3 species in this bryozoan genus are known from the Gulf: *C. brunnea*, *C. minuta*, *C. quadrispinosa*)
- Crisia* sp. (this was likely *C. operculata* Robertson, 1910)
- Flustra* (?) sp. (the genus *Flustra* has been split, and there are now a half-dozen species in other genera that this could have been)
- Lagenipora erecta* (no species in this genus are known to occur in the Gulf today; many *Lagenipora* have been transferred to other genera in recent years)
- Lichenopora* sp. (misspelled in Log as “*Lichenspora*,” p. 342; there are 3 species of *Lichenopora* in the Gulf: *L. buskiana*, *L. intricata*, *L. novaezelandiae*)
- Membranipora tuberculata* (a common bryozoan ranging from California to Peru)
- Membranipora* sp. (4 species of *Membranipora* are known from the Gulf today: *M. tuberculata*, *M. tenuis*, *M. savarti*, *M. arborescens*)
- Porella* sp. (2 species of *Porella* are known from the Gulf: *P. rogickae*, *P. porifera*; if the identification was by R. S. Bassler, it is likely the correct genus identification)
- Scrupocellaria diegensis* (there seems to be no subsequent record of this California species from the Gulf; 4 other species in this genus are known from the Gulf, and the expedition’s specimen was likely one of these: *S. bertholetti*, *S. mexicana*, *S. scruposa*, *S. varians*)
- Scrupocellaria* sp. (4 species in this genus are known from the Gulf: *S. bertholetti*, *S. mexicana*, *S. scruposa*, *S. varians*)
- Stylopoma spongites* (a tropical West Atlantic species; presence in Gulf needs confirmation)
- Thalamoporella californica* (a well-known California bryozoan ranging south to Colombia and the Galapagos Islands)

Phylum Sipuncula (peanut worms are now widely regarded as highly modified annelids): 10 species

- Antillesoma antillarum* (as *Physcosoma antillarum* *Themiste hennahi*; = *Dendrostoma lissum*, a junior synonym) (holotype)
- Apionsoma (Edmondsius) pectinatum* (described by Fisher as *Siphonides rickettsi*, a junior synonym) (holotype)
- Apionsoma misakianum* (as *Golfingia hespera* and *Phascolosoma hesperum*, junior synonyms)
- Phascolosoma agassizii* (as *Physcosoma agassizii*, a junior synonym)
- Phascolosoma dentigrerum*
- Phascolosoma elachum* (holotype)

Phascolosoma hesperum (commensal in *Cerianthus* tubes)

Phascolosoma sp. (the “small *P. agassizii*”)

Phascolosoma sp., cf. *P. gouldii* (Ricketts speculated this was an undescribed species, but it may have been one of the other 3 species of *Phascolosoma* now known from the Gulf: *P. nigrescens*, *P. perlucens*, or *P. agassizii*, or even some other genus)

Sipunculus nudus

Phylum Echiura (spoon worms are now regarded as highly modified annelids): 2 species

Ochetostoma edax (types; endemic to the Sea of Cortez)

Thalassema steinbecki (holotype)

Phylum Annelida, Polychaeta (free-living segmented worms): 53 species

Acromegalomma circumspectum (identification made by Gómez and Tovar-Hernández 2008; possibly the same specimens reported by Steinbeck and Ricketts as *Megalomma mushaensis*, below)

Acromegalomma mushaensis (as *Megalomma mushaensis*; a nearly circumtropical sabellid polychaete)

Acromegalomma quadrioculatum (as *Megalomma quadrioculatum*, but possibly a misidentification of *Acromegalomma circumspectum*)

Amblyosyllis sp. (= *Pterosyllis* according to Steinbeck and Ricketts; there are about 4 dozen species of syllid polychaetes known from the Gulf, only one of which is in this genus, *A. granosa*)

Anaitides madeirensis

Armandia sp. (2 species of polychaetes in this genus are known from the Gulf: *A. brevis* and *A. intermedia*)

Bhawania riveti (described as “a *Phyllodoce*-like form”; this species has apparently not been reported since the expedition, but another species, *B. goodei*, has been reported from the Gulf)

Ceratonereis tentaculata

Chloeia viridis (the 3-stripe fire worm; a stinging polychaete and fairly common tropical East Pacific species)

Cirriformia spirabranhus (a well-known, tube-building cirratulid polychaete)

Dasybranchus caducus (a Caribbean species thought to also occur in the Gulf)

- Dorvillea cerasina* (as *Stauronereis cerasina*; one of 6 *Dorvillea* species known from the Gulf)
- Eudistoma* sp. (Steinbeck and Ricketts speculated that this might be an undescribed species; 2 *Eudistoma* species are currently known from the Gulf, *E. mexicanum* and *E. psammion*)
- Eulalia myriacyclum* (long, green, sand flat polychaete)
- Eunice afra* (a single specimen of this Gulf endemic polychaete was taken on the expedition)
- Eunice antennata* (a wide-ranging polychaete occurring from Southern California to Ecuador)
- Eunice aphroditois*
- Eunice filamentosa* (a Gulf endemic)
- Eunice schemacephala* (this is a tropical West Atlantic species and may have been a misidentification; there are 2 dozen species of *Eunice* known from the Gulf today)
- Eunice* sp. (there are about 2 dozen species of *Eunice* known from the Gulf today)
- Eupomatus* sp. (there are 3 species of *Eupomatus* known from the Gulf today: *E. brachyacantha*, *E. recurvispina*, *E. uncinatus*)
- Eurythoe complanata* (the ubiquitous fire worm; found at every rocky shore site the expedition visited)
- Eusigalion lewisii* (a polychaete of uncertain identification; nothing with this name is known today from the Sea of Cortez)
- Glycera dibranchiata* (a well-known polychaete ranging from San Francisco Bay to the Gulf)
- Halosydna glabra* (a scale worm described the year before the expedition)
- Idanthyrsus pennatus* (a circumtropical terebellid polychaete)
- Iphione ovata* (a tropical scale worm)
- Lepidonotus hupferi*
- Maldanidae (bamboo worms; about a dozen species of maldanids occur in the Gulf)
- Marphysa aenea*
- Neanthes* sp. (taken by night-lighting; 5 species of *Neanthes* are known from the Gulf: *N. caudate*, *N. cortezi*, *N. micromma*, *N. pelagica*, *N. succinea*)
- Notopygos ornata* (Gulf “small fire worm”)
- Odontosyllis* sp. (there are 4 species of *Odontosyllis* known from the Gulf: *O. heterodonta*, *O. phosphorea*, *O. polycera*, *O. undecimdongta*)
- Oenone fulgida* (as *Aglaurides fulgida*; a Tropical East Pacific polychaete)
- Ophiodromus pugettensis* (as *Podarke pugettensis*; Steinbeck and Ricketts found it only in the ambulacral groove of *Oreaster*)

occidentalis, but it is known to be a symbiont in several Gulf sea stars)

Owenia fusiformis (a circumtropical polychaete species)

Palola siciliensis (a nearly circumtropical polychaete species)

Perineris sp., epitokous stage (taken by night-lighting; there are no known polychaetes of this genus known in the Gulf today; given that the specimens were epitokes, the identification could easily have been incorrect)

Pista elongata (a Tropical East Pacific terebellid polychaete)

Platynereis agassizi, epitokous (“heteronereids” taken by night-lighting; likely a misidentification of one of the 3 species of *Platynereis* known from the Gulf today: *P. bicanaliculata*, *P. dumerilii*, *P. polyscalma*)

Platynereis polyscalma (“epitokous or heteronereids forms” taken by night-lighting; a well-known nereid polychaete ranging from the Central Gulf to Ecuador)

Polydora sp. (perhaps *P. citron* or *P. websteri*, both described by Olga Hartman in the mid-1940s)

Polyodontes oclea (scale worm, in a *Cerianthus*-like tube)

Protula tubularia (a poorly known serpulid polychaete)

Salmacina tribranchiata (as *S. dysteri*, see Bastida-Zavala et al. [2016]; tube worms with rusty red gills)

Scolecopsis sp. (an unidentified spionid polychaete)

Spirobranchus incrassatus (spiral-gilled, calcareous tube worm)
“*Spirorbis* tubes” (about 15 species of Spirorbidae are known from the Gulf today)

Stylarioides capulata (this Southern California species has apparently not been reported from the Gulf since the Steinbeck-Ricketts expedition)

Stylarioides papillata (possibly *Pherusa papillata*, a Southern Gulf flabelligerid polychaete)

Thelepus setosus (a circumtropical terebellid polychaete)

Thormora johnstoni (a widely distributed East Pacific scale worm)

Travasia gigas (a well-known California-Gulf polychaete)

Phylum Echinodermata (sea stars, urchins, sea cucumbers, etc.): 64 species

Class Asteroidea (15 species)

Acanthaster ellisii (the Eastern Pacific crown-of-thorns)

Astrometis sertulifera

Astropecten armatus (a very common sand sea star in the Gulf, but collected only once on the expedition)

Echinaster tenuispina (= *Othilia tenuispina*)

Heliaster kubiniji (the Gulf sun star; second most ubiquitous animal on the expedition; suffering from a “wasting disease” beginning in 1978, from which it never fully recovered, this sea star is rare in the Gulf today)

Heliaster sp.

Henricia sp. (5 species in this genus are known from the Gulf today: *H. aspera*, *H. asthenactis*, *H. clarki*, *H. gracilis*, *H. polyacantha*)

Leiaster teres

Linckia columbiae

Luidia phragma (a very common subtidal species taken by the expedition only at Bahía Concepción, from 7 fathoms, in “crab nets”)

Mithrodia bradleyi

Nidorellia armata

Pentaceraster cumingi (as *Oreaster occidentalis*, a junior synonym)

Pharia pyramidalis

Phataria unifascialis

Class Ophiuroidea (12 species)

Amphipholis elevata (a rarely collected, littoral-to-73-m-deep, long-armed sand bottom brittle star)

Ophiactis savignyi (a common Tropical East Pacific 6-armed brittle star)

Ophiactis simplex (the small, 5- or 6-armed brittle star)

Ophiocnida hispida (an East Pacific tropical, bristly, long-armed brittle star)

Ophiocoma aethiops

Ophiocoma alexandri

Ophioderma panamense

Ophioderma teres

Ophionereis annulata

Ophiophragmus marginatus (a sand-burrowing, long-armed brittle star; had not been reported since Lütken’s original description from Nicaragua, a century earlier)

Ophiothrix rudis

Ophiothrix spiculata

Class Echinoidea (15 species)

Agassizia scrobiculata (a heart urchin)

Arbacia incisa (the common, sharp-spined purple urchin; *Arbacia stellata* by some workers—the name is in dispute)

Astropyga pulvinata (taken only at Bahía Concepción, with a crab net baited with fish guts)

Centrostephanus coronatus

Clypeaster rotundus

Diadema mexicanum (= *Centrechinus mexicanus*; curiously, the expedition collected this very common, toxic-spined species only twice, at Punta Lobos and at Marcial Point)

Echinometra vanbrunti

Encope grandis

Encope micropora (= *E. californica*, a junior synonym)

Eucidaris thouarsii

Lovenia cordiformis (a heart urchin)

Mellita longijfissa

Meoma grandis (a heart urchin)

Metalia nobilis (as *M. spatagus*; a small and uncommon heart urchin ranging from the Upper Gulf to Panama)

Tripneustes gratilla (as *Tripneustes depressus*; a trans-Pacific species)

Class Holothuroidea (22 species)

Afrocumis ovulum (as *Euthyonidiuim ovulum*; an uncommon species known only from the Central and Southern Gulf, south to Peru)

Chiridota aponocrita (a small synaptid cucumber)

Chiridota sp. (not in Phyletic Catalogue, but identified by E.

Deichmann; there are only 2 valid species of *Chiridota* known from the Gulf today, *C. aponocrita* and *C. rigida*)

Epitapta tobogae (as *Leptosynapta* sp.)

Euaпта godeffroyi (a large, conspicuous, synaptid cucumber; surprisingly taken at only 2 localities)

Holothuria arenicola (a circumtropical species common in the Gulf)

Holothuria difficilis (a circumtropical species)

Holothuria impatiens (a circumtropical species; the second most common sea cucumber of the expedition)

Holothuria inhabilis (a flat, sand-encrusted, trans-Pacific species; found only once)

Holothuria kefersteini

Holothuria languens

Holothuria lubrica (= *Slenkothuria lubrica*; the sulfur cucumber; the most common sea cucumber taken during the expedition, and the most common littoral cucumber in the Sea of Cortez today). Ricketts's field notes state, "one fact increasingly emerges; the green and black cucumber (*C. lubrica*) is the most ubiquitous Gulf of California shore animal, and *Heliaster* runs it a close second." One specimen of

Holothuria lubrica from the expedition had a commensal pearl fish living in it, *Encheliophiops hancocki* Reid.

Holothuria paraprinceps

Holothuria rigida (a circumtropical cucumber)

Isostichopus fuscus

Neocucumis veleronis (as *Euthyonidium veleronis*; found only once)

Neothyone gibbosa

Paracaudina chilensis Müller, 1850 (a smooth, white, burrowing cucumber resembling a sipunculan; found only once). The taxonomic nature of this “cosmopolitan” species is unclear and the Gulf specimens could be an undescribed species. Not included in the Solís-Marín et al. (2009) monograph of Gulf holothurians.

Pentamera chierchia (found only once)

Pseudocnus californicus (as *Cucumaria californica*; found only once)

Stichopus jusus (not in Phyletic Catalogue, but identified by E. Deichmann; the nature of this species name is unclear)

Thyone parafusus (taken only at this locality)

**Phylum Arthropoda, subphylum Crustacea (crabs and their kin):
152 species**

Class Copepoda (1 species)

Gastrodelpys dalesi (a symbiont with the sabellid polychaete *Acromegalomma circumspectum*; discovered by Gómez and Tovar-Hernández 2008)

Class Thecostraca, Subclass Cirripedia (barnacles and their kin) (11 species)

Balanus fissus

Balanus improvisus

Balanus inexpectatus (as *Balanus amphitrite inexpectatus*)

Balanus trigonus

Chelonibia patula dentata (type specimen) (incorrectly stated in Phyletic Catalogue as being from “Agiabampo Bay”; actually from the cheliped of the swimming crab, *Callinectes bellicosus*, from Estero de la Luna, Sonora; identified by Dora Henry as a new subspecies and described by her)

Chthamalus anisopoma

Megabalanus californicus (as *Balanus tintinabulum californicus*)

Megabalanus peninsularis (as *Balanus tintinabulum peninsularis*)

Paraconcaucus mexicanus (as *Balanus concavus*)

Tetraclita rubescens (as *Tetraclita squamosa*)
Tetraclita stalactifera (as *Tetraclita squamosa stalactifera*)

Class Malacostraca, Subclass Hoplocarida (mantis shrimps) (3 species)

Neogonodactylus stanschi (as *Gonodactylus stanschi*)
Neogonodactylus zacaе (as *Gonodactylus oerstedii*, which is actually a West Atlantic species; the specimens were re-examined by Ray Manning in 1972 and described as the new species *Gonodactylus zacaе*, later moved to *Neogonodactylus*)
Pseudosquilla lessonii (larvae taken by night-lighting; questionable identification)

Class Malacostraca, Subclass Eumalacostraca (crabs, shrimps, amphipods, isopods, etc.) (137 species)

BRACHIURANS (“true” crabs) (55 species)

Ala cornuta (as *Anaptychus cornutus*, a junior synonym)
Callinectes bellicosus (the pugnacious blue swimming crab; Steinbeck and Ricketts noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case)
Cataleptodius occidentalis (as *Leptodius occidentalis*, a junior synonym; one of the most common and abundant small crabs in the Gulf)
Daira americana
Dissodactylus nitidus (one of several species of small pea crabs, Pinnotheridae, commensal on sand dollars in the Tropical East Pacific)
Dissodactylus xantusi (one of several species of small pea crabs, Pinnotheridae, commensal on sand dollars in the Tropical East Pacific)
Domecia hispida (as *Eriphides hispida*, a junior synonym of this circumtropical coral-inhabiting crab)
Epialtus minimus
Epixanthus tenuidactylus (as *Ozius tenuidactylus*, a junior synonym)
Eriphia squamata (“old lumpy claws”; a very common, small, pugnacious xanthid crab ranging from the Upper Gulf to Peru)
Eucinetops lucasi
Eucinetops panamensis
Eurypanopeus planissimus

- Geograpsus stormi* (as *Geograpsus lividus*, a junior synonym; circumtropical)
- Geotice americanus* (Steinbeck and Ricketts initially misidentified this species as *Hemigrapsus oregonensis*; S. Glassell presumably made the correction)
- Glyptoxanthus meandricus* (a spectacularly sculptured xanthid crab, once common but now becoming scarce)
- Goniopsis pulchra*
- Gonopanope areolata* (as *Micropanope areolata*, a junior synonym)
- Grapsus grapsus* (Sally Lightfoot crab; taken at all rocky shore stations)
- Hepatus kossmanni* (a gift to Ricketts from Captain Corona of Guaymas, who operated a fleet of shrimp trawlers; formerly a common species in shrimp net bycatch, now rare due to decades of bottom trawling)
- Heteractaea lunata* (an uncommon xanthid crab in the Gulf)
- Hypoconcha panamensis* (collected in “crab net on bottom at night, 7 fathoms”; this crab normally carries a clam shell over its carapace)
- Litopenaeus stylirostris* (as *Penaeus stylirostris*; found dead on sand flats; probably washed up from a local shrimp boat)
- Microphrys platysoma*
- Mithraculus denticulatus* (as *Mithrax areolatus*, a junior synonym)
- Moreiradromia sarraburei* (as *Dromidia larraburei*, a junior synonym; pelagic larvae collected by night-lighting)
- Ocypode occidentalis*
- Ozium tenuidactylus*
- Pachygrapsus crassipes* (one of the most common invertebrates of the temperate NW Pacific coast, but probably always rare in the Gulf; a temperate disjunct species ranging from the Pacific Northwest to Magdalena Bay [SW Baja], reappearing in the Northern and Central Gulf). The last reliable records in the Gulf seem to be from the late 1960s, and it might be that sea surface temps are now too warm for this species to survive in the Sea of Cortez. Also reported from Japan and Korea. Randall’s original type locality of Hawaii was almost certainly an error.
- Pachygrapsus socius* (as *Pachygrapsus transversus*, an Atlantic species)
- Panopeus bermudensis* (in 1941, this species was thought to be distributed in the Caribbean and Tropical East Pacific; however, the “panopeid” crabs are a taxonomic mess and the actual identity of the expedition’s Sea of Cortez species is

unclear; there are ~2 dozen described panopeid crabs usually recognized from the Gulf, but this is not one of them)

Parapinnixa nitida (a small pea crab, Pinnotheridae, that might be endemic to the Gulf; collected by night-lighting)

Percnon gibbesi

Pilumnoides sp. (juvenile; there is only one species in this genus reported from the Sea of Cortez today, *P. rotundus*, described in 1940 and rare in the Gulf)

Pilumnus gonzalensis

Pilumnus pygmaeus

Pilumnus townsendi

Pinnixa transversalis (a common Tropical East Pacific pea crab, Pinnotheridae; collected from a “sandy-tubed worm on a sand flat” at Bahía de los Ángeles)

Pinnotheres sp. (an unidentified Pinnotheridae)

Pitho picteti

Pitho sexdentata

Platypodiella rotundata (as *Platypodia rotundata*)

Podochela latimanus

Polyonyx quadriungulatus (typically commensal in the tubes of chaetopterid polychaetes, but found “free living” at El Mogote)

Portunus xantusii affinis (as *Portunus pichilinquiei*, a junior synonym of this subspecies)

Portunus xantusii minimus (as *Portunus minumus*, a species that has been sunk into *P. xantusii*; captured by night-lighting)

Sesarma sulcatum

Stenorhynchus debilis (the common Gulf arrow crab)

Teleophrys cristulipes

*Thoe sulcata**Trapezia bidentata* (as *Trapezia cymodoce ferruginea*, a junior synonym)

Trapezia digitalis

Trapezia sp. (perhaps *T. digitalis*)

Uca crenulata (Steinbeck and Ricketts felt this was the only species of *Uca* they collected on the expedition; however, that is unlikely; the taxonomy of this genus is desperately in need of revision and some species are difficult to differentiate)

Xanthodius cooksoni (as *Leptodius cooksoni*, a junior synonym)

Xanthodius sternberghii (as *Xanthodius hebes*, a junior synonym)

ANOMURANS (porcelain crabs, hermit crabs, ghost shrimps, lobsters, etc.) (35 species)

Albunea lucasii (sand crab; noted as *Emerita* sp. in *Sea of Cortez*)

Calcinus californiensis

Callianassa sp. cf. *C. uncinata* and *C. rochei*

- Clibanarius digueti* (the blue-spotted hermit crab; perhaps the most common hermit in the Gulf)
- Clibanarius panamensis*
- Dardanus sinistripes*
- Emerita rathbunae* (a sand crab)
- Megalobrachium sinuimanus* (as *Pisonella sinuimanus*)
- Megalobrachium tuberculipes* (as *Pisonella tuberculipes*; an uncommon Tropical East Pacific porcelain crab)
- Neaxius vivesi* (as *Axius vivesi*; a common species throughout the Gulf, but the expedition took it only at one site)
- Pachycheles biocellatus* (formerly *Petrolisthes biocellatus*)
- Pachycheles panamensis* (formerly *Pachycheles sonorensis*)
- Pachycheles setimanus* (formerly *Petrolisthes setimanus*)
- Pachycheles* sp. (6 species of *Pachycheles* are known from the Gulf today)
- Paguristes digueti* (a subtidal, tropical hermit crab “taken in crab nets set at night in 7 fathoms” in Bahía Concepción)
- Pagurus albus*
- Pagurus benedicti*
- Pagurus lepidus*
- Panulirus inflatus*
- Panulirus interruptus*
- Petrochirus californiensis* (the passive “gentle giant”; the largest hermit crab in the Gulf)
- Petrolisthes armatus* (one of the most common porcelain crabs in the Gulf; likely this species was at every rocky shore they visited, even though they reported it only twice)
- Petrolisthes edwardsii*
- Petrolisthes gracilis* (one of the most common porcelain crabs in the Gulf; likely this species was at every rocky shore they visited, even though they reported it only 4 times)
- Petrolisthes hians* (as *Pisosoma flagraciliata*, a junior synonym)
- Petrolisthes hirtipes* (a very common porcelain crab in the Gulf)
- Petrolisthes hirtispinosus* (a common porcelain crab in the Gulf)
- Petrolisthes lewisi* (as *Pisosoma lewisi*)
- Petrolisthes nigrungiculatus* (a common porcelain crab in the Gulf)
- Petrolisthes* sp.
- Pleuroncodes planipes* (the pelagic red lobsterette)
- Porcellana cancrisocialis* (typically found on the shells of the hermit crabs *Petrochirus californiensis* and *Dardanus sinistripes*)
- Porcellana paguriconviva*
- Upogebia thistlei* (a ghost shrimp)

Upogebia sp. (there are 8 species of mud/ghost shrimp in this genus in the Gulf, but they are difficult to distinguish and often confused with species of other Gulf thalassinidean shrimps, such as *Pomatogebia*, *Neotrypaea*, *Naushonia*, *Callianidea*, and *Biffarius*)

ISOPODS (13 species)

Cirolana nielbrucei (as *Cirolana harfordi*; *C. harfordi* is a temperate isopod species that is rare in the Gulf; the Steinbeck-Ricketts specimens [from USNM] were described as *Cirolana nielbrucei* by Brusca, Wetzer, and France in 1995)

“*Dynamella*” sp. (presumably a misspelling of *Dynamenella*, an isopod genus known from California shores, and not from the Sea of Cortez; however, it is more likely the specimens were *Dynoides*, *Paracerceis*, or *Paradella*)

Eurydice caudata (a wide-ranging isopod known from central California to Ecuador; the expedition took these specimens by night-lighting)

Excorallana tricornis (misspelled as *Excorallana*; there are 5 species of *Excorallana* in the Gulf, 3 that were named and described only recently, so the accuracy of this identification is questionable; further, J. O. Maloney was not known to be the best crustacean taxonomist working at the time)

Exosphaeroma yucatanum (almost certainly a misidentification of some other sphaeromatid isopod; *E. yucatanum* is a West Atlantic species)

Ligia exotica (as *Ligyda exotica*)

Ligia occidentalis

Ligia sp. (probably *Ligia occidentalis*)

Mesanthura sp. (almost certainly the very common *M. occidentalis*)

Paracerceis gilliana (from Isla San Marcos; almost certainly a mistaken identification as *P. gilliana* is a Californian species; 3 species in this genus occur in the Gulf: *P. richardsoni*, *P. sculpta*, *P. spinulosa*)

Paracerceis sp. (3 species in this genus occur in the Gulf: *P. richardsoni*, *P. sculpta*, *P. spinulosa*)

Paranthura longitelson (as *Paranthura* sp. in Phyletic Catalogue; collected by night-lighting)

Rocinela signata (reported as *Rocinella aries*, a misspelling of the junior synonym)

- Ampithoe plumulosa* (broadly distributed in the east Pacific:
Canada to Ecuador)
Ampithoe ramondi (a circumtropical species)
Ampithoe sp.
Aruga dissimilis (a Southern California species)
Aruga sp. (only one species in this genus is known from the Gulf
today, *A. holmesi*)
Bemlos macromanus (a Tropical East Pacific amphipod, ranging
from the Gulf to the Galapagos)
Caprella aequilibra (a caprellid amphipod, in an “*Obelia* colony”)
Elasmopus pocillimanus (a cosmopolitan amphipod; not reported
otherwise in the Gulf)
Elasmopus sp. (possibly the same species as *E. pocillimanus*)
Erichkonius brasiliensis (in an “*Obelia* colony”)
Hyale hawaiiensis (probably an incorrect identification; likely one
of the amphipod species named by J. L. Barnard in 1979—
e.g., *H. californica*, *H. guasave*, *H. yaqui*, *H. zuaque*)
Parajassa sp. (in an “*Obelia* colony”)
Pontharpinia sp.
Pontogeneia sp. (in an “*Obelia* colony”)

EUPHAUSIDS (1 species)

- Nyctiphanes simplex* (a widespread Eastern Pacific euphausid/krill;
one of the primary food items of baleen whales in the Gulf)

MYSIDS (3 species)

- Archeomysis* cf. *maculata*
Mysidium rickettsi (as *Mysidopsis* sp.; not described until 1987,
when Harrison and Bowman came across the specimen in the
USNM collections where the type material is housed today)
Siriella pacifica

CUMACEANS (1 species)

- Cumella* sp. (taken only once, at Bahía Concepción)

SHRIMPS (15 species)

- Alpheus lottini* (as *Crangon ventrosus*, a tropical trans-Pacific
snapping shrimp)
Alpheus wonkimi (as *Crangon* [= *Alpheus*] *malleator*, a snapping
shrimp)
Crangon sp. No. 1 (likely an unknown species of caridean shrimp,
but not a *Crangon*; many shrimps identified as *Crangon* by
Steinbeck and Ricketts proved to be alpheid shrimps)

Crangon sp. No. 2 (likely an unknown species of caridean shrimp, but not a *Crangon*; many shrimps identified as *Crangon* by Steinbeck and Ricketts proved to be alpheid shrimps)

Crangon sp. No. 3 (likely an unknown species of caridean shrimp, but not a *Crangon*; many shrimps identified as *Crangon* by Steinbeck and Ricketts proved to be alpheid shrimps)

Farfantepenaeus californiensis

Macrobrachium jamaicense (an amphi-American freshwater shrimp; source of specimen unknown)

Palaemon ritteri

Pontonia pinnae (a symbiont in the hatchet clam, *Pinna rugosa*)

Sicyonia penicillata (an offshore, deeper-water penaeid shrimp)

Synalpheus digueti

Synalpheus sanjosei

Synalpheus sanlucasi

Synalpheus townsendi

Synalpheus sp.

Phylum Mollusca (clams, snails, cephalopods, etc.): 176 species

Class Polyplacophora (15 species)

Acanthochitona exquisita

Acanthochitona sp.

Americhiton arragonites (as *Acanthochitona arragonites* in Phyletic Catalogue)

Callistochiton elenensis (as *Callistochiton infortunatus*, a junior synonym)

Callistochiton sp. (3 species of *Callistochiton* are known from the Gulf today: *C. colimensis*, *C. elenensis*, *C. palmulatus*)

Chaetopleura limaciformis

Chaetopleura aff. *lurida* (the “small, hairy chiton” of the Log; Central Gulf to Colombia)

Chiton virgulatus

Ischnochiton tridentatus

Lepidozona clathrata (as *Ischnochiton clathratus*, a junior synonym, in Phyletic Catalogue)

“Minute *Mopalia*-like form”

Nuttallina sp. cf. *allantophora* (*N. allantophora* is now a junior synonym of *Liolophura japonica*, a far-west Pacific species; it is probable that the expedition’s specimen was *Nuttallina crossota* Berry, 1956, the only species in this genus known from the Gulf today)

Stenoplax limaciformis (as *Ischnochiton limaciformis* in Phyletic Catalogue)

Stenoplax sonorana (as *Ischnochiton conspicuus*, a misspelling of the junior synonym, in Phyletic Catalogue)

Stenoplax sp. (7 species of *Stenoplax* are known from the Gulf today)

Class Scaphopoda (2 species)

Graptacme semipolitus (as *Dentalium semipolitus*, a junior synonym; the “striated” tusk shell from El Mogote)

Laevidentalium splendidum (as *Dentalium semipolitus*, a junior synonym; the “smooth” tusk shell from El Mogote)

Class Bivalvia (43 species)

Anadara multicostata (as *Arca multicostata*, a junior synonym)

Anadara tuberculosa (as *Arca tuberculosa*, a junior synonym)

Anomalocardia subrugosa

Anomia peruviana (known in Mexico as *papas fritas*, or the Peruvian jingle, this is the only species in the genus that occurs in the Gulf; cited as a “rock oyster” in the Narrative. Surprisingly, this is the only record of this very common species from the expedition. The Seri people make necklaces from these beautiful and delicate shells)

Arca mutabilis (as *Navicula mutabilis*, a junior synonym)

Arca pacifica (as *Navicula pacifica*, a junior synonym)

Arcopsis solida (as *Fossularca solida*, a junior synonym; the common “garbanzo clam” of the Gulf)

Atrina tuberculosa (the less common of two pen shells called *callo de hacha*, the other being *Pinna rugosa*)

Barbatia reeveana (the hairy ribbed mussel; one of the commoner Gulf arc shells)

Brachidontes semilaevis (as *Brachidontes multiformis*, a junior synonym)

Carditamera affinis (as *Carditamera affinis californica*; Steinbeck and Ricketts considered this “the commonest bivalve in the Gulf”; also common in shell middens in the Northern Gulf)

Chama echinata (as *Chama squamuligera*; Coan and Valentich-Scott [2012] consider *C. squamuligera* to be a white morph of *C. echinata*)

?*Chama frondosa* (as *Chama mexicana* Carpenter; noted as a species of *Spondylus* in the Narrative)

Chione californiensis (as *Chione succincta*, a junior synonym; one of the most common bivalves in the Gulf)

Chione sp.

Diplodonta subquadrata (as *Taras subquadrata*, a junior synonym)

- Divalinga eburnea* (as *Divaricella eburnea*, a junior synonym; Steinbeck and Ricketts described their specimen as “pearly-white” and ranging from Cape San Lucas to Panama; but this species has pale brown stripes and ranges throughout the Gulf to Peru and the Galapagos Islands; perhaps their specimen was an old, worn shell, or this is a misidentification)
- Dosinia dunkeri*
- Felaniella cornea* (as *Felaniella sericata*, a junior synonym)
- Fugleria illota* (the “triangular Arca” of the Log)
- Glovibenus fordii* (as *Anomalocaridia subrugosa*, a junior synonym)
- Gregariella coarctata* (misidentified as *Botulina opifex*, a West Atlantic species)
- Isognomon janus* (as *I. anomioides*, a junior synonym; a thin rock oyster)
- Isognomon recognitus* (as *I. chemnitziana* d’Orbigny, a junior synonym)
- Leukoma grata* (as *Protothaca grata*, a junior synonym)
- Lithophaga aristata*
- Lithophaga plumula* (“or similar”—a boring clam)
- Macoma indentata* (initially identified by H. Rehder as an undescribed species he intended to name *M. rickettsi*)
- Megapitaria aurantiaca* (as *Macrocallista aurantiaca*, a junior synonym; one of two species known as “chocolata clam,” or “almeja chocolata,” in Mexico)
- Megapitaria squalida* (as *Macrocallista squalida*, a junior synonym; one of two species called “chocolata clam,” or “almeja chocolata,” in the Gulf)
- Modiolus capax* (as *Volsella capax*, the bearded mussel; *Volsella* is a junior synonym of *Modiolus*)
- Ostrea* sp. (there are 7 true oysters [Ostreidae] in the Gulf, the most “Chama-like” being *Ostrea conchaphila*)
- “*Paphia*-like form” (probably a misidentification; there are no *Paphia* known to occur in the Gulf)
- Periglypta multicostata* (the “*Chione*-like form, 90 mm” in the Narrative)
- Pinctada mazatlanica* (the Panamic pearl oyster; surprisingly, this species was collected at only one site)
- Pinna rugosa* (the principal commercial Gulf hacha)
- ?*Ptera sterna* (as *Pinctada fimbriata* Dunker 1852; a likely misidentification; the “clam-like hacha” of the Narrative)
- Saccostrea palmula* (as *Ostrea cumingiana* Dunker 1846, and *O. mexicana*, both junior synonyms of *S. palmula*; a fairly common edible oyster found throughout the Gulf, and also common in Northern Gulf aboriginal shell middens)

Semele corrugata (the “unribbed *Paphia*-like form” in the Narrative; this species is not known to occur north of South America, and this is likely a misidentification of one of the other 21 species of *Semele* that do occur in the Gulf)

Spondylus princeps (reported as “*Spondlyus [sic]* sp. probably *limbatus* Sowerby”; *S. limbatus* is a junior synonym of *S. princeps*, the most common spiny oyster in the Gulf; surprisingly, this common species was collected only once in the Gulf)

Tagelus affinis

Tivela planulata

Trachycardium procerum

Class Gastropoda (111 species)

SHELLED GASTROPODS (90 species)

Acanthais triangularis (as *Thais triangularis*, a junior synonym)

Acanthina lugubris

Bulla gouldiana (reported from Puerto Escondido as the “undetermined bubble shell”; there are 3 species of bubble shells known from the Gulf today)

Callopoma fluctuosum (possibly a junior synonym of *Tegula brunnea* or *Chlorostoma brunneum fluctuosum*)

Cerithideopsis californica (as *Cerithidea mazatlanica*, a junior synonym; I disagree with the synonymy of *C. mazatlanica* and *C. californica*, as the two seem easy to distinguish from one another)

Cerithium maculosum (it is a mystery why the only tidal flat site at which Steinbeck and Ricketts collected this species was Puerto San Carlos, Sonora; this snail is very abundant on tidal flats throughout the Gulf, and they should have also collected it in the La Paz area, at Puerto Escondido’s inner bay, in Bahía Concepción, in San Carlos Bay, Baja, on the tidal flats at Bahía de los Ángeles, and at Esteros Agiabampo and de la Luna)

Chicoreus erythrostomus (= *Phyllonotus bicolor*, = *Hexaplex erythrostomus*; pink murex; shells only, on beach at Bahía Concepción). Hedgpeth’s (1978b) comment in a footnote that these large murexes “may be taken by the bushel in [shrimp] trawl hauls as far north as Puerto Peñasco” is telling. This was the case for many years, but by the 1990s they had been so decimated by trawlers, divers, and shore collectors that they were beginning to be scarce, and today they are rare on the coast of Sonora.

- Columbella fuscata*
Conus brunneus
Conus nux
Conus princeps
Coralliophila californica
Coralliophila costata
Coralliophila monodonta (as *Galeropsis madreporarum*, a junior synonym; Steinbeck and Ricketts were uncertain of this identification of the Puerto Lobos specimens)
Costoanachis coronata (as *Anachis coronata*)
Crassispira (Monilispira) monilifera (as *Monilispira monilifera*)
Crepidula incurva
Crepidula onyx (a slipper shell)
Crepidula striolata (as *Crepidula squama*, a junior synonym)
Crucibulum scutellatum (as *Crucibulum imbricatum*, a junior synonym)
Crucibulum spinosum
Diodora alta (misspelled in Phyletic Catalogue as “*Diadora*”)
Diodora inaequalis (misspelled as “*inequalis*” in Phyletic Catalogue)
Echinolittorina aspera (as *Littorina philippi*, a junior synonym)
Echinolittorina modesta (as *Nodilittorina modesta*)
Enaeta cumingii
Engina ferruginosa Reeve (the identity of this species is unclear, but it is likely what we now call *Morula nodulosa* or *Morula ferruginosa*)
Eualetes centiquadra, “or another vermetid snail”
Fissurella rugosa
Fusinus dupetitthouarsi (this is an offshore species that is frequently captured, and killed, by shrimp trawlers)
Heliacus bicanaliculatus (as *Heliacus radiatus*, a junior synonym)
Hexaplex brassica (as *Phyllonotus brassica*, a junior synonym; the cabbage murex)
Hexaplex princeps (as *Phyllonotus princeps*, a junior synonym)
Hipponix antiquatus
Liocerithium judithae (as *Cerithium sculptum*, a junior synonym; the “mid-tide minute spired snail” of the Narrative; one of the most common small snails in the Gulf)
Lottia atrata (as *Acmaea atrata*, a junior synonym)
Lottia dalliana (as *Acmaea dalliana*, a junior synonym)
Lottia discors (as *Acmaea discors*, a junior synonym)
“*Lottia gigantea*” (almost certainly a misidentification; this is a western Baja/California temperate species)
Lottia mesoleuca (as *Acmaea mesoleuca*, a junior synonym)
Lottia pediculus (as *Acmaea pediculus*, a junior synonym)

- Lottia strigatella* (as *Acmaea strigatella*, a junior synonym)
Mancinella tuberculata (as *Thais tuberculata* and *Neorapana tuberculata*)
Melampus olivaceous (an intertidal pulmonate)
Melongena patula
Migra tristis (as *Strigatella dolorosa*, a junior synonym)
Mitrella densilineata (as *Nitidella densilineata*, a junior synonym)
Mitrella guttata (as *Nitidella guttata*, a junior synonym; this species, one of the most common small snails in the Gulf, is considered a synonym of *Mitrella/Columbella ocellata* by some workers, but the latter is a trans-Atlantic species)
Mitrella santabarbarensis (as *Anachis reevei*, a junior synonym)
Murex rectirostris (likely a misidentification of *Murex elenensis* of *M. recurvirostris*)
Muricopsis armatus (as *Muricopsis squamulata*, a junior synonym)
Naria albuginosa (= *Cypraea albuginosa*)
Nassarius iodes (as *Nassarius ioaedes*)
Nassarius luteostomus
Nassarius tiarula (as *Nassarius tegula*, a junior synonym)
Natica chemnitzii (the “variegated *Polinices*-like form” of the Log)
Neverita reclusiana (as *Polinices reclusianus*, a junior synonym of *Polinices reclusiana*, misspelled in the Log)
Nodilittorina modesta
Oliva venulata
Olivella dama (as *Oliva dama*)
Ovulidae (there are 7 ovulid species known from the Gulf today)
Parametaria epamella (as *Parametaria coniformis*, a junior synonym; originally described as *Columbella epamella*)
Phyllonotus erythrostomus (as *Phyllonotus bicolor*, a junior synonym; the pink-mouth murex; Steinbeck and Ricketts found this to be the most common large snail of their expedition—indeed, it was once the most common littoral and shallow subtidal large snail throughout the Gulf, but no longer, due to intense over-collecting; large specimens are now exceedingly rare intertidally)
Pleuroploca princeps (as *Fasciolaria princeps*, a junior synonym)
Plicopurpura patula (as *Purpura patula*, a junior synonym, as is *Purpura pansa*; one of the purple dye snails)
Polinices bifasciatus (moon snail)
Polinices uber (moon snail)
Pseudozonaria annettae (= *Cypraea annettae*, = *Zonaria annettae*, = *C. sowerbyi*, = *C. ferruginosa*)

Purpura sp. (the genus *Purpura* has been split into several genera, including *Plicopurpura* and *Pteropurpura*; at least 6 species in these 2 genera occur in the Gulf today)

Simnialena inflexa (as *Simnia variabilis*, a junior synonym; Ovulidae)

Siphonaria aequiliorata (misspelled as “*aequilirata*”; an intertidal pulmonate; this is the “sand flat limpet” of the Narrative)

Siphonaria maura (as *Simnia variabilis*; a limpet-like intertidal pulmonate)

Stramonita haemastoma (as *Thais biserialis*, a junior synonym)

Strombina maculosa

Strombus galeatus

Strombus gracilior (presumably the “stalk-eyed conchs” of the Log)

Strombus spp. (taken with a crab net, baited with fish guts)

Tectura fascicularis (as *Acmaea fascicularis*, a junior synonym)

Tegula impressa

Tegula mariana

Tegula rugosa (today, this is probably the most common species of *Tegula* in the Gulf)

Tegula sp.

Terebra variegata

Thais planospiral (known locally as *ojo de Judas*)

Thylacodes squamigerus (as *Aletes squamigerus*, a junior synonym; also = *Aletes squamigerus*—the scaled worm snail; this species is not reported from the Gulf today, so the identity of these specimens is unclear)

Turbo fluctuosus (as *Callopora fluctuosum*, a junior synonym; probably the most common mid-size gastropod in the Gulf)

“Undetermined bubble shell”

Vasula speciosa (as *Thais centiquadrata*, a junior synonym; this species has had a tortuous nomenclatural history—other synonyms include *Thais speciosa*, *Purpura speciosa*, *Purpura centriquadra*, *Manciella speciosa*, and *Purpura triserialis*)

Vermetus contortus (a worm snail strongly resembling a serpulid polychaete)

Vermicularia pellucida eburnea (as *Vermicularia eburnea*; the species was sunk into *V. pellucida*, which has several subspecies)

SLUGS (21 species)

Aclesia rickettsi (as “*Notarchus (Aclesia)* sp.” in Phyletic Catalogue; apparently this sea slug has not been reported since MacFarland’s original description in 1966)

Aegires sp. (the “small, elongate, dotted” slug of the Log; only one species in this genus is known from the Gulf today, *A.*

albopunctatus)

Aplysia californica (sometimes as “*Tethys* sp. probably *californica*”)

Berthella sp. (as *Berthella plumula* in Phyletic Catalogue, which is an Atlantic species; there are 3 described species in this genus known from the Gulf)

Berthellina ilisima (as *Berthellina engeli*; the apricot slug)

Diodora alta (misspelled in Phyletic Catalogue as “*Diadora*”)

Diodora inaequalis (misspelled as “*inequalis*” in Phyletic Catalogue)

Dolabella auricularia (as “*Dolabella* sp. probably *californica*” in Phyletic Catalogue, a junior synonym)

Doris umbrella

Elysia diomedea (= *Tridachiella diomedea*, the famous Gulf “Mexican/Spanish dancer” nudibranch; Steinbeck and Ricketts note it was “possibly the most common nudibranch” they encountered; it is still very common, except where tide-pool tourists have taken them in excess)

“Giant sea hares” (= *Aplysia californica*?)

Haminoea virescens (as *Haminoea strongi*, a junior synonym, in Phyletic Catalogue)

Hoffmannola lesliei (as *Onchidium lesliei* in Phyletic Catalogue)

“Large seal-brown nudibranch”

Melibe leonina (as *Chioraera leonina*, a junior synonym; the “pelagic nudibranch also found in Puget Sound”; the existence of this species in the Gulf is still uncertain)

Onchidella binneyi

Pleurobranchidae (unidentified slug)

Pleurobranchus digueti (the “red tectibranch” of the Log)

“Small white *Cadlina*-like dorid”

Stylocheilus striatus (as *Stylocheilus longicauda*)

Unidentified dorid nudibranch

Class Cephalopoda (5 species)

Doryteuthis opalescens (as *Loligo opalescens*, a junior synonym; taken from a Japanese shrimp trawler just south of Guaymas; identified by S. Stillman Berry but likely a misidentification because *D. opalescens*, the California market squid, is a temperate species that doesn't do well in warm waters, although it ranges south as far as the central west coast of Baja California)

Larval male Loliginidae (taken by night-lighting; identified by S. Stillman Berry)

Lolliguncula panamensis (the Panama brief squid; taken from a Japanese shrimp trawler just south of Guaymas; identified by S. Stillman Berry)

Octopus bimaculatus

Octopus sp. (not *O. bimaculatus*; there are 9 species of *Octopus* in the Gulf)

Phylum Hemichordata, Class Enteropneusta (acorn worms): 2 species

Balanoglossus sp.

Ptychodera flava

Phylum Chordata, Subphylum Urochordata/Tunicata (sea squirts): 11 species

Aplidium californicum (= *Amaroucium californicum*; a wide-ranging East Pacific compound tunicate)

Ascidia sp. (a solitary tunicate; noted in the Narrative as “large sea-squirt the color of water”; there are 3 species of *Ascidia* known from the Gulf today—*A. sydneyensis*, *A. interrupta*, and *A. ceratodes*—it is likely their specimen was one of these, and possibly *A. interrupta* which fits their description and is the most common of the three)

Botrylloides diegensis

Clavelina sp. (Steinbeck and Ricketts speculated this was an undescribed species; there is only one species of *Clavelina* known from the Gulf today, *C. fasciculata*)

Cystodytes dellechiajei

Didemnum carnulentum (a compound tunicate)

Didemnum vanderhorsti (a compound tunicate)

Eudistoma sp. (Steinbeck and Ricketts speculated that this might be an undescribed species; 2 *Eudistoma* species are currently known from the Gulf, *E. mexicanum* and *E. psammion*)

Polyclinum sp. (2 species of *Polyclinum* are known from the Gulf today, *P. laxum* and *P. vasculosum*; however, the tunicate fauna of the Gulf has never been carefully studied)

Pyura sp. (the “red sea squirt” of the Log; likely *P. lignosa*, a common simple tunicate ranging from the Central Gulf to at least Costa Rica)

Trididemnum opacum (a compound tunicate)

Phylum Chordata, Subphylum Cephalochordata (lancelets): 1

Branchiostoma californiense (the common Gulf lancelet)

Table 3. Numbers of Invertebrate Species Taken at Each Collecting Station by the 1940 Steinbeck-Ricketts Sea of Cortez Expedition

Collection No. 1 (March 16). Offshore (outside) Magdalena Bay (southwest Baja California Peninsula). 3 species.

Collection No. 2 (March 18). Cabo San Lucas. 53 species.

Collection No. 3 (March 19). Pulmo Reef. 85 species.

Collection No. 4 (March 20). Isla Espíritu Santo, Punta Lobos. 115 species.

Collection No. 5 (March 21). La Paz, sand flats with rocks and dead coral. 73 species.

Collection No. 6 (March 22). La Paz, El Mogote (tidal flats with mangroves). 76 species.

Collection No. 7 (March 21–22). La Paz, Bahía La Paz, Misc. rocky shore collecting. 21 species.

Collection No. 8 (March 23). Isla San José, Islote Cayo. 20 species.

Collection No. 9 (March 24; Easter Sunday). Isla San Jose, Bahía Amortajada. 2 species.

Collection No. 10 (March 24, Easter Sunday; morning of March 25). Punta/Bahía San Marcial. 63 species.

Collection No. 11 (March 25). Puerto Escondido, outer bay. 79 species.

Collection No. 12 (March 27). Puerto Escondido, inner bay. 24 species.

Total species count for Puerto Escondido = 95 species.

Collection No. 13 (March 27). Isla Coronado, Loreto area. 61 species.

Collection No. 14 (March 28–29). Bahía Concepción. 91 species.

Collection No. 15 (March 30). San Lucas Cove. 60 species.

Collection No. 16 (March 30–31). Bahía San Carlos, Baja California. 58 species.

Collection No. 17 (March 31). Bahía de San Francisquito. 30 species.

Collection No. 18 (April 1). Bahía de Los Ángeles. 88 species rocky shores, 8 species tidal flats, 3 species Ballenas Canal = 99 species.

Collection No. 19 (April 2). Isla Ángel de la Guarda, Puerto Refugio. 92 species.

Collection No. 20 (April 3). Isla Tiburón, Red Bluff Point/Punta Colorado. 58 species.

Collection No. 21 (April 4). Sonora, Guaymas area, Puerto San Carlos. 47 species.

Collection No. 22 (April 10). Sonora, Estero de la Luna (S of Guaymas). 34 species.

Collection No. 23 (April 11). Sonora, Estero Agiabampo. 14 species.

Collection No. 24 (April 12). Isla Espíritu Santo, Bahía San Gabriel. 78 species.

Table 4. Annotated List of Invertebrate Species, by Station, Collected by the 1940 Steinbeck-Ricketts Sea of Cortez Expedition

These species records are from several sources. First, from the Narrative and Annotated Phyletic Catalogue of *The Sea of Cortez: A Leisurely Journal of Travel and Research*. This is updated using information in Ricketts's post-expedition correspondence with taxonomic specialists, and then further updated with museum collections records from the Smithsonian Institution's National Museum of Natural History (USNM, denoted with *) and San Francisco's California Academy of Sciences (CAS, denoted with **). Finally, all of the species names are updated based on the post-1940 taxonomic literature (e.g., the Macrofauna Golfo database: <http://www.desertmuseum.org/center/seaofcortez/database.php>). See previous site descriptions for details on localities.

Many of the identifications given in *Sea of Cortez* are incorrect or questionable, and a great many of the expedition's species have undergone name changes since 1940, either through taxonomic revisions or simple nomenclatural changes. In fact, about 30% of the names in the Phyletic Catalogue have been updated or are questionable, and these are noted in the following lists. The invertebrate fauna of the Sea of Cortez is still relatively poorly known, and many groups have still not

benefited from any specialist concentrating in the region (e.g., cnidarians, brachiopods, nematodes, hemichordates, tunicates). The smaller phyla are essentially unknown for the region—Xenacoelomorpha, Gastrotricha, Entoprocta, Gnathostomulida, Micrognathozoa, Rotifera, Phoronida, Kinorhyncha. Steinbeck and Ricketts (hereafter, S&R) often used names of temperate California species they were familiar with, when, in fact, the Gulf specimens in question were similar-appearing, but different, tropical species. However, S&R were keenly aware that they were working in a faunal region (which they called the Panamic Region, but today is usually referred to as the Tropical Eastern Pacific Biogeographic Region) vastly different from the one they knew best, the Temperate Northeast Pacific. They noted that a biologist from Monterey (California) entering the Sea of Cortez at Cabo/Cape San Lucas “would find himself in a territory wholly unfamiliar zoologically” (*Sea of Cortez*, p. 297). They even noted the phenomenon of “look-alike ecological equivalents” (described in some detail in Brusca 1980a), stating, “Unfamiliar animals would be found inhabiting familiar ecological niches.” And further, “*Pisaster* would be replaced by the many-rayed *Heliaster* which clings equally tightly; *Strongylocentrotus* spp. by *Echinometra vanbrunti*” (*Sea of Cortez*, p. 298). In some cases, S&R did not distinguish between closely related species (probably because they were unaware of them). For example, during the expedition, they assumed that all *Heliaster* were *H. kubiniji*, whereas some specimens they saw, especially in the Cabo San Lucas/La Paz region, could have been *H. microbrachius*, and they seemed to assume that all (or most) of the swimming crabs were *Callinectes bellicosus* although there are several other similar species.

As noted in *Sea of Cortez* (p. 306), for many of the animal groups S&R collected, little information existed in 1940 for the Sea of Cortez or Tropical Eastern Pacific in general, such as sponges (Porifera), sea anemones, alcyonarians, flatworms (Platyhelminthes), sipunculans, echiurans, and sea squirts (Urochordata). In fact, they had so little information to go on for the anemones and alcyonarians that they did not even include them in the Phyletic Catalogue, although they did collect specimens in these phyla that were worked on by specialists later in time and these are included in the following lists.

I estimate ~557 species were collected by the expedition, about 40 of which were new to science and have since been named and described (perhaps another dozen or so still remain undescribed).

Abbreviations Used

Sea of Cortez = the book, *Sea of Cortez: A Leisurely Journal of Travel and Research*
 Narrative = Narrative (or “Log”) section of the book *Sea of Cortez*

Phyletic Catalogue = Annotated Phyletic Catalogue (Appendix) of the book *Sea of Cortez*

S&R = Steinbeck and Ricketts

Gulf = Gulf of California/Sea of Cortez

BC = Baja California

BCS = Baja California Sur

ANNOTATED COLLECTION LISTS

The species lists below, for each collecting station, follow the same taxonomic order of phyla as that in the Phyletic Catalogue in *Sea of Cortez*. In all of Ricketts's writings, he consistently ordered the animal phyla such that Echinodermata was placed near Mollusca, rather than with the other deuterostome phyla (Hemichordata and Chordata). The concept of the Deuterostomia, while first proposed over 100 years ago, did not become firmly codified in the minds of American biologists until the work of Libbie Hyman and others in the 1950s. Thus, the sequence of phyla in the Phyletic Catalogue and the following lists is:

Porifera
 Cnidaria/Coelenterata
 Platyhelminthes/Turbellaria
 Nemertea
 Bryozoa/Ectoprocta
 Sipuncula
 Echiura
 Annelida/Polychaeta
 Echinodermata
 Arthropoda
 Mollusca
 Hemichordata/Enteropneusta
 Chordata/Urochordata/Tunicata
 Chordata/Cephalochordata

March 16: Outside Magdalena Bay, SW coast of Baja California Peninsula.
Collection No. 1 (p. 45 in the Narrative)

Note: The Narrative section of the *Sea of Cortez* states this collection was from the vicinity of Bahía Magdalena, but the Phyletic Catalogue, p. 474, states "S of Punta Abrejos," (misspelled as "Abrojos"). Punta Abrejos is near Laguna San Ignacio, far north of Bahía Magdalena.

Hawksbill turtle *Eretmochelys imbricata* harpooned, with symbiotic hydroids (*Obelia dichotoma*) and pelagic crabs ("*Planes minutus*"). *Planes minutus* is an Atlantic and Indian Ocean species; it is likely the crab they found was *Planes major* (a well-known facultative symbiont of sea turtles, especially loggerhead turtles). Turtle's gut filled with the pelagic red crab *Pleuroncodes planipes*. *Pleuroncodes planipes* were also found in schools offshore.

March 18: Cabo/Cape San Lucas, BCS. Collection No. 2 (p. 58 in the Narrative)

Leucetta losangelensis (the most common calcareous sponge in the Gulf, and one of the most common sponges in the region)
Sertularia versluysi (a transisthmian hydroid species)
Leptogorgia rigida ("purple pendant gorgonian" of the Narrative)

- **Zoanthus depressus* (holotype; type locality)
- ***Pleurobranchus areolatus* (almost certainly a misidentification of *Pleurobranchus digueti*)
- “*Planocera*-like forms” (flatworms)
- Crisia* sp. (this was likely *C. operculata* Robertson, 1910)
- **Apionsoma misakianum* (as *Phascolosma hesperum*, a junior synonym; = *Golfingia hespera*)
- Polydora* sp. (attached to the tube of *Spirobranchus*; likely either *P. citron* or *P. websteri*, both described by Olga Hartman in the mid-1940s)
- Eupomatus* sp. (minute serpulids attached to tube of *Spirobranchus*; 3 species of *Eupomatus* are known from the Gulf today: *E. brachyacantha*, *E. recurvispina*, *E. uncinatus*)
- Spirobranchus incrassatus* (a large worm with anastomosing calcareous tubes; spiral gills banded red, white, and black)
- Heliaster kubiniji* (the most common of the Gulf sun stars)
- Pentacerastrum cumingi* (as *Oreaster occidentalis*, a junior synonym; a widespread Tropical East Pacific species)
- **Ophiocoma alexandri*
- Eucidaris thouarsii* (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)
- ***Echinometra vanbrunti*
- Holothuria lubrica* (= *Slenkothuria lubrica*; the sulfur cucumber; the most common sea cucumber taken during the expedition, and the most common cucumber in the Gulf littoral today)
- Tetraclita stalactifera* (as *Tetraclita squamosa stalactifera*)
- Chthamalus anisopoma*
- Megabalanus californicus* (as *Balanus tintinabulum californicus*)
- ***Megabalanus peninsularis* (as *Balanus tintinabulum peninsularis*)
- Balanus trigonus*
- Petrolisthes hians* (as *Pisosoma flagraciliata*, a junior synonym)
- ***Petrolisthes edwardsii*
- Grapsus grapsus* (Sally Lightfoot crab; taken at all rocky shore stations)
- Pachygrapsus socius* (as *Pachygrapsus transversus* in Phyletic Catalogue, an Atlantic species)
- ***Percnon gibbesi*
- Thoe sulcata*
- Pilumnoides* sp. (juvenile; there is only one species in this genus reported from the Gulf today, *P. rotundus*, described in 1940 and rare in the Gulf)
- Isognomon janus* (as *I. anomioides*, a junior synonym; very common, thin rock oyster on rocky shores in the Gulf)
- Saccostrea palmula* (as *Ostrea cumingiana* Dunker 1846, and *O. mexicana*, both junior synonyms of *S. palmula*; this is a fairly common edible oyster found throughout the Gulf, and also common in Northern Gulf shell middens)
- Chama echinata*
- Siphonaria aequiliorata* (misspelled as “*aequilirata*”; an intertidal pulmonate; this is the “sand flat limpet” of the Narrative)
- **Siphonaria maura* (as *Simnia variabilis*; an intertidal limpet)

**Conus nux*

**Echinolittorina modesta* (as *Nodilittorina modesta*)

**Simnialena inflexa* (Ovulidae)

Mitrella santabarbarensis (as *Anachis reevei*, a junior synonym)

Columbella fuscata

Mitrella densilineata (as *Nitidella densilineata*, a junior synonym)

Mitrella guttata (as *Nitidella guttata*, a junior synonym; this species, one of the most common small snails in the Gulf, is considered a synonym of *Mitrella/Columbella ocellata* by some workers, although the latter is a trans-Atlantic species)

Coralliophila californica

Plicopurpura patula (as *Purpura patula*, a junior synonym, as is *Purpura pansa*; one of the purple dye snails)

Stramonita haemastoma (as *Thais biserialis*, a junior synonym)

Vasula speciosa (as *Thais centiquadrata*, a junior synonym; this species has had a tortuous nomenclatural history—other synonyms include *Thais speciosa*, *Purpura speciosa*, *Purpura centriquadra*, *Manciella speciosa*, and *Purpura triserialis*)

Echinolittorina modesta (as *Littornia conspersa*, a junior synonym)

Lottia atrata (as *Acmaea atrata*; with the barnacle *Chthamalus anisopoma* attached)

Lottia discors (as *Acmaea discors*)

Tectura fascicularis (as *Acmaea fascicularis*)

Pleurobranchus digueti (the “red tectibranch” of the Narrative)

Didemnum carnulentum

Trididemnum opacum

Also mentioned in the Narrative: 5 types of sponges, brachiopods, no chitons

March 19: Cabo Pulmo/Bahía Pulmo Reef, BCS. Collection No. 3 (p. 76 in the Narrative)

Chondrosia reniformis

Muricea austera (“large fleshy gorgonian” in the Narrative)

Pacificorgia adamsi (as *Gorgonia adamsi*; “lacy sea fans”)

***Leptogorgia rigida*

Astrangia pedersenii (a solitary coral and one of 11 *Astrangia* species in the Gulf; considered a junior synonym of *A. haimei* by Squires 1959)

Porites cf. *porosa* (on sand bottom adjacent to reef) (= *P. panamensis* of most, but not all modern workers; this species is protected by Mexican federal law)

Pocillopora capitata (a major reef-building coral in Pulmo Bay). Reyes (1992) considers *P. robusta* and *P. porosa* to be junior synonyms of *P. capitata*. Many species of *Pocillopora* have been reported from the Gulf, but their taxonomy and nomenclature are still not well resolved.

Pocillopora capitata capitata (probably a misidentification of *Pocillopora meandrina*)

**Pocillopora meandrina*

Stylochus sp. or spp. (undescribed flatworm/Platyhelminthes; this might have been *S. atentaculatus* described by Hyman in 1953)

- Membranipora tuberculata* (a common bryozoan ranging from California to Peru)
- Halosydna glabra* (a scale worm described the year before the expedition)
- Eurythoe complanata* (the ubiquitous fire worm; found at every rocky shore site S&R visited)
- Anaitides madeirensis* (an elongate phyllodocid polychaete)
- Ophiodromus pugettensis* (as *Podarke pugettensis*; S&R found it only in the ambulacral groove of *Oreaster occidentalis*, but it is known to be a symbiont in several Gulf sea stars)
- Odontosyllis* sp. (there are 4 species of *Odontosyllis* known from the Gulf: *O. heterodonta*, *O. phosphorea*, *O. polycera*, *O. undecimdongta*; the last was described and named by Olga Hartman in 1964, who identified the S&R polychaetes)
- Eunice aphroditois*
- Eunice antennata* (a wide-ranging polychaete occurring from Southern California to Ecuador; the “*Lumbrinereis*-like form” in the Narrative)
- Idanthyrsus pennatus* (a circumtropical terebellid polychaete)
- Heliaster kubiniji*
- Phataria unifascialis*
- Pharia pyramidata*
- Nidorellia armata* (a very common shallow-water sea star in the Gulf, but collected by S&R only at Pulmo Reef and Puerto Escondido)
- Mithrodia bradleyi*
- Pentaceraster cumingi* (as *Oreaster occidentalis*, a junior synonym; a widespread Tropical East Pacific species)
- Ophiothrix spiculata*
- Ophiothrix rudis* (an uncommon brittle star ranging from the Southern Gulf to southern Mexico; most often reported from corals but both species of *Ophiothrix* in the Gulf live commensally with other organisms)
- **Ophiactis simplex* (the small, 5- or 6-armed brittle star)
- **Ophiocoma alexandri*
- Eucidaris thouarsii* (the commonest sea urchin in the Gulf; collected “at practically every suitable collecting place”)
- Echinometra vanbrunti*
- Arbacia incisa* (these are the urchins S&R noted at Pulmo Reef, “penetrated all but the heaviest part of the soles of our rubber boots”)
- Afrocucumis ovulum* (as *Euthyonidiium ovulum*; an uncommon species known only from the Central and Southern Gulf, south to Peru; taken only at this location)
- Megabalanus peninsularis* (as *Balanus tintinabulum peninsularis*)
- **Alpheus wonkimi* (as *Crangon* [= *Alpheus*] *malleator*, a snapping shrimp)
- **Alpheus lottini* (as *Crangon ventrosus*, a tropical trans-Pacific snapping shrimp)
- Trapezia* spp. (red coral crabs)
- Mithrax denticulatus* (= *M. areolatus*; spider crab)
- **Exosphaeroma yucatanum* (almost certainly a misidentification of some other sphaeromatid isopod; *E. yucatanum* is a west Atlantic species)
- Tetraclita stalactifera* (as *Tetraclita squamosa stalactifera*)
- ***Alpheus lottini*
- ***Synalpheus sanlucasi*

Synalpheus sanjosei

Synalpheus digueti

Synalpheus sp.

Calcinus californiensis (one of the most attractive hermit crabs in the Gulf)

Pachycheles biocellatus (formerly *Petrolisthes biocellatus*; living in coral interstices)

Pachycheles panamensis (formerly *Pachycheles sonorensis*)

Pachycheles setimanus (formerly *Petrolisthes setimanus*; living in coral interstices)

Pachycheles sp. (6 species of *Pachycheles* are known from the Gulf today)

Petrolisthes hians (as *Pisosoma flagraciliata*, a junior synonym)

Thoe sulcata

***Mithraculus denticulatus* (as *Mithrax areolatus*, a junior synonym; common)

Platypodiella rotundata (as *Platypodia rotundata*)

Daira americana

Pilumnus pygmaeus (an uncommon hairy crab of the Southern Gulf)

Eriphia squamata (“old lumpy claws”; a very common, small, pugnacious xanthid crab ranging from the Upper Gulf to Peru)

Domecia hispida (as *Eriphides hispida*, a junior synonym of this circumtropical coral-inhabiting crab)

Trapezia bidentata (as *Trapezia cymodoce ferruginea*, a junior synonym; the “cherry-colored coral crab” in the Narrative)

Trapezia digitalis (common among the coral heads)

***Trapezia* sp. (perhaps *T. digitalis*)

Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations)

Pachygrapsus socius (as *Pachygrapsus transversus*, an Atlantic species)

Isognomon janus (as *I. anomioides*, a junior synonym; very common, thin rock oyster on rocky shores in the Gulf)

Ostrea sp. (reported as a “*Chama*-like form”; there are 7 true oysters [Ostreidae] in the Gulf, the most “*Chama*-like” being *Ostrea conchaphila*)

Gregariella coarctata (misidentified as *Botulina opifex*, a west Atlantic species; a fairly common boring clam in the Gulf)

Brachidontes semilaevis (as *Brachidontes multiformis*, a junior synonym; a very common small mytilid mussel in the Gulf)

Lithophaga aristata

Chama echinata (attached by the left valve to rocks; this is the “oyster-like form [*Spondylus?*]” from the Narrative)

Siphonaria maura (as *Siphonarea pica*, a junior synonym; the “stellate *Acmaea*” of the Narrative)

Coralliophila monodonta (as *Galeropsis madreporarum*, a junior synonym)

Vermetes contortus (a worm snail strongly resembling a serpulid polychaete)

Hexaplex princeps (as *Phyllonotus princeps*, a junior synonym)

Thais planospiral (known locally as “ojo de Judas”)

*Ovulidae

**Simmialena inflexa* (as *Simnia variabilis*, a junior synonym; Ovulidae)

Naria albuginosa (= *Cypraea albuginosa*)

Vermicularia pellucida eburnea (as *Vermicularia eburnea*; the species was sunk into *V. pellucida*, which has several subspecies)

Crepidula striolata (as *Crepidula squama*, a junior synonym)
Lottia atrata (as *Acmaea atrata*, a junior synonym)
Lottia discors (as *Acmaea discors*, a junior synonym)
Tectura fascicularis (as *Acmaea fascicularis*, a junior synonym)
Diadora alta (misspelled in Phyletic Catalogue as “*Diadora*”)
Fissurella rugosa
Aplidium californicum (= *Amaroucium californicum*; wide-ranging East Pacific compound tunicate; the tunicates of the Gulf of California have not yet been carefully studied)
 Also mentioned in narrative: “probably *Phyllonotus regius*” (presumably *Chicoreus erythrostomus*), sipunculans, anemones, octopus

March 20: Isla Espíritu Santo, Punta Lobos (S end of island). Collection No. 4 (p. 91 in the Narrative)

Aaptos vannamei (questionable identification of a black sponge)
Geodia mesotriaena (the most commonly encountered sponge of the expedition)
Haliclona ecbasis (this species has apparently been reported from the Gulf by no one else)
Leucetta losangelensis (the most common calcareous sponge in the Gulf, and one of the most common sponges in the Tropical East Pacific)
 **Porites californica* “massive form” (as *P. porosa*, a junior synonym; S&R correctly noted this was the commonest coral on Gulf shores, occurring as dome-shaped encrusting heads 8 inches in diameter)
 **Phyllactis concinnata* (anemone)
 **Telmatactis panamensis* (anemone)
Stylochus sp. or spp. (undescribed flatworm/Platyhelminthes; this might have been *S. atentaculatus* described by Hyman in 1953)
Baseodiscus mexicanus (the largest and most distinctive nemertean in the Gulf, and apparently the only species S&R collected)
 **Themiste hennahi* (as *Dendrostoma lissum*, sipunculan) (holotype; type locality)
 **Phascolosoma elachum* (sipunculan) (holotype; type locality)
Phascolosoma agassizii (as *Physcosoma agassizii*, a junior synonym)
Phascolosoma sp., cf. *P. gouldii* (S&R speculated this was an undescribed species, but it may have been one of the other two species of *Phascolosoma* now known from the Gulf: *P. nigrescens*, *P. perlucens*, or even some other genus)
 **Siphonides rickettsi* (sipunculan) (holotype; type locality)
Ochetostoma edax (type specimen of a new spoon worm)
Antillesoma antillarum (as *Physcosoma antillarum*, a junior synonym; a cosmopolitan species)
Iphione ovata (a tropical scale worm)
Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the expedition visited)
Eunice afra (a single specimen of this Gulf endemic polychaete was taken)
Eunice aphroditois
Eunice schemacephala (this is a tropical West Atlantic species and possibly was a misidentification; there are 2 dozen species of *Eunice* known from the Gulf today)

- Oenone fulgida* (as *Aglaurides fulgida*; a Tropical East Pacific polychaete)
Eualetes centiquadra, or another vermetid snail
Chaetopleura limaciformis
Heliaster kubiniji
 ***Astrometis sertulifera*
 ***Echinaster tenuispina*
Phataria unifascialis
Pharia pyramidata
Mithrodia bradleyi
Pentacaster cumingi (as *Oreaster occidentalis*, a junior synonym; a widespread Tropical East Pacific species)
Ophiocoma aethiops
Ophiocoma alexandri
 **Ophiothrix spiculata*
Ophionereis annulata
Ophioderma teres
Ophioderma panamense (for some reason this is the only locality at which the expedition collected this very common littoral species, which occurs throughout the Gulf)
Eucidaris thouarsii (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)
Echinometra vanbrunti
Arbacia incisa
Diadema mexicanum (= *Centrechinus mexicanus*; curiously, S&R collected this common, toxic-spined species only twice, at Punta Lobos and at Marcial Point)
Tripneustes gratilla (= *Tripneustes depressus*; a trans-Pacific species; collected only at this locality)
Holothuria arenicola (a circumtropical species common in the Gulf)
Holothuria difficilis (a circumtropical species, taken only at this locality)
Holothuria impatiens (a circumtropical species; S&R describe this as the second most common sea cucumber from their expedition)
Holothuria kefersteini
Holothuria lubrica (= *Slenkothuria lubrica*; the sulfur cucumber; the most common sea cucumber taken during the expedition, and the most widespread and abundant sea cucumber in the Gulf today). Ricketts’s field notes from this station read, “present by the millions.” One specimen had a commensal pearl fish living in it, *Encheliophiops hancocki* Reid.
Holothuria languens (two color varieties taken at Punta Lobos—“one was yellowish; the other mottled”)
Chiridota aponocrita (a small synaptid cucumber, taken only at this locality)
Isostichopus fuscus (not in Phyletic Catalogue, but identified by E. Deichmann)
 **Neogonodactylus zacae* (as *Gonodactylus oerstedii*, which is actually a West Atlantic species; the specimens were re-examined by Ray Manning in 1972 and described as the new species *Gonodactylus zacae*, later moved to *Neogonodactylus*)
 **Neogonodactylus stanschi* (as *Gonodactylus stanschi*)

- Tetraclita stalactifera* (as *Tetraclita squamosa stalactifera*)
Chthamalus anisopoma
Pontonia pinnae (a symbiont in the hatchet clam, *Pinna*)
Crangon sp. No. 1 (likely an unknown species of caridean shrimp, but not a *Crangon*; many shrimps identified as *Crangon* by S&R proved to be alpheaoid shrimps)
Crangon sp. No. 2 (likely an unknown species of caridean shrimp, but not a *Crangon*; many shrimps identified as *Crangon* by S&R proved to be alpheaoid shrimps)
Crangon sp. No. 3 (likely an unknown species of caridean shrimp, but not a *Crangon*; many shrimps identified as *Crangon* by S&R proved to be alpheaoid shrimps)
Synalpheus sanlucasi
Calcinus californiensis (one of the most distinctive and attractive hermit crabs in the Gulf)
Pluroncodes planipes (“carapaces found washed ashore in hordes”)
Petrolithes hirtispinosus (a common porcelain crab in the Gulf)
Petrolithes nigrunguiculatus (a common porcelain crab in the Gulf)
Megalobrachium sinuimanus (as *Pisonella sinuimanus*)
Petrolithes lewisi (as *Pisosoma lewisi*)
 ***Xanthodius cooksoni*
Thoe sulcata
Mithraculus denticulatus (as *Mithrax areolatus*, a junior synonym; common)
Microphtys platysoma
Platypodiella rotundata (as *Platypodia rotundata*)
Xanthodius cooksoni (as *Leptodius cooksoni*, a junior synonym)
Epixanthus tenuidactylus (as *Ozius tenuidactylus*, a junior synonym)
 ***Eriphia squamata* (“old lumpy claws”; a very common, small, pugnacious xanthid crab ranging from the Upper Gulf to Peru)
Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations)
Arcopsis solida (as *Fossularca solida*, a junior synonym; the common “garbanzo clam” of the Gulf)
Arca mutabilis (as *Navicula mutabilis*, a junior synonym; the “minute *Zirfaea*-like form” of the Narrative)
Pinna rugosa (the principal commercial Gulf hacha)
Isognomon janus (as *I. anomioides*, a junior synonym; very common, thin rock oyster on rocky shores in the Gulf)
Carditamera affinis (as *Carditamera affinis californica*; S&R considered this “the commonest bivalve in the Gulf”; common in Northern Gulf aboriginal shell middens, where they appear to have been fashioned into pendants)
Chama echinata (as *Chama squamuligera*; Coan and Valentich-Scott [2012] consider *C. squamuligera* to be a white morph of *C. echinata*)
Chaetopleura aff. *lurida* (the “small, hairy chiton” of the Narrative; *C. lurida* ranges from the Central Gulf to Colombia)
Stenoplax limaciformis (as *Ischnochiton limaciformis* in Phyletic Catalogue)
Conus brunneus
 **Conus nux*

**Conus princeps*

**Nodilittorina modesta* (gastropod)

Crassispira (*Monilispira*) *monilifera* (as *Monilispira monilifera*)

Mitra tirstis

Mitrella guttata (as *Nitidella guttata*, a junior synonym; this species, one of the most common small snails in the Gulf, is considered a synonym of *Mitrella/Columbella ocellata* by some workers, but the latter is a trans-Atlantic species)

Coralliphila costata

?*Quoyula madreporarum* (as *Galeropsis madreporarum*, a junior synonym; S&R were uncertain of this identification of the Puerto Lobos specimens)

Hexaplex princeps (as *Phyllonotus princeps*, a junior synonym)

Vasula speciosa (as *Thais centiquadrata*, a junior synonym; this species has had a tortuous nomenclatural history—other synonyms include *Thais speciosa*, *Purpura speciosa*, *Purpura centriquadra*, *Manciella speciosa*, and *Purpura triserialis*)

Acanthais triangularis (as *Thais triangularis*, a junior synonym; also *Mancinella triangularis*)

Naria albuginosa (= *Cypraea albuginosa*)

Pseudozonaria annettae (= *Cypraea annettae*, = *Zonaria annettae*, = *C. sowerbyi*, = *C. ferruginosa*)

**Liocerithium judithae* (as *Cerithium sculptum*, a junior synonym; the “mid-tide minute spired snail” of the Narrative; one of the most common small snails in the Gulf)

Echinolittorina modesta (as *Littornia conspersa*, a junior synonym)

Crucibulum scutellatum (as *Crucibulum imbricatum*, a junior synonym)

Diodora inaequalis (misspelled as “*inequalis*” in Phyletic Catalogue)

Aclesia rickettsi (as “*Notarchus (Aclesia)* sp.” in Phyletic Catalogue; apparently this sea slug has not been reported since MacFarland’s original description in 1966)

Pleurobranchus digueti (the “red tectibranch” of the Narrative)

** *Berthellina ilisima* (as *Berthellina engeli*; the apricot slug)

** *Stylocheilus striatus* (as *Stylocheilus longicauda*)

** *Elysia diomedea* (= *Tridachiella diomedea*; the famous Gulf “Mexican/Spanish dancer” nudibranch; S&R note it was “possibly the most common nudibranch” they encountered; it is still very common, except where tide-pool tourists have taken them in excess)

** *Doris umbrella*

**Aclesia rickettsi* (aplysiid sea slug) (lectotype)

Pleurobranchidae (unidentified slug)

“Small white *Cadlina*-like dorid”

“Large seal-brown nudibranch”

Balanoglossus sp. (acorn worm)

Ptychodera flava (acorn worm)

** *Aplidium californicum* (= *Amaroucium californicum*; a wide-ranging east Pacific compound tunicate; the tunicates of the Gulf of California have not yet been carefully studied)

Eudistoma sp. (S&R speculated that this might be an undescribed species; two *Eudistoma* species are currently known from the Gulf, *E. mexicanum* and *E. psammion*)

Pyura sp. (the “red sea squirt” of the Narrative; likely *P. lignosa*, a common simple tunicate ranging from the Central Gulf to at least Costa Rica)

Also mentioned in the Narrative: octopus, bryozoans

March 21: La Paz (sand flats with rocks and dead coral, east of town), BCS.
Collection No. 5 (p. 109 in the Narrative)

Geodia mesotriaena (the most commonly encountered sponge of the expedition)

Hircinia variabilis (a questionable identification)

**Epiactis irregularis* (holotype; type locality)

**Phialoba steinbecki* (syntype; anemone)

**Phyllactis concinnata*

**Telmatactis panamensis* (anemone)

Plumularia setacea (this hydroid ranges from the Galapagos Islands to British Columbia)

Porites californica, “massive form” (as *P. porosa*, a junior synonym; S&R correctly noted this was commonest coral on Gulf shores, occurring as dome-shaped encrusting heads 8 inches in diameter)

***Ptilosarcus undulatus* (= *Leioptilus undulatus*)

Pennatula sp. (a sea pen; although not mentioned in the Phyletic Catalogue, Ricketts’s field notes and correspondence with E. Deichmann note “*Pennatula* sp. La Paz, under cement wharf”; there are a few reports of *Pennatula phosphorea* from the Pacific, but these might be incorrect identifications as that appears to be an Atlantic species)

Stylopoma spongites (a tropical west Atlantic species; presence in Gulf needs confirmation)

Antillesoma antillarum (as *Physcosoma antillarum*, a junior synonym; a cosmopolitan bryozoan species)

Bhawania riveti (described as “a *Phyllodoce*-like form”; this species has apparently not been reported since the S&R expedition, but another species, *B. goodei*, has been reported from the Gulf)

Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the expedition visited)

Notopygos ornata (“small Gulf fire worm”)

Stylarioides papillata (possibly *Pherusa papillata*, a Southern Gulf flabelligerid polychaete)

Heliaster sp.

Eucidaris thouarsii (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)

Ophiocoma aethiops

Ophiocoma alexandri

Ophionereis annulata

Ophioderma teres

Holothuria impatiens (a circumtropical species; S&R describe this as the second most common sea cucumber from their expedition)

Holothuria kefersteini

Neocucumis veleronis (as *Euthyonidium veleronis*; taken only at this location)

Neothyone gibbosa

Stichopus jusus (not in Phyletic Catalogue, but identified by E. Deichmann; the nature of this species name is unclear)

Ampithoe ramondi (a circumtropical amphipod found in a cluster of hydroids)

Neaxius vivesi (as *Axius vivesi*; a common species throughout the Gulf, but the expedition took it only at this one site)

Calcinus californiensis (one of the most attractive hermit crabs in the Gulf)

Thoe sulcata

Mithraculus denticulatus (as *Mithrax areolatus*, a junior synonym; common)

Barbatia reeveana (the hairy ribbed mussel; one of the commoner Gulf arc shells)

Engina ferruginosa Reeve (the identity of this species is unclear, but it is likely what we now call *Morula nodulosa* or *Morula ferruginosa*)

Columbella fuscata

Heliaster kubiniji

Phataria unifascialis

Phara pyramidalis

Eucidaris thouarsii

Lithophaga plumula (“or similar”—a boring clam)

Eurythoe complanata

Pleuroncodes planipes (“carapaces found washed ashore in hordes”)

Microphrys platysoma

Callinectes bellicosus (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case)

Pilumnus townsendi

Heteractaea lunata (an uncommon xanthid crab in the Gulf; S&R found this species only once, in coral heads at this site)

**Ampithoe ramondi*

**Neogonodactylus zacaе* (as *Gonodactylus oerstedii*, which is actually a West Atlantic species; the specimens were re-examined by Ray Manning in 1972 and described as the new species *Gonodactylus zacaе*, later moved to *Neogonodactylus*)

Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations)

Uca crenulata (S&R felt this was the only species of *Uca* they collected on the expedition; however, the taxonomy of this genus is desperately in need of revision and some species are difficult to differentiate)

Atrina tuberculosa (the less common of two pen shells called *callo de hacha*, the other being *Pinna rugosa*)

Carditamera affinis (as *Carditamera affinis californica*; S&R considered this “the commonest bivalve in the Gulf”; common in shell middens in the Northern Gulf, where they appear to have been fashioned into pendants)

Trachycardium procerum

Dosinia dunkeri

Muricopsis armatus (as *Muricopsis squamulata*, a junior synonym)

- Phyllonotus erythrostomus* (as *Phyllonotus bicolor*, a junior synonym; the pink-mouth murex; S&R found this to be the most common large snail of their expedition—indeed, it was once the most common littoral and shallow subtidal large snail throughout the Gulf, but no longer, due to intense over-collecting; large specimens are now exceedingly rare intertidally)
- Hexaplex brassica* (as *Phyllonotus brassica*, a junior synonym; the cabbage murex)
- Mancinella tuberculata* (as *Thais tuberculata*, a junior synonym)
- Pseudozonaria annettae* (= *Cypraea annettae*, = *Zonaria annettae*, = *C. sowerbyi*, = *C. ferruginosa*)
- Thylacodes squamigerus* (as *Aletes squamigerus*, a junior synonym; also = *Aletes squamigerus*, the scaled worm snail; this species is not reported from the Gulf today, so the identity of these specimens is unclear)
- Crepidula onyx* (slipper shell)
- Polinices uber*
- Turbo fluctuosus* (as *Callopoma fluctuosum*, a junior synonym; the most common mid-size gastropod in the Gulf)
- Tegula mariana*
- ***Elysia diomedea*
- ***Aclesia rickettsi* (paratype; as “*Notarchus (Aclesia) sp.*” in Phyletic Catalogue; apparently this sea slug has not been reported since MacFarland’s original description in 1966)
- Tridachiella diomedea* (the famous Gulf “Mexican/Spanish dancer” nudibranch; S&R note it was “possibly the most common nudibranch” they encountered; it is still very common, except where tide-pool tourists have taken them in excess)
- Octopus bimaculatus*
- Aplidium californicum* (= *Amaroucium californicum*; a wide-ranging East Pacific compound tunicate; the tunicates of the Gulf of California have not yet been carefully studied)
- Didemnum carnulentum*
- Cystodytes dellechiaiei*
- Clavelina* sp. (S&R speculated this was an undescribed species; there is only one species of *Clavelina* known from the Gulf today, *C. fasciculata*)
- Also mentioned in the Narrative: orange nudibranchs (probably *Berthellina ilisima*), mud-living mussels, pink ghost shrimps

March 22: El Mogote (mud flats, adjacent to mangroves), BCS. Collection No. 6 in the Narrative

- **Phyllactis bradleyi*
- **Andvakia insignis* (burrowing anemone; as *Pachycerianthus insignis*, a junior synonym) (holotype; presumably the “*Cerianthus*” mentioned in the Narrative)
- Stylatula elongata* (presumably the “littoral pennatulids like *Pennatula aculeata*” of the Narrative; note that *P. aculeata* is an Atlantic species)
- Baseodiscus mexicanus* (the largest and most distinctive nemertean in the Gulf)
- Sipunculus nudus*

**Thalassema steinbecki* (holotype)

Glycera dibranchiata (a well-known polychaete ranging from San Francisco Bay to the Gulf)

Marphysa aenea (found at the base of mangroves; a well-known Tropical East Pacific species)

Dasybranchus caducus (a Caribbean species thought to also occur in the Gulf)

Pista elongata (a Tropical East Pacific terebellid polychaete)

Eurythoe complanata

Polychaeta, Maldanidae (about a dozen species of maldanids occur in the Gulf)

Owenia fusiformis (a circumtropical polychaete)

**Ophiothrix spiculata*

**Ophiactis savignyi* (a common Tropical East Pacific 6-armed brittle star)

Amphipholis elevata (a rarely collected, littoral-to-73-m-deep, long-armed sand bottom brittle star)

Agassizia scrobiculata (heart urchin)

Holothuria impatiens (a circumtropical species; S&R describe this as the second most common sea cucumber from their expedition)

Holothuria languens (described as “chunkier” than the specimens taken at Punta Lobos)

Holothuria kefersteini (?)

Holothuria rigida (a circumtropical species)

Holothuria paraprinceps

Thyone parafusus (taken only at this locality; the “small black cucumbers” of the Narrative?)

Paracaudina chilensis (a smooth, white, burrowing cucumber resembling a sipunculan; taken only at this locality)

**Ampithoe plumulosa* (amphipod; broadly distributed in the east Pacific: Canada to Ecuador)

**Paracerceis* sp. (3 species in this genus occur in the Gulf: *P. richardsoni*, *P. sculpta*, *P. spinulosa*)

Balanus inexpectatus (as *Balanus Amphitrite inexpectatus*)

Balanus fissus

Litopenaeus stylirostris (as *Penaeus stylirostris*; found dead on the sand flats; probably washed up from a local shrimp boat)

***Farfantepenaeus californiensis*

Synalpheus sanjosei

Clibanarius panamensis

Petrochirus californiensis (the largest hermit crab in the Gulf, aka “the gentle giant”)

Pagurus lepidus

Petrolisthes armatus (one of the most common porcelain crabs in the Gulf; this species was at just about every rocky shore they visited, even though they collected it only twice)

Polyonyx quadriungulatus (typically commensal in the tubes of chaetopterid polychaetes, but found “free living” at El Mogote)

Podocheila latimanus

Thoe sulcata

Pitho picteti

Mithraculus denticulatus (as *Mithrax areolatus*, a junior synonym; common)

Teleophrys cristulipes

Microphrys platysoma

Callinectes bellicosus (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [presence assumed]

Daira americana

Catleptodius occidentalis (as *Leptodius occidentalis*, a junior synonym; one of the most common and abundant small crabs in the Gulf)

Panopeus bermudensis (in 1941, this species was thought to be distributed in the Caribbean and Tropical East Pacific; however, the “panopeid” crabs are a taxonomic mess and the actual identity of the S&R Sea of Cortez species is unclear; there are ~2 dozen described panopeid crabs usually recognized from the Gulf, but this is not one of them)

Pilumnus townsendi

Geograpsus stormi (as *Geograpsus lividus*, a junior synonym; a circumtropical species)

Graptacme semipolitus (as *Dentalium semipolitus*, a junior synonym; the “striated” tusk shell from El Mogote)

Laevidentalium splendidum (as *Dentalium semipolitus*, a junior synonym; the “smooth” tusk shell from El Mogote)

Anadara multicosata (as *Arca multicosata*, a junior synonym)

Anadara tuberculosa (as *Arca tuberculosa*, a junior synonym)

Modiolus capax (as *Volsella capax*, the bearded mussel; *Volsella* is a junior synonym of *Modiolus*)

Carditamera affinis (as *Carditamera affinis californica*; S&R considered this “the commonest bivalve in the Gulf”; common in shell middens in the Northern Gulf, where they appear to have been fashioned into pendants)

Divalinga eburnea (as *Divaricella eburnea*, a junior synonym; S&R described their specimen as “pearly-white” and ranging from Cape San Lucas to Panama; but this species has pale brown stripes and ranges throughout the Gulf to Peru and the Galapagos Islands; perhaps their specimen was an old, worn shell, or this is a misidentification)

Chione californiensis (as *Chione succincta*, a junior synonym; one of the most common bivalves in the Gulf)

Dosinia dunkeri

Megapitaria squalida (as *Macrocallista squalida*, a junior synonym; one of two species called “chocolata clam,” or “almeja chocolata,” in the Gulf)

Oliva venulata

Pseudozonaria annettae (= *Cypraea annettae*, = *Zonaria annettae*, = *C. sowerbyi*, = *C. ferruginosa*)

Strombus gracilior

Natica chemnitzii (the “variegated *Polinices*-like form” of the Narrative)

Polinices bifasciatus (moon snail)

Polinices uber

Aplysia californica (as “*Tethys* sp. probably *californica*”)

Tridachiella diomedea (the famous Gulf “Mexican/Spanish dancer” nudibranch; S&R note it was “possibly the most common nudibranch” they encountered; it is still very common, except where tide-pool tourists have taken them in excess)

***Aplysia californica*

***Berthellina engeli*

***Elysia diomedea* (opisthobranch)

Bulla gouldiana

Balanoglossus sp. (acorn worm)

Polyclinum sp. (2 species of *Polyclinum* are known from the Gulf today, *P. laxum* and *P. vasculosum*; however, the tunicate fauna of the Gulf has never been carefully studied)

Botrylloides diegensis

Also mentioned in the Narrative: 2 species of tusk shells, keyhole limpets, fiddler crabs, *Nidorellia armata*?, *Linckia*?, white sea whip, flatworms (several species), burrowing shrimp (“*Upogebia*”?), octopus

March 21–22: Misc. rocky shore collections, Bahía La Paz. Collection No. 7 in the Narrative

Cliona californiana (as *C. celata*)

**Unidentified sponge

**Porites californica*

**Epizoanthus californicus* (syntype)

**Palythoa pazi* (syntype)

***Stylocheilus striatus* (as *Stylocheilus longicauda*)

Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the expedition visited)

Heliaster kubiniji

***Phataria unifascialis*

Pharia pyramidata

Pentaceraster cumingi (*Oreaster occidentalis*, a junior synonym; a widespread Tropical East Pacific species)

**Ophiocoma aethiops*

**Ophiocoma alexandri*

**Ophioderma teres*

Eucidaris thouarsii (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)

***Neocucumis veleronis*

Balanus inexpectatus (as *Balanus amphitrite inexpectatus*)

Cataleptodius occidentalis (as *Leptodius occidentalis*, a junior synonym; one of the most common and abundant small crabs in the Gulf)

Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations)

Modiolus capax (as *Volsella capax*, the bearded mussel; *Volsella* is a junior synonym of *Modiolus*; this is the “*Mytilus*-like form” of the Narrative)

***Elysia diomedea*

March 23: Islote Cayo, SW tip of Isla San José, ~1.5 miles from Bahía Amortajada. Collection No. 8 (p. 127 in the Narrative)

Leucetta losangelensis (the most common calcareous sponge in the Gulf, and one of the most common sponges in the Tropical East Pacific)

Leucosolenia coriacea

Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the expedition visited)

“*Spirorbis* tubes” (about 15 species of Spirorbidae are known from the Gulf today)

Heliaster sp. (presumably *H. kubiniji*)

Phataria unifascialis

Pharia pyramidata

Eucidaris thouarsii (the commonest urchin in the Gulf; collected “at practically every suitable collecting place”)

Tetraclita stalactifera (as *Tetraclita squamosa stalactifera*)

Elasmopus pocillimanus (a cosmopolitan amphipod; not reported otherwise from the Gulf)

Hyale hawaiiensis (probably an incorrect identification; likely one of the amphipod species named by J. L. Barnard in 1979—e.g., *H. californica*, *H. guasave*, *H. yaqui*, *H. zuaque*)

*“*Dynamella*” sp. (probably a misspelling of *Dynamenella*, an isopod genus known from California shores, but not from the Sea of Cortez; however, it is more likely the specimens were *Dynoides*, *Paracerceis*, or *Paradella*)

Petrolisthes nigrungiculatus (a common porcelain crab in the Gulf)

Xanthodius sternberghii (as *Xanthodius hebes*, a junior synonym)

Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations and in abundance here)

Brachidontes semilaevis (as *Brachidontes multififormis*, a junior synonym; a very common small mytilid mussel in the Gulf)

Coralliophila costata

**Liocerithium judithae* (as *Cerithium sculptum*, a junior synonym; one of the most common small snails in the Gulf)

“*Lottia gigantea*” (almost certainly a misidentification; this is a western Baja/California temperate species)

Also noted in the Narrative: many anemones, some cucumbers, one small sipunculan, tube snails (“*Aletes*, or a similar genus”; any of a dozen possible Vermetidae species), “sea rabbits” (probably *Aplysia* sp.)

March 24 (morning): Easter Sunday, Isla San José, Bahía Amortajada. Collection No. 9 (p. 131 in the Narrative)

Echinolittorina aspera (as *Littorina philippi*, a junior synonym)

Diodora inaequalis (misspelled as “*inequalis*” in Phyletic Catalogue)

Note: These two species are rocky shore gastropods; however, Ricketts’s “Verbatim Transcription” states they collected fiddler crabs and estuarine snails in the lagoon at Bahía Amortajada, although I have not come across those specimens in any published lists or museum collections

March 24: afternoon of Easter Sunday; March 25: morning, Marcial "Reef," Bahía San Marcial, just S of Punta Marcial. Collection No. 10 (p. 152 in the Narrative)

Geodia mesotriaena (the most commonly encountered sponge of the expedition)

Aglaophenia diegensis (one of the most common hydroids in the northeastern Pacific)

Astrangia pedersenii (a solitary coral and one of 11 *Astrangia* species in the Gulf; considered a junior synonym of *A. haimeii* by Squires 1959)

**Porites californica* "massive form" (as *P. porosa*, a junior synonym; S&R correctly noted this was the commonest coral on Gulf shores, occurring as dome-shaped encrusting heads 8 inches in diameter)

Stylochus (?) sp. (this might have been *Stylochoplana panamensis*)

Bugula neretina (one of the most widespread bryozoans in the Gulf; also ranging from central California to Panama)

Lagenipora erecta (no species in this genus are known to occur in the Gulf; many *Lagenipora* have been transferred to other genera in recent years)

Lichenopora sp. (misspelled in the Narrative as "*Lichenspora*," p. 342; there are three species of *Lichenopora* in the Gulf: *L. buskiana*, *L. intricata*, *L. novaezelandiae*)

Scrupocellaria sp.

Iphione ovata (a tropical scale worm)

Thormora johnstoni (a widely distributed East Pacific scale worm)

Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the expedition visited)

Odontosyllis sp. (there are 4 species of *Odontosyllis* known from the Gulf: *O. heterodonta*, *O. phosphorea*, *O. polycera*, *O. undecimdongta*; the last was described and named by Olga Hartman in 1964, who identified the S&R polychaetes)

Thelepus setosus (a circumtropical terebellid polychaete)

Heliaster kubiniji

Phataria unifascialis

Pharia pyramidata

**Mithrodia bradleyi*

Astrometis sertulifera

Echinaster tenuispina (= *Othelia tenuispina*; noted to be more common the farther north they traveled; once very common, now less so due to uncontrolled beach tourism)

**Ophiocoma alexandri*

Eucidaris thouarsii (one of the most common urchins in the Gulf; collected "at practically every suitable collecting place")

Echinometra vanbrunti

Centrostephanus coronatus

Diadema mexicanum (= *Centrechinus mexicanus*; curiously, S&R collected this common, toxic-spined species only twice, at Punta Lobos and at Marcial Point)

Isostichopus fuscus (as *Stichopus fuscus*; it is surprising that this very common Gulf sea cucumber was found only at two localities by the expedition)

Chthamalus anisopoma

Eurydice caudata (a wide-ranging isopod known from central California to Ecuador; S&R took these specimens by night-lighting)

**Nyctiphanes simplex* (a widespread eastern Pacific euphausiid/krill; one of the primary food items of baleen whales in the Gulf)

**Archeomysis* cf. *maculata* (a mysid, taken along with the euphausiid *N. simplex*)

**Mysidium rickettsi* (as *Mysidopsis* sp., a mysid taken by night-lighting; not described until 1987, when Harrison and Bowman came across the specimen in the USNM collections) (holotype and allotype; type locality)

**Eurydice caudata*

**Elasmopus pocillimanus*

**Hyale hawaiiensis* (probably an incorrect identification; likely one of the amphipod species named by J. L. Barnard in 1979—e.g., *H. californica*, *H. guasave*, *H. yaqui*, *H. zuaque*)

Crangon sp. No. 1 (likely an unknown species of caridean shrimp, but not a *Crangon*)

**Panulirus inflatus* (a recently molted specimen of the tropical, blue spiny lobster; it is odd that only a single specimen of this common lobster was taken by the expedition)

Clibanarius digueti (the blue-spotted hermit crab; perhaps the most common hermit in the Gulf)

Petrolithes hirtipes (a very common porcelain crab in the Gulf)

Pitho sexdentata

Ala cornuta (as *Anaptychus cornutus*, a junior synonym)

Callinectes bellicosus (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [presence assumed]

Xanthodius sternberghii (as *Xanthodius hebes*, a junior synonym)

Uca crenulata (S&R felt this was the only species of *Uca* they collected on the expedition; however, the taxonomy of this genus is desperately in need of revision and some species are difficult to differentiate)

Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations)

Chiton virgulatus

Acanthochitona sp.

Arca mutabilis (as *Navicula mutabilis*, a junior synonym; the “minute *Zirfaea*-like form” of the Narrative)

Chama echinata (as *Chama squamuligera*; Coan and Valentich-Scott [2012] consider *C. squamuligera* to be a white morph of *C. echinata*)

Cerithiopsis californica (as *Cerithidea mazatlanica*, a junior synonym; Brusca disagrees with the synonymy of *C. mazatlanica* and *C. californica*, and the two seem easy to distinguish from one another)

Melampus olivaceus (an intertidal pulmonate)

Mitrella guttata (as *Nitidella guttata*, a junior synonym; this species, one of the most common small snails in the Gulf, is considered a synonym of *Mitrella/Columbella ocellata* by some workers, but the latter is a trans-Atlantic species)

**Liocerithium judithae* (as *Cerithium sculptum*, a junior synonym; one of the most common small snails in the Gulf)

**Conus princeps*

Thylacodes squamigerus (as *Aletes squamigerus*, a junior synonym; also = *Aletes squamigerus*, the scaled worm snail; this species is not reported from the Gulf today, so the identity of these specimens is unclear)

Tegula impressa

Tegula sp.

Acanthochitona exquisita

Chiton virgulatus (S&R note this is the commonest chiton in the Gulf; it remains so today)

Ischnochiton tridentatus

Eudistoma sp. (S&R speculated that this might be an undescribed species; 2 *Eudistoma* species are currently known from the Gulf, *E. mexicanum* and *E. psammion*)

Also mentioned in the Narrative: sea fans, sipunculans, snapping shrimps, cerianthids

March 25: Puerto Escondido, BC outer bay. Collection No. 11 (p. 156 in the Narrative)

Aaptos vannamei (questionable identification of a black sponge)

Cliona californiana (as *C. celata*)

Aglaophenia longicarpa

**Anthopleura dowii* (anemone)

**Palythoa complanata* (holotype; type locality) (noted in the Narrative as “In superficial appearance it was identical with...*Zoanthus pulchellus*” of the Caribbean)

**Zoanthus danae*

Astrangia pedersenii (a solitary coral and one of 11 *Astrangia* species in the Gulf; considered a junior synonym of *A. haimeii* by Squires 1959)

Latocestus sp. (undescribed species of flatworm/Platyhelminthes)

Membranipora sp. (4 species of *Membranipora* are known from the Gulf today: *M. tuberculata*, *M. tenuis*, *M. savarti*, *M. arborescens*)

Phascolosoma sp. (“small *P. agassizii*”)

Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the expedition visited)

Odontosyllis sp., pelagic epitokous stage (there are 4 species of *Odontosyllis* known from the Gulf: *O. heterodonta*, *O. phosphorea*, *O. polycera*, *O. undecimdonga*; the last was described and named by Olga Hartman in 1964, who identified the S&R polychaetes)

Oenone fulgida (as *Aglaurides fulgida*; a Tropical East Pacific polychaete)

Ceratonereis tentaculata

Heliaster kubiniji

Pharia pyramidata

Mithrodia bradleyi (15 inches in diameter)

- Pentaceraster cumingi* (*Oreaster occidentalis*, a junior synonym; a widespread Tropical East Pacific species)
- Nidorellia armata* (a common littoral sea star in the Gulf, but collected by S&R only at Pulmo Reef and Puerto Escondido)
- **Leiaster teres* (sea star)
- **Phataria unifascialis*
- **Acanthaster ellisii* (Eastern Pacific crown-of-thorns)
- **Ophiothrix spiculata*
- **Ophioderma teres*
- Eucidaris thouarsii* (one of the commonest urchins in the Gulf; collected “at practically every suitable collecting place”)
- Holothuria arenicola* (a circumtropical species common in the Gulf)
- Holothuria impatiens* (a circumtropical species; S&R describe this as the second most common sea cucumber from their expedition)
- Holothuria lubrica* (= *Slenkothuria lubrica*; the sulfur cucumber; the most common sea cucumber taken during the expedition)
- Holothura rigida* (a circumtropical species)
- Neothyone gibbosa*
- Isostichopus fuscus* (not in Phyletic Catalogue, but identified by E. Deichmann; now a rare, Mexican endangered species due to over-exploitation in the 1980s and 1990s)
- Euapta godeffroyi* (a large, conspicuous synaptid cucumber; surprisingly taken at only 2 localities)
- Chiridota* sp. (not in Phyletic Catalogue, but identified by E. Deichmann; there are only two valid species of *Chiridota* known from the Gulf today, *C. aponocrita* and *C. rigida*)
- Ligia exotica* (as *Ligyda exotica*)
- **Ligia occidentalis*
- Tetraclita stalactifera* (as *Tetraclita squamosa stalactifera*)
- Clibanarius digueti* (the blue-spotted hermit crab; perhaps the most common hermit in the Gulf)
- Petrolisthes nigrunguiculatus* (a common porcelain crab in the Gulf)
- Megalobrachium sinuimanus* (as *Pisonella sinuimanus*)
- Podochela latimanus*
- Callinectes bellicosus* (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [presence assumed]
- Platypodiella rotundata* (as *Platypodia rotundata*)
- Xanthodius cooksoni* (as *Leptodius cooksoni*, a junior synonym)
- Panopeus bermudensis* (in 1941, this species was thought to be distributed in the Caribbean and Tropical East Pacific; however, the “panopeid” crabs are a taxonomic mess and the actual identity of the S&R Sea of Cortez species is unclear; there are ~2 dozen described panopeid crabs usually recognized from the Gulf, but this is not one of them)
- Grapsus grapsus* (Sally Lightfoot crab; taken at all rocky shore stations)
- Chiton virgulatus* (S&R noted this is the commonest chiton in the Gulf; it remains so today)

- Lepidozona clathrata* (as *Ischnochiton clathratus*, a junior synonym)
Ischnochiton tridentatus
Acanthochitona sp.
Barbatia reeveana (the hairy ribbed mussel; one of the commoner Gulf arc shells)
Arcopsis solida (as *Fossularca solida*, a junior synonym; the common “garbanzo clam” of the Gulf)
Pinna rugosa (the principal commercial Gulf hacha)
Isognomon janus (as *I. anomioides*, a junior synonym; very common, thin rock oyster on rocky shores in the Gulf)
Isognomon recognitus (as *I. chemnitziana* d’Orbigny, a junior synonym)
 ?*Ptera sterna* (as *Pinctada fimbriata* Dunker 1852; a likely misidentification; the “clam-like hacha” of the Narrative)
Pinctada mazatlanica (the Panamic pearl oyster; surprisingly, this is the only locality this common, but largely subtidal species was collected)
Spondylus princeps (reported as “*Spondylus [sic]* sp. probably *limbatus* Sowerby”; *S. limbatus* is a junior synonym of *S. princeps*, the most common spiny oyster in the Gulf; surprisingly, this common species was collected only once in the Gulf)
Anomia peruviana (known in Mexico as *papas fritas*, or the Peruvian jingle, this is the only species in the genus that occurs in the Gulf; cited as a “rock oyster” in the Narrative; surprisingly, this is the only record of this very common species from the expedition; the Seri People make necklaces from these beautiful and delicate shells)
Modiolus capax (as *Volsella capax*, the bearded mussel; *Volsella* is a junior synonym of *Modiolus*)
Semele corrugata (the “unribbed *Paphia*-like form” in the Narrative; this species is not known to occur north of South America, thus this is likely a misidentification of one of the other 21 species of *Semele* that do occur in the Gulf)
Pleuroploca princeps (as *Fasciolaria princeps*, a junior synonym)
Engina ferruginosa Reeve (the identity of this species is unclear, but it is likely what we now call *Morula nodulosa* or *Morula ferruginosa*)
Mitrella guttata (as *Nitidella guttata*, a junior synonym; this species, one of the most common small snails in the Gulf, is considered a synonym of *Mitrella/Columbella ocellata* by some workers, but the latter is a trans-Atlantic species)
Coralliophila costata
Phyllonotus erythrostomus (as *Phyllonotus bicolor*, a junior synonym; the pink-mouth murex; S&R found this to be the most common large snail of their expedition—indeed, it was once the most common littoral and shallow subtidal large snail throughout the Gulf, but no longer, due to intense over-collecting; large specimens are now exceedingly rare intertidally)
Mancinella tuberculata (as *Thais tuberculata*, a junior synonym)
Pseudozonaria annettae (= *Cypraea annettae*, = *Zonaria annettae*, = *C. sowerbyi*, = *C. ferruginosa*)
Strombus galeatus

Crepidula onyx (slipper shell)

Crucibulum scutellatum (as *Crucibulum imbricatum*, a junior synonym)

Crucibulum spinosum

Tegula mariana

Diodora inaequalis (misspelled as “*inequalis*” in Phyletic Catalogue)

***Dolabella auricularia* (as “*Dolabella* sp. probably *californica*” in Phyletic Catalogue, a junior synonym)

Acanthochitona exquisita

***Berthellina engeli*

***Cystodytes dellechiaiei* (ascidian)

Pyura sp. (the “red sea squirt” of the Narrative; likely *P. lignosa*, a common simple tunicate ranging from the Central Gulf to at least Costa Rica)

Ascidia sp. (noted in the Narrative as “large sea-squirt the color of water”; S&R speculated that this might be an undescribed species; there are 3 species of *Ascidia* known from the Gulf today—*A. sydneyensis*, *A. interrupta*, and *A. ceratodes*—it is likely their specimen was one of these, and possibly *A. interrupta* which fits their description and is the most common of the three)

March 27: Puerto Escondido, BC inner bay. Collection No. 12 (p. 170 in the Narrative)

Tethya aurantia

Aaptos vannamei (questionable identification of a black sponge)

**Alicia beebei* (anemone)

**Phialoba steinbecki* (anemone)

**Phymactis clematis* (anemone)

**Telmatactis panamensis* (anemone)

**Phyllactis concinnata* (anemone)

**Aiptasiomorpha elongata* (anemone)

?*Cerianthus* sp. (5 cerianthid-like burrowing anemones are currently known from the Sea of Cortez: *Andvakia insignis*, *Cerianthus vas*, *Isarachnanthus panamensis*, *Pachycerianthus aestuari*, *Botruanthus benedini*)

Porites sp. (as “probably *P. porosa*”)

Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the expedition visited)

Heliaster kubiniji

Leiaster teres (an uncommon, large, purple-blue sea star ranging from the Gulf to Panama and the Galapagos Islands)

Isostichopus fuscus (as *Stichopus fuscus*; it is surprising that this very common Gulf sea cucumber was found at only 2 localities by the expedition)

Euapta godeffroyi (a large, conspicuous synaptid cucumber; surprisingly taken at only 2 localities during the expedition)

**Ophiactis savignyi*

Callinectes bellicosus (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [presence assumed]

Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations)
Carditamera affinis (as *Carditamera affinis californica*; S&R considered this “the commonest bivalve in the Gulf”; common in shell middens in the Northern Gulf, where they appear to have been fashioned into pendants)
Megapitaria aurantiaca (as *Macrocallista aurantiaca*, a junior synonym; one of two species known as “chocolata clam,” or “almeja chocolata,” in Mexico)
Periglypta multicostata (the “*Chione*-like form, 90 mm” in the Narrative)
Leukoma grata (as *Protothaca grata*, a junior synonym)
 “Giant sea hares” (= *Aplysia californica*?)
 “Undetermined bubble shell”

March 27: Loreto area, Isla Coronado. Collection No. 13 in the Narrative

Aaptos vannamei (questionable identification of a black sponge)
Tethya aurantia
Geodia sp.
Cliona californiana (?)
 **Phialoba steinbecki* (anemone)
 **Telmatactis panamensis* (anemone)
 **Palythoa insignis* (syntype)
 **Zoanthus dowi*
 **Astrangia pedersenii* (a solitary coral and one of 11 *Astrangia* species in the Gulf; considered a junior synonym of *A. haime* by Squires 1959)
 **Porites* cf. *nodulosa* (in the Gulf, *P. nodulosa* has been considered to be restricted to the Cabo Pulmo-Cabo San Lucas corridor; Reyes [1992] considered it a synonym of *P. panamensis*)
Cellepora sp. (3 species in this bryozoan genus are known from the Gulf: *C. brunnea*, *C. minuta*, *C. quadrispinosa*)
Phascolosoma sp. (“small *P. agassizii*”; as *Physcosoma agassizii*, a junior synonym)
Ochetostoma edax (type specimen of a spoon worm new to science)
Iphione ovata (a tropical scale worm)
Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the expedition visited)
Anaitides madeirensis (an elongate phyllodocid polychaete)
Dorvillea cerasina (as *Stauronereis cerasina*)
Eunice antennata (a wide-ranging polychaete occurring from Southern California to Ecuador; the “*Lumbrinereis*-like form in the Narrative)
Cirriformia spirabranthus (a well-known, tube-building cirratulid polychaete)
Acromegalomma mushaensis (as *Megalomma mushaensis*; a nearly circumtropical sabellid polychaete; very common)
Acromegalomma circumspectum (identification made by Gómez and Tovar-Hernández 2008; possibly the same specimens reported by S&R as *Megalomma mushaensis*, above)
Heliaster kubiniji
Phataria unifascialis

Mithrodia bradleyi

**Ophiocoma aethiops*

**Ophiocoma alexandri*

Ophiactis savignyi (a common Tropical East Pacific 6-armed brittle star)

Ophiactis simplex (the small, 5- or 6-armed brittle star)

Ophioderma teres

Euclidaris thouarsii (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)

Holothuria lubrica (= *Slenkothuria lubrica*; the sulfur cucumber; the most common sea cucumber taken during the expedition)

Holothuria arenicola (not in Phyletic Catalogue, but identified by E. Deichmann; a circumtropical species common in the Gulf)

**Ampithoe* sp.

**Ampithoe plumulosa* (a broadly distributed, East Pacific amphipod)

**Aruga dissimilis* (a Southern California species of amphipod)

**Bemlos macromanus* (a Tropical East Pacific amphipod, ranging from the Gulf to the Galapagos)

Petrolithes hirtispinosus (a common porcelain crab in the Gulf)

Megalobrachium tuberculipes (as *Pisonella tubeerculipes*; an uncommon Tropical East Pacific porcelain crab)

Epialtus minimus

Pitho sexdentata

Mithraculus denticulatus (as *Mithrax areolatus*, a junior synonym; common)

Callinectes bellicosus (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [presence assumed]

Gonopanope areolata (as *Micropanope areolata*, a junior synonym)

Pilumnus gonzalensis

Pilumnus townsendi

Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations)

Gastrodelpys dalesi (a copepod symbiont with the sabellid polychaete *Acromegalomma circumspectum*; discovered by Gómez and Tovar-Hernández 2008)

Arcopsis solida (as *Fossularca solida*, a junior synonym; the common “garbanzo clam” of the Gulf)

Isognomon janus (as *I. anomioides*, a junior synonym; very common, thin rock oyster on rocky shores in the Gulf)

Acanthochitona exquisita

Acanthochitona sp.

Mancinella tuberculata (as *Thais tuberculata*, a junior synonym)

Pseudozonaria annettae (= *Cypraea annettae*, = *Zonaria annettae*, = *C. sowerbyi*, = *C. ferruginosa*)

Heliacus bicanaliculatus (as *Heliacus radiatus*, a junior synonym)

Diodora inaequalis (misspelled as “*inequalis*” in Phyletic Catalogue)

Fissurella rugosa

**Heliacus areola bicanaliculatus* (architectonid gastropod)

**Unidentified dorid nudibranch

Didemnum carnulentum (this tunicate was mistaken for a white sponge in the Narrative)

Cystodytes dellechiaiei

Pyura sp. (the “red sea squirt” of the Narrative; likely *P. lignosa*, a common simple tunicate ranging from the Central Gulf to at least Costa Rica)

March 28–29: Bahía Concepción. E shore of bay. Collection No. 14 (pp. 185, 193 in the Narrative)

Tedania “ignis”

Geodia mesotriaena (the most commonly encountered sponge of the expedition)

Haliclona ecbasis (this species has apparently been reported from the Gulf by no one else)

Tedania ignis (possibly *T. nigrescens*)

Cerianthus sp. (5 cerianthid-like burrowing anemones are currently known from the Sea of Cortez: *Andvakia insignis*, *Cerianthus vas*, *Isarachnanthus panamensis*, *Pachycerianthus aestuari*, *Botruanthus benedini*)

**Calliactis polypus* (this anemone has been reported worldwide; in the eastern Pacific, so far as is known, it is found only on the shells of gastropods inhabited by the hermit crab *Dardanus sinistripes*)

Porites californica “massive form” (as *P. porosa*, a junior synonym; S&R correctly noted this was the commonest coral on Gulf shores, occurring as dome-shaped encrusting heads 8 inches in diameter)

**Porites* cf. *nodulosa* (in the Gulf, *P. nodulosa* has been considered to be restricted to the Cabo Pulmo-Cabo San Lucas corridor; Reyes [1992] considered it a synonym of *P. panamensis*)

**Zoanthus danae*

Halosydna glabra (a scale worm described just the year before the expedition)

Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the expedition visited)

Ceratonereis tentaculata (epitokous/heteronereids stage taken by night-lighting)

Platynereis polyscalma (“epitokous or heteronereids forms” taken by night-lighting; a well-known nereid polychaete ranging from the Central Gulf to Ecuador)

Eunice sp. (there are about 2 dozen species of *Eunice* known from the Gulf today)

Chicoreus erythrostomus (= *Phyllonotus bicolor*, = *Hexaplex erythrostomus*; pink murex; shells only, on beach)

Strombus galeatus

Strombus spp. (taken with a crab net, baited with fish guts)

Heliaster kubiniji

Phataria unifascialis

**Luidia phragma* (a very common subtidal species taken by S&R only at this location, 7 fathoms, in crab nets)

**Ophiocnida hispida* (a Tropical East Pacific, bristly, long-armed brittle star)

**Ophioderma teres*

**Ophionereis annulata*

**Ophiothrix spiculata*

Eucidaris thouarsii (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)

***Astropyga pulvinata* (taken with a crab net, baited with fish guts; “A net left down five minutes was brought up with at least 20 urchins in it, and all attacking the bait”; S&R collected this urchin only once, assuming it is strictly subtidal, which it is not)

Encope micropora (= *E. californica*) (common)

Encope grandis (common)

Encope californica

Clypeaster rotundus (noted as rare)

Meoma grandis (heart urchin; abundant 2 to 3 feet below water surface at low tide)

Holothuria inabilis (a flat, sand-encrusted, trans-Pacific species; only record from expedition)

**Cumella* sp. (Cumacea)

Ampithoe plumulosa (a broadly distributed, East Pacific amphipod)

Pontharpinia sp. (amphipod taken by night-lighting)

Pontonia pinnae (living inside hachas, presumably *Pinna rugosa*)

Eurydice caudata (a wide-ranging isopod known from central California to Ecuador; S&R took these specimens by night-lighting)

Excorallana tricornis (misspelled as *Exocorallana*; there are 5 species of *Excorallana* in the Gulf, 3 that were named and described only recently, so the accuracy of this identification is questionable; further, J. O. Maloney was not known to be the best crustacean taxonomist working at the time)

Mesanthura sp. (almost certainly the very common *M. occidentalis*)

Megabalanus californicus (as *Balanus tintinabulum californicus*)

Balanus improvisus

Balanus trigonus

*,***Pontonia pinnae* (a symbiont in the hatchet clam, *Pinna*)

Synalpheus sanjosei

Synalpheus digueti

Synalpheus townsendi

**Eurydice caudata*

**Excorallana tricornis occidentalis*

**Ampithoe plumulosa*

**Pontharpinia* sp. (gammarid amphipod)

Clibanarius digueti (the blue-spotted hermit crab; perhaps the most common hermit in the Gulf)

Petrochirus californiensis (the largest hermit crab in the Gulf, aka “the gentle giant”)

Paguristes digueti (a subtidal, tropical hermit crab “taken in crab nets set at night in 7 fathoms”)

Petrolisthes armatus (one of the most common porcelain crabs in the Gulf; likely this species was at every rocky shore they visited, even though they collected it only twice)

Porcellana paguricomviva

Hypoconcha panamensis (collected in “crab net on bottom at night, 7 fathoms”; this crab normally carries a clam shell over its carapace)

Eucinetops lucasi

Epialtus minimus (“associated with hatchet clam,” *Pinna rugosa*)

Ala cornuta (as *Anaptychus cornutus*, a junior synonym; “associated with the hatchet clam,” *Pinna rugosa*)

Microphrys platysoma

Portunus xantusii affinis (as *Portunus pichilinquai*, a junior synonym of this subspecies; taken at night with a “crab net at 7 fathoms”)

**Callinectes bellicosus* (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [presence assumed]

Pilumnus townsendi

Dissodactylus nitidus (one of several species of small pea crabs, Pinnotheridae, commensal on sand dollars in the Tropical East Pacific)

Dissodactylus xantusi (one of several species of small pea crabs, Pinnotheridae, commensal on sand dollars in the Tropical East Pacific)

Pinnotheres sp. (“94 pea-crabs” taken by night-lighting at anchorage; should read, “94 specimens of unidentified Pinnotheridae”)

Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations)

Sesarma sulcatum

Uca crenulata (S&R felt this was the only species of *Uca* they collected on the expedition; however, the taxonomy of this genus is desperately in need of revision and some species are difficult to differentiate)

Anadara multicostata (as *Arca multicostata*, a junior synonym)

Barbatia reeveana (the hairy ribbed mussel; one of the commoner Gulf arc shells)

Arca pacifica (as *Navicula pacifica*, a junior synonym; the “common large irregular elongate form” in the Narrative)

?*Atrina tuberculosa* (the less common of two pen shells called *callo de hacha*, the other being *Pinna rugosa*; the uncertainty is because S&R did not differentiate the 2 species on the expedition)

Pinna rugosa (the principal commercial Gulf hacha)

Isognomon janus (as *I. anomioides*, a junior synonym; very common, thin rock oyster on rocky shores in the Gulf)

?*Chama frondosa* (as *Chama mexicana* Carpenter; noted as a species of *Spondylus* in the Narrative)

Oliva venulata

Enaeta cumingii

Pleuroploca princeps (as *Fasciolaria princeps*, a junior synonym)

Phyllonotus erythrostomus (as *Phyllonotus bicolor*, a junior synonym; the pink-mouth murex; S&R found this to be the most common large snail of their expedition—indeed, it was once the most common littoral and shallow subtidal large snail throughout the Gulf, but no longer, due to intense over-collecting; large specimens are now exceedingly rare intertidally)

Strombus galeatus

**Liocerithium judithae* (as *Cerithium sculptum*, a junior synonym; one of the most common small snails in the Gulf)

Crepidula onyx (slipper shell)

Crucibulum scutellatum (as *Crucibulum imbricatum*, a junior synonym)

Ischnochiton tridentatus

Aplidium californicum (= *Amaroucium californicum*; a wide-ranging East Pacific compound tunicate; the tunicates of the Gulf of California have not yet been carefully studied)

Didemnum carnulentum

***Didemnum vanderhorsti*

Eudistoma sp. (S&R speculated that this might be an undescribed species; 2 *Eudistoma* species are currently known from the Gulf, *E. mexicanum* and *E. psammion*)

Ascidia sp. (noted in the Narrative as “large sea-squirt the color of water”; S&R speculated that this might be an undescribed species; there are 3 species of *Ascidia* known from the Gulf today—*A. sydneyensis*, *A. interrupta*, and *A. ceratodes*—it is likely their specimen was one of these, and possibly *A. interrupta* which fits their description and is the most common of the three)

Also mentioned in the Narrative: “Masked rock-clams,” solitary corals (on a “masked rock clam”)

March 30 (morning): Isla San Marcos, San Lucas Cove (south of Santa Rosalía).
Collection No. 15 (p. 200 in the Narrative); steamed for San Carlos Bay in
afternoon

?*Cerianthus* sp. (“very plentiful” at this location; 5 cerianthid-like burrowing anemones are currently known from the Sea of Cortez: *Andvokia insignis*, *Cerianthus vas*, *Isarachnanthus panamensis*, *Pachycerianthus aestuarii*, *Botruanthus benedini*)

**Botruanthus benedini* (burrowing anemone)

**Apionsoma misakanium* (as *Golfingia hespera* and *Phascolosoma hesperum*, junior synonyms)

Membranipora tuberculata (a common bryozoan ranging from California to Peru)

Eusigalion lewisii (a polychaete of uncertain identification; nothing with this name is known today from the Sea of Cortez)

Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the Expedition visited)

Amblyosyllis sp. (= *Pterosyllis* according to S&R; there are about 4 dozen species of syllid polychaetes known from the Gulf, only one of which is in this genus, *A. granosa*)

Neanthes sp. (taken night-lighting; 5 species of *Neanthes* are known from the Gulf: *N. caudate*, *N. cortezi*, *N. micromma*, *N. pelagica*, *N. succinea*)

Perineris sp., epitokous stage (taken by night-lighting; there are no known polychaetes of this genus known in the Gulf today; given that the specimens were epitokes, the identification could easily have been incorrect)

Platynereis agassizi, epitokous (“heteronereids”) (taken by night-lighting; likely a misidentification of one of the 3 species of *Platynereis* known from the Gulf today: *P. bicanaliculata*, *P. dumerilii*, *P. polyscalma*)

- Glycera dibranchiata* (a well-known polychaete ranging from San Francisco Bay to the Gulf)
- Scolecopsis* sp. (an unidentified spionid polychaete)
- Armandia* sp. (2 species of polychaetes in this genus are known from the Gulf: *A. brevis*, *A. intermedia*)
- Travasia gigas* (a well-known California-Gulf polychaete)
- Chione* spp.
- Carditamera affinis*
- Octopus bimaculatus*
- Larval male Loliginidae (squid) (taken by night-lighting; identified by S. Stillman Berry)
- Heliaster kubiniji*
- Phataria unifascialis*
- Astrometis sertulifera*
- Ophiothrix spiculata*
- Eucidaris thouarsii* (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)
- Holothuria lubrica*
- **Ampithoe plumulosa* (a broadly distributed, east Pacific amphipod)
- **Pontharpinia* sp. (amphipod taken by night-lighting)
- Eurydice caudata* (a wide-ranging isopod known from central California to Ecuador; S&R took these specimens night-lighting)
- Ligia occidentalis*
- **Paranthura* sp.
- **Paracerceis gilliana* (almost certainly a mistaken identification, as *P. gilliana* is a Californian species; 3 species in this genus occur in the Gulf: *P. richardsoni*, *P. sculpta*, *P. spinulosa*)
- **Albunea lucasii* (sand crab; noted as *Emerita* sp. in *Sea of Cortez*)
- ***Pagurus albus*
- Clibanarius digueti* (the blue-spotted hermit crab; perhaps the most common hermit in the Gulf)
- Dardanus sinistripes*
- Paguristes digueti* (a subtidal, tropical hermit crab)
- Pagurus benedicti*
- Moreiradromia sarraburei* (as *Dromidia larraburei*, a junior synonym; pelagic larvae collected by night-lighting)
- Callinectes bellicosus* (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [Presence assumed]
- Grapsus grapsus* (Sally Lightfoot crab; taken at all rocky shore stations)
- Uca crenulata* (S&R felt this was the only species of *Uca* they collected on the expedition; however, the taxonomy of this genus is desperately in need of revision and some species are difficult to differentiate)
- Felaniella cornea* (as *Felaniella sericata*, a junior synonym)
- Chione californiensis* (as *Chione succincta*, a junior synonym; one of the most common bivalves in the Gulf)

- Megapitaria squalida* (as *Macrocallista squalida*, a junior synonym; one of two species called “chocolata clam,” or “almeja chocolata,” in the Gulf)
- Tagelus affinis* (a single specimen; this is the only station this subtidal species was collected)
- ?*Tivela planulata* (the “Pismo-like clams” of the Narrative)
- Olivella dama* (as *Oliva dama*)
- Fusinus dupetitthouarsi* (this is an offshore species that is frequently capture, and killed, by shrimp trawlers; the “large snail...from San Lucas Cove sand flats” of the Narrative)
- Nassarius iodes* (as *Nassarius ioaedes*)
- Nassarius tiarula* (as *Nassarius tegula*, a junior synonym)
- Strombina maculosa*
- Murex rectirostris* (likely a misidentification of *Murex elenensis* of *M. recurvirostris*)
- Mancinella tuberculata* (as *Thais tuberculata*, a junior synonym)
- Strombus gracilior*
- Natica chemnitzii*
- Turbo fluctuosus* (as *Callopoma fluctuosum*, a junior synonym; the most common mid-size gastropod in the Gulf)
- Balanoglossus* sp. (acorn worm)
- Branchiostoma californiense* (the common Gulf lancelet; referred to as “*Amphioxus*” by Ricketts)

March 30 (afternoon) and March 31 (morning): Bahía San Carlos/San Carlos Bay/San Carlos Cove, BC. Collection No. 16 (pp. 203–205 in the Narrative)

Note: This site is called “Punta Trinidad” in Sagarin et al. (2008). Also note, this is not the same locality as “Bahía San Carlos, Sonora,” which is referred to as “Puerto San Carlos” by S&R (see Collection No. 21). Collections made 6–7:30 p.m. on March 30 and 10 a.m.–12 p.m. on March 31.

Blue sponges

Large yellow sponge (*Cliona californiana*?)

White sponge (*Stelletta coccinea*?)

Astrangia pedersenii (a solitary coral and one of 11 *Astrangia* species in the Gulf; considered a junior synonym of *A. haimei* by Squires 1959)

Phascolosoma sp. (“small *P. agassizii*”; as *Physcosoma agassizii*, a junior synonym)

Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the expedition visited)

Heliaster kubiniji

Astrometis sertulifera

Linckia columbiae

**Ophioderma teres*

Ophionereis annulata

Holothuria lubrica

- Eucidaris thouarsii* (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)
- Long-spined purple urchin (probably *Arbacia stellata* [formerly *A. incisa*] or *Echinometra vanbrunti*)
- Agassizia scrobiculata* (heart urchin)
- Tetraclita stalactifera* (as *Tetraclita squamosa stalactifera*)
- **Ligia occidentalis*
- Ligia exotica* (as *Ligyda exotica*)
- **Eurydice caudata* (a wide-ranging isopod known from central California to Ecuador; S&R took these specimens by night-lighting)
- **Sicyonia penicillata* (an offshore, deeper-water penaeid shrimp)
- **Siriella pacifica* (mysid)
- **Elasmopus* sp. (amphipod)
- **Pontharpinia* sp. (amphipod; possibly 2 different species)
- **Pseudosquilla lessonii* (larvae taken by night-lighting)
- Grapsus grapsus* (Sally Lightfoot crab; taken at all rocky shore stations)
- Eucinetops panamensis*
- Callinectes bellicosus* (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [presence assumed]
- Glyptoxanthus meandricus* (a spectacularly sculptured xanthid crab, once common but now becoming scarce)
- ***Cataleptodius occidentalis* (as *Leptodius occidentalis*, a junior synonym; one of the most common and abundant small crabs in the Gulf)
- Xanthodius cooksoni* (as *Leptodius cooksoni*, a junior synonym)
- Pilumnus gonزالensis*
- Eriphia squamata* (“old lumpy claws”; a very common, small, pugnacious xanthid crab ranging from the Upper Gulf to Peru)
- Calcinus californiensis* (one of the most attractive hermit crabs in the Gulf)
- Petrolisthes gracilis* (one of the most common porcelain crabs in the Gulf; likely this species was at every rocky shore they visited, even though they collected it only 4 times)
- Petrolisthes hirtipes* (a very common porcelain crab in the Gulf)
- Petrolisthes nigrunguiculatus* (a common porcelain crab in the Gulf)
- Petrolisthes* sp.
- Acanthochitona* sp.
- Acanthochitona exquisita* (abundant at this site)
- Chiton virgulatus* (S&R noted this is the commonest chiton in the Gulf; it remains so today)
- Ischnochiton tridentatus*
- Stenoplax sonorana* (as *Ischnochiton conspicuus*, a misspelling of the junior synonym in Phyletic Catalogue)
- Arcopsis solida* (as *Fossularca solida*, a junior synonym; the common “garbanzo clam” of S&R)
- Isognomon recognitus* (as *I. chemnitziana* d’Orbigny, a junior synonym)
- Brachidontes semillaevis* (as *Brachidontes multififormis*, a junior synonym; a very common small mytilid mussel in the Gulf)

Carditamera affinis (as *Carditamera affinis californica*; S&R considered this “the commonest bivalve in the Gulf”; common in shell middens in the Northern Gulf, where they appear to have been fashioned into pendants)

Tivela planulata? (“Pismo clams” of the Narrative)

Oliva venulata

Mitrella guttata (as *Nitidella guttata*, a junior synonym; this species, one of the most common small snails in the Gulf, is considered a synonym of *Mitrella columbella ocellata* by some workers, but the latter is a trans-Atlantic species)

Acanthina lugubris

Tegula rugosa (today, this is probably the most common species of *Tegula* in the Gulf)

***Crepidula striolata* (as *Crepidula squama*, a junior synonym)

***Hoffmannella lesliei* (as *Onchidium lesliei*)

***Haminoea virescens* (as *Haminoea strongi*, a junior synonym)

“Undetermined bubble shell”

Octopus bimaculatus

Also mentioned in the Narrative: anemones, flatworms, nemertean, sipunculan, limpets, tunicates, orange nudibranchs (probably *Berthellina ilisima*), giant terebellid worms, tunicates

March 31 (evening): Bahía de San Francisquito, BC. Collection No. 17 (p. 211 in the Narrative)

Note: Ricketts’s log notes that the morning tide on March 31 was very poor (“about 2.5 ft or 3 ft below the uppermost line of barnacles”).

Leucetta losangelensis (the most common calcareous sponge in the Gulf, and one of the most common sponges in the Tropical East Pacific)

Scrupocellaria diegensis (there seems to be no subsequent record of this California species from the Gulf; 4 other species in this genus are known from the Gulf, and the S&R specimen was likely one of these: *S. bertholetti*, *S. mexicana*, *S. scruposa*, *S. varians*)

Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the expedition visited)

Salmacina tribranchiata (as *S. dysteri*; tube worms with rusty red gills; S&R noted this worm “resembles *Filograna*”)

Astrometis sertulifera

Heliaster kubiniji

Phataria unifascialis

Ophioderma teres

Eucidaris thouarsii (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)

**Chthamalus anisopoma*

**Tetraclita stalactifera* (as *Tetraclita squamosa stalactifera*, and as *Tetraclita squamosa stalactifera*, f. *confinis*)

**Rocinela signata* (reported as *Rocinella aries*, a misspelling of the junior synonym)

**Panulirus interruptus* (the Mexican spiny lobster, with the odd range of San Luis Obispo, California, to Cabo San Lucas, including the Central and Southern Gulf; the expedition found only dried carapaces on the shore here and in several other bays)

Clibanarius digueti (the blue-spotted hermit crab; perhaps the most common hermit in the Gulf)

Petrolisthes nigrunguiculatus (a common porcelain crab in the Gulf)

Emerita rathbunae (burrowed in beach sand)

Callinectes bellicosus (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, "found at practically every suitable station," and this is still the case) [presence assumed]

Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations)

Pachygrapsus crassipes (one of the most common invertebrates of the temperate NW Pacific coast, but probably always rare in the Gulf; a temperate disjunct species ranging from the Pacific Northwest to Magdalena Bay [SW Baja], reappearing in the Northern and Central Gulf). The last reliable records in the Gulf seem to be from the late 1960s, and it might be that sea surface temps are now too warm for this species to survive in the Sea of Cortez. Also reported from Japan and Korea. Randall's original type locality of Hawaii was almost certainly an error.

Geograpsus stormi (as *G. lividus*)

Ischnochiton tridentatus

Acanthina lugubris

Lottia dalliana (as *Acmaea daliana*, a junior synonym)

Tegula sp.

Purpura sp. (the genus *Purpura* has been split into several genera, including *Plicopurpura* and *Pteropurpura*; at least 6 species in these 2 genera occur in the Gulf today)

Didemnum carnulentum (this tunicate was mistaken for a white sponge in the Narrative)

Cystodytes dellechiaiei

Also mentioned in the Narrative: anemones, bristle chitons, the usual holothurians (presumably *Holothuria lubrica*)

April 1: Bahía de Los Ángeles, BC. Collection No. 18 (p. 219 in the Narrative)

From intertidal rocks on W side of bay

Geodia sp.

Cliona californiana (as *C. celata*)

Stelletta clarella (as *Stelletta estrella*)

Tethya aurantia

**Anthopleura dowii* (anemone)

**Anthothoe panamensis*

**Bunodosoma californica*

**Palythoa ignota* (syntype)

Latocestus sp. (undescribed species of flatworm/Platyhelminthes)

***Baseodiscus mexicanus* (the largest and most distinctive nemertean in the Gulf)

- Bugula neretina* (one of the most widespread bryozoans in the Gulf; ranging from central California to Panama)
- Scrupocellaria* sp. (4 species in this genus are known from the Gulf: *S. bertholetti*, *S. mexicana*, *S. scruposa*, *S. varians*)
- Thalamoporella californica* (a well-known California bryozoan ranging south all the way to Colombia and the Galapagos Islands)
- Eurythoe complanata* (the ubiquitous fire worm; found at every rocky shore site the expedition visited)
- Thelepus setosus* (a circumtropical terebellid polychaete)
- Salmacina tribranchiata* (as *S. dysteri*; tube worms with rusty red gills; S&R noted this worm “resembles *Filograna*”)
- ***Heliaster kubiniji*
- Phataria unifascialis*
- Linckia columbiae*
- Mithrodia bradleyi*
- Echinaster tenuispina* (= *Othelia tenuispina*; noted to be more common the farther north they traveled; once very common, now less so due to uncontrolled beach tourism)
- ***Astropecten armatus* (a very common sand sea star in the Gulf, but collected by S&R only at this single location)
- Ophionereis annulata*
- Ophioderma teres*
- Ophiocoma aethiops*
- Ophiactis savignyi* (a common Tropical East Pacific 6-armed brittle star)
- Eucidaris thouarsii* (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)
- Arbacia incisa*
- Encope californica*
- Encope grandis*
- Holothuria lubrica* (= *Slenkothuria lubrica*; the sulfur cucumber; the most common sea cucumber taken during the expedition and the most common littoral cucumber in the Sea of Cortez today)
- Pseudocnus californicus* (as *Cucumaria californica*; found only at this location)
- ***Neothyone gibbosa*
- ***Pentamera chierchia* (found only at this locality)
- Epitomapta tobogae* (as *Leptosynapta* sp.; taken only at this locality, and possibly also Puerto Refugio, Isla Ángel de la Guarda)
- Ligia occidentalis* (as *Ligyda occidentalis*; although collected only from this single site, this isopod is common on virtually all rocky shores in the Gulf north of Bahía La Paz, though difficult to capture)
- Tetraclita stalactifera* (as *Tetraclita squamosa stalactifera*)
- Chthamalus anisopoma*
- Clibanarius digueti* (the blue-spotted hermit crab; perhaps the most common hermit in the Gulf)
- Petrolisthes gracilis* (one of the most common porcelain crabs in the Gulf; likely this species was at every rocky shore they visited, even though they collected it only 4 times)

- Petrolisthes hirtipes* (a very common porcelain crab in the Gulf)
- Platypodiella rotundata* (as *Platypodia rotundata*)
- Eurypanopeus planissimus*
- Pilumnus gonzalensis*
- Eriphia squamata* (“old lumpy claws”; a very common, small, pugnacious xanthid crab ranging from the Upper Gulf to Peru)
- Pinnixa transversalis* (a common Tropical East Pacific pea crab, Pinnotheridae; collected from a “sandy-tubed worm on a sand flat”)
- Grapsus grapsus* (Sally Lightfoot crab; taken at all rocky shore stations)
- Geotice americanus* (S&R initially misidentified this species as *Hemigrapsus oregonensis*; S. Glassell presumably made the correction)
- **Panulirus interruptus*
- Acanthochitona exquisita* (abundant at this site)
- Chaetopleura* aff. *lurida* (the “small, hairy chiton” of the Narrative; *C. lurida* ranges from the Central Gulf to Colombia)
- Chiton virgulatus* (S&R note this is the commonest chiton in the Gulf; it remains so today)
- Lepidozона clathrata* (as *Ischnochiton clathratus*, a junior synonym)
- A “minute *Mopalia*-like form”
- Arcopsis solida* (as *Fossularca solida*, a junior synonym; the common “garbanzo clam” of the Gulf)
- Fugleria illota* (the “triangular *Arca*” of the Narrative)
- Isognomon janus* (as *I. anomioides*, a junior synonym; very common, thin rock oyster on rocky shores in the Gulf)
- Saccostrea palmula* (as *O. mexicana*, a junior synonym; this is a fairly common edible oyster found throughout the Gulf, and it is also common in Northern Gulf shell middens; this was the “rock oysters” reported from Bahía de los Ángeles in the Narrative)
- Carditamera affinis* (as *Carditamera affinis californica*; S&R considered this “the commonest bivalve in the Gulf”; common in shell middens in the Northern Gulf, where they appear to have been fashioned into pendants)
- Chione californiensis* (as *Chione succincta*, a junior synonym; one of the most common bivalves in the Gulf)
- Megapitaria squalida* (as *Macrocallista squalida*, a junior synonym; one of two species called “chocolata clam,” or “almeja chocolata,” in the Gulf)
- Leukoma grata* (as *Protothaca grata*, a junior synonym)
- Macoma indentata* (initially identified by H. Rehder as an undescribed species he intended to name *M. rickettsi*)
- “*Paphia*-like form” (probably a misidentification; there are no *Paphia* known to occur in the Gulf)
- Terebra variegata*
- Migtra tristis* (as *Strigatella dolorosa*, a junior synonym)
- Nassarius tiarula* (as *Nassarius tegula*, a junior synonym)
- Costoanachis coronata* (as *Anachis coronata*)
- Mitrella guttata* (as *Nitidella guttata*, a junior synonym; this species, one of the most common small snails in the Gulf, is considered a synonym of *Mitrella/Columbella ocellata* by some workers, but the latter is a trans-Atlantic species)

Acanthina lugubris

Mancinella tuberculata (as *Thais tuberculata*, a junior synonym)

**Liocerithium judithae* (as *Cerithium sculptum*, a junior synonym; the “small turret-snails” of the Narrative; one of the most common small snails in the Gulf)

Crepidula onyx (slipper shell)

Crucibulum spinosum

Neverita reclusiana (as *Polinices reclusianus*, a junior synonym of *Polinices reclusiana*, misspelled in the Narrative)

Lottia dalliana (as *Acmaea daliana*, a junior synonym)

Tegula impressa

Pleurobranchidae (unidentified slug)

Hoffmannola lesliei (as *Onchidium lesliei* in Phyletic Catalogue; this species is very similar to *Onchidella binneyi*, and this identification needs verification)

***Berthellina engeli*

***Onchidella binneyi*

Octopus bimaculatus

Octopus sp. (not *O. bimaculatus*; there are 9 species of *Octopus* in the Gulf)

Balanoglossus sp. (acorn worm)

Aplidium californicum (= *Amaroucium californicum*, a wide-ranging east Pacific compound tunicate; the tunicates of the Gulf of California have not yet been carefully studied)

Didemnum carnulentum

Eudistoma sp. (S&R speculated that this might be an undescribed species; 2 *Eudistoma* species are currently known from the Gulf, *E. mexicanum* and *E. psammion*)

Branchiostoma californiense (the common Gulf lancelet)

From tidal flats on N side of bay

**Botruanthus benedeni* (cerianthid anemone)

Anthothoe carcinophila? (the “long turreted snails carrying commensal anemones on their shells” of the Narrative)

Callinectes bellicosus (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [presence assumed]

Felaniella cornea (as *Felaniella sericata*, a junior synonym)

Chione sp.

Tivela sp.

Octopus sp. (not *O. bimaculatus*)

Crepidula onyx (slipper shell; the “sand flats limpets” of the Narrative)

Branchiostoma californiense (the common Gulf lancelet)

Also mentioned in the Narrative: oysters (attached to rocks in mud), highly ornamented limpets (attached to rocks in mud), small snails (attached to rocks in mud), chitons, tube worms with pea crabs (Pinnotheridae) commensal in the tubes

From “Ballenas Canal” (on collection labels)**Ophiactis savignyi***Ophiocoma aethiops***Ophionereis annulata*April 2: Isla Ángel de la Guarda, Puerto Refugio. Collection No. 19 (p. 224 in the Narrative)*Aaptos vannamei* (questionable identification of a black sponge)*Hymeniacion* sp. (there are 3 species in this genus known from the Gulf: *H. sinapium*, *H. adreissiformis*, and *H. rubiginosa*; the last is known from Puerto Refugio and likely the species S&R reported)*Leucetta losangelensis* (the most common calcareous sponge in the Gulf, and one of the most common sponges in the Tropical East Pacific)*Leuconia heathi* (questionable identification; this is a California species)*Aglaophenia diegensis* (one of the most common hydroids in the northeastern Pacific)**Porites californica* (as *P. porosa*, a junior synonym; S&R correctly noted this was the commonest coral on Gulf shores, occurring as dome-shaped encrusting heads 8 inches in diameter)**Phyllactis concinnata* (ruffled anemone)**Telmatactis panamensis* (anemone)*Flustra* (?) sp. (the genus *Flustra* has been broken apart, and there are now a half-dozen species in other genera that this could have been)*Phascalosoma* sp. (“small *P. agassizii*”; as *Physcosoma agassizii*, a junior synonym)*Sipunculus nudus***Ochetostoma edax* (type specimen of a new echiuran described by W. K. Fisher in 1946; Ricketts’s field notes called this “a green *Echiurus*”)*Chloeia viridis* (the 3-stripe fire worm; a stinging polychaete and fairly common Tropical East Pacific species)*Eurythoe complanata* (the ubiquitous fire worm; found at every rocky shore site the expedition visited)*Notopygos ornata* (“small Gulf fire worm”)*Eulalia myriacyclum* (long, green, sand flat polychaete)*Eunice filamentosa* (a Gulf endemic)*Palola sicilensis* (regarded as a nearly circumtropical polychaete)*Protula tubularia* (a poorly known serpulid polychaete)*Stylarioides capulata* (this Southern California species has apparently not been reported from the Gulf since the S&R report)*Eurythoe complanata**Chloeia viridis* (the “short fat stinging worm”)*Heliaster kubiniji**Astrometis sertulifera**Phataria unifascialis**Linckia columbiae*

Mithrodia bradleyi

Henricia sp. (5 species in this genus are known from the Gulf today; *H. aspera*, *H. asthenactis*, *H. clarki*, *H. gracilis*, *H. polyacantha*)

Echinaster tenuispina (= *Othelia tenuispina*; noted to be more common the farther north they traveled; once very common, now less so due to uncontrolled beach tourism)

**Ophiocoma alexandri*

**Ophioderma teres*

**Ophionereis annulata*

**Ophiothrix spiculata*

Eucidaris thouarsii (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)

Arbacia incisa

Centrostephanus coronatus

Metalia nobilis (= *M. spatagus*; a small and uncommon heart urchin ranging from the Upper Gulf to Panama, taken only at this locality)

Holothuria arenicola (a circumtropical species common in the Gulf)

Holothuria impatiens (a circumtropical species; S&R describe this as the second most common sea cucumber from their expedition)

Holothuria lubrica (= *Slenkothuria lubrica*; the sulfur cucumber; the most common sea cucumber taken during the expedition and the most common cucumber in the Sea of Cortez littoral today)

Chthamalus anisopoma

Ligia sp.

**Aruga* sp. (amphipod; only one species in this genus is known from the Gulf today, *A. holmesi*)

Pachygrapsus crassipes (one of the most common invertebrates of the temperate NW Pacific Coast, but probably always rare in the Gulf; a temperate disjunct species ranging from the Pacific Northwest to Magdalena Bay [SW Baja], reappearing in the Northern and Central Gulf) The last reliable records in the Gulf seem to be from the late 1960s, and it might be that sea surface temps are now too warm for this species to survive in the Sea of Cortez. Also reported from Japan and Korea. Randall’s original type locality of Hawaii was almost certainly an error.

Moreiradromia sarraburei (as *Dromidia larraburei*, a junior synonym; small specimens in tide pools)

Eucinetops lucasi

Microphrys platysoma

Portunus xantusii affinis (as *Portunus pichilinqei*, a junior synonym of this subspecies; taken by night-lighting)

Cataleptodius occidentalis (as *Leptodius occidentalis*, a junior synonym; one of the most common and abundant small crabs in the Gulf)

Eurypanopeus planissimus

Pilumnus gonzalensis

Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations)

Palaemon ritteri

- Petrolithes hirtipes* (a very common porcelain crab in the Gulf)
- Acanthochitona exquisita* (abundant at this site)
- Acanthochitona* sp.
- Chiton virgulatus* (S&R note this is the commonest chiton in the Gulf; it remains so today)
- Lepidozона clathrata* (as *Ischnochiton clathratus*, a junior synonym, in Phyletic Catalogue)
- Ischnochiton tridentatus*
- Nuttallina* sp. cf. *allantophora* (*N. allantophora* is now a junior synonym of *Liolophura japonica*, a far-west Pacific species; it is probable that the expedition's specimen was *Nuttallina crossota* Berry, 1956, the only species in this genus known from the Gulf today)
- Chaetopleura limaciformis*
- Stenoplax* sp. (7 species of *Stenoplax* are known from the Gulf today)
- Arcopsis solida* (as *Fossularca solida*, a junior synonym; the common "garbanzo clam" of the Gulf)
- Fugleria illota* (the "triangular *Arca*" of S&R)
- Isognomon janus* (as *I. anomioides*, a junior synonym; very common, thin rock oyster on rocky shores in the Gulf)
- Brachidontes semilaevis* (as *Brachidontes multiformis*, a junior synonym; a very common small mytilid mussel in the Gulf)
- Carditamera affinis* (as *Carditamera affinis californica*; S&R considered this "the commonest bivalve in the Gulf"; common in shell middens in the Northern Gulf, where they appear to have been fashioned into pendants)
- Lottia atrata* (as *Acmaea atrata*, a junior synonym)
- Lottia dalliana* (as *Acmaea daliana*, a junior synonym)
- Lottia mesoleuca* (as *Acmaea mesoleuca*, a junior synonym)
- Engina ferruginosa* Reeve (the identity of this species is unclear, but it is likely what we now call *Morula nodulosa* or *Morula ferruginosa*)
- Columbella fuscata*
- Acanthina lugubris*
- **Liocerithium judithae* (as *Cerithium sculptum*, a junior synonym; one of the most common small snails in the Gulf)
- Turbo fluctuosus* (as *Callopoma fluctuosum*, a junior synonym; the most common mid-size gastropod in the Gulf)
- Tegula impressa*
- Diodora inaequalis* (misspelled as "*inequalis*" in Phyletic Catalogue)
- Fissurella rugosa*
- Aplysia californica* (as "*Tethys* sp. probably *californica*")
- Berthella* sp. (as *Berthella plumula* in Phyletic Catalogue, which is an Atlantic species; there are 3 described species in this genus known from the Gulf)
- Aegires* sp. (the "small, elongate, dotted" slug of the Narrative; only one species in this genus is known from the Gulf today, *A. albopunctatus*)
- Pleurobranchidae (unidentified slug)
- Melibe leonina* (as *Chioraera leonina*, a junior synonym; the "pelagic nudibranch also found in Puget Sound"; the existence of this species in the Gulf is still uncertain)

***Hoffmannola lesliei* (as *Onchidium lesliei*; this species is very similar to *Onchidella binneyi*, and this identification needs verification; Ricketts's field notes referred to this as a "tectibranch," noting how abundant they were; today, *O. binneyi* is very abundant at this site)

***Haminoea virescens* (as *Haminoea strongi*, a junior synonym)

Octopus bimaculatus

Aplidium californicum (= *Amaroucium californicum*, a wide-ranging East Pacific compound tunicate; the tunicates of the Gulf of California have not yet been carefully studied)

Didemnum carnulentum

Eudistoma sp. (S&R speculated that this might be an undescribed species; 2 *Eudistoma* species are currently known from the Gulf, *E. mexicanum* and *E. psammion*)

Ascidia sp. (noted in the Narrative as "large sea-squirt the color of water"; S&R speculated that this might be an undescribed species; there are 3 species of *Ascidia* known from the Gulf today—*A. sydneyensis*, *A. interrupta*, and *A. ceratodes*—it is likely their specimen was one of these, and possibly *A. interrupta* which fits their description and is the most common of the three)

Also mentioned in the Narrative: mussels (*Mytilus*-like), hermit crabs, a "*Leptosynapta*-like form" (possibly *Epitomapta tobogae*)

April 3: Isla Tiburón, Red Bluff Point/Punta Risco Colorado (south end of island).

Collection No. 20 (p. 234 in the Narrative)

Spirastrella sp. (reported as "a white encrusting sponge"; probably *S. coccinea*, a common Gulf species)

Aglaophenia diegensis (one of the most common hydroids in the northeastern Pacific)

Astrangia pederseii (a solitary coral and one of 11 *Astrangia* species in the Gulf; considered a junior synonym of *A. haimeii* by Squires 1959)

**Porites californica* (as *P. porosa*, a junior synonym; S&R correctly noted this was the commonest coral on Gulf shores, occurring as dome-shaped encrusting heads 8 inches in diameter)

**Bunodosoma californica* (syntype)

**Telmatactis panamensis* (anemone)

**Palythoa rickettsi* (holotype and paratype; type locality)

Stylochoplana plehni (= *Leptoplana californica*; a flatworm/Platyhelminthes)

Porella sp. (2 species of *Porella* are known from the Gulf: *P. rogickae*, *P. porifera*; if the identification was by R. S. Bassler, it is likely the correct genus identification)

Eurythoe complanata (the ubiquitous fire worm; found at every rocky shore site the expedition visited)

Heliaster kubiniji

Phataria unifascialis

****Linckia columbiae*

**Pharia pyramidata*

**Ophiothrix spiculata*

Ophiocoma aethiops

**Ophiactis simplex* (the small, 5- or 6-armed brittle star)

Eucidaris thouarsii (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)

Centrostephanus coronatus

Holothuria impatiens? or *Holothuria arenicola?* (not in Phyletic Catalogue, but in a letter from E. Deichmann; however, Ricketts’s collecting notes say this specimen was “probably the common knobby form,” which would imply it might have been either one of these species; both are circumtropical species common in the Gulf)

Tetraclita rubescens (as *Tetraclita squamosa*)

Grapsus grapsus (Sally Lightfoot crab; few)

Pachygrapsus crassipes (one of the most common invertebrates of the temperate NW Pacific coast, but probably always rare in the Gulf; a temperate disjunct species ranging from the Pacific Northwest to Magdalena Bay [SW Baja], reappearing in the Northern and Central Gulf) The last reliable records in the Gulf seem to be from the late 1960s, and it might be that sea surface temps are now too warm for this species to survive in the Sea of Cortez. Also reported from Japan and Korea. Randall’s original type locality of Hawaii was almost certainly an error.)

Stenorhynchus debilis (the common Gulf arrow crab)

**Cirolana nielbrucei* (as *Cirolana harfordi*; *C. harfordi* is a temperate isopod species that is rare in the Gulf; the S&R specimens [from USNM] were described as *Cirolana neilbrucei* by Brusca, Wetzer, and France in 1995)

**Paranthura longitelson* (as *Paranthura* sp. in Phyletic Catalogue; collected by night-lighting)

***Palaemon ritteri*

Clibanarius digueti (the blue-spotted hermit crab; perhaps the most common hermit in the Gulf)

Megalobrachium tuberculipes (as *Pisonella tuberculipes*; an uncommon Tropical East Pacific porcelain crab)

Callinectes bellicosus (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [presence assumed]

Eurypanopeus planissimus

Pilumnus gonzalensis

Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations)

Chiton virgulatus (S&R noted this is the commonest chiton in the Gulf; it remains so today)

Ischnochiton tridentatus

Stenoplax limaciformis (as *Ischnochiton limaciformis* in Phyletic Catalogue)

Callistochiton sp. (3 species of *Callistochiton* are known from the Gulf today: *C. colimensis*, *C. elenensis*, *C. palmulatus*)

Arcopsis solida (as *Fossularca solida*, a junior synonym; the common “garbanzo clam” of the Gulf)

- Fugleria illota* (the “triangular *Arca*” of S&R)
- Isognomon janus* (as *I. anomioides*, a junior synonym; very common, thin rock oyster on rocky shores in the Gulf)
- Diplodonta subquadrata* (as *Taras subquadrata*, a junior synonym)
- Stramonita haemastoma* (as *Thais biserialis*, a junior synonym)
- Vasula speciosa* (as *Thais centiquadrata*, a junior synonym; this species has had a tortuous nomenclatural history—other synonyms include *Thais speciosa*, *Purpura speciosa*, *Purpura centriquadra*, *Manciella speciosa*, and *Purpura triserialis*)
- Lottia atrata* (as *Acmaea atrata*, a junior synonym)
- Lottia pediculus* (as *Acmaea pediculus*, a junior synonym)
- Turbo fluctuosus* (as *Callopoma fluctuosum*, a junior synonym; the most common mid-size gastropod in the Gulf)
- Tegula mariana*
- Diodora alta* (misspelled in Phyletic Catalogue as “*Diadora*”)
- Diodora inaequalis* (misspelled as “*inequalis*” in Phyletic Catalogue)
- ***Elysia diomedea*
- Tridachiella diomedea* (the famous Gulf “Mexican/Spanish dancer” nudibranch; S&R note it was “possibly the most common nudibranch” they encountered; it is still very common, except where tide-pool tourists have taken them in excess)
- Turbo fluctuosus* (= *Callopoma fluctuosum*)
- Callopoma fluctuosum* (possibly a junior synonym of *Tegula brunnea* or *Chlorostoma brunneum fluctuosum*?)
- Aplidium californicum* (= *Amaroucium californicum*; a wide-ranging East Pacific compound tunicate; the tunicates of the Gulf of California have not yet been carefully studied)
- Eudistoma* sp. (S&R speculated that this might be an undescribed species; 2 *Eudistoma* species are currently known from the Gulf, *E. mexicanum* and *E. psammion*)
- Also noted in the Narrative: barnacles

April 4 (mis-labeled as April 22 in the Narrative): Guaymas area, Puerto/Port San Carlos, Sonora (N of Guaymas). **Collection No. 21 (p. 239 in the Narrative)**

- Cliona californiana* (as *C. celata*)
- Aglaophenia diegensis* (one of the most common hydroids in the northeastern Pacific)
- **Aiptasiomorpha elongata* (holotype)
- **Anthopleura dowii* (Specimens taken from Puerto San Carlos, Sonora, were described by Carlgren in 1951 as a new species, *Bunodactis mexicana*. However, Daly [2004] showed Carlgren’s specimens to have been *Anthopleura dowii*, thus making *B. mexicana* a junior synonym of *A. dowii*. Daly further reckoned that Brusca’s [1973, 1980a] records of *Bunodactis mexicana* were actually an undescribed species, which he named *Isoaulactini hespervolita* [Daly 2004])
- **Telmatactis panamensis*

- Latocestus* sp. (undescribed species of flatworm/Platyhelminthes)
- **Phascolosoma dentigerum*
- Eurydice caudata* (a wide-ranging isopod known from central California to Ecuador; S&R took these specimens by night-lighting)
- Heliaster kubiniji*
- Phataria unifascialis*
- Ophioderma teres*
- Holothuria lubrica* (= *Slenkothuria lubrica*; the sulfur cucumber; the most common sea cucumber taken during the expedition and the most common littoral cucumber in the Sea of Cortez today)
- **Chthamalus anisopoma*
- **Mysidium rickettsi* (paratype)
- Sicyonia penicillata* (as *Eusicyonia penicillata*; a penaeid shrimp taken while night-lighting)
- Clibanarius digueti* (the blue-spotted hermit crab; perhaps the most common hermit in the Gulf)
- Dardanus sinistripes* (or more likely from a Japanese shrimp trawler at Guaymas; possible labeling confusion)
- Petrolisthes gracilis* (one of the most common porcelain crabs in the Gulf; likely this species was at every rocky shore they visited, even though they collected it only 4 times)
- Portunus xantusii minimus* (as *Portunus minimus*, a species that has been sunk into *P. xantusii*; captured by night-lighting)
- Callinectes bellicosus* (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [presence assumed]
- Cataleptodius occidentalis* (as *Leptodius occidentalis*, a junior synonym; one of the most common and abundant small crabs in the Gulf)
- Parapinnixa nitida* (a small pea crab, Pinnotheridae, that might be endemic to the Gulf; collected by night-lighting)
- Geotice americanus* (S&R initially misidentified this species as *Hemigrapsus oregonensis*; S. Glassell presumably made the correction)
- Callistochiton elenensis* (as *Callistochiton infortunatus*, a junior synonym, in Phyletic Catalogue)
- Arcopsis solida* (as *Fossularca solida*, a junior synonym; the common “garbanzo clam” of the Gulf)
- Fugleria illota* (the “triangular *Arca*” of S&R)
- Isognomon janus* (as *I. anomioides*, a junior synonym; very common, thin rock oyster on rocky shores in the Gulf)
- Carditamera affinis* (as *Carditamera affinis californica*; S&R considered this “the commonest bivalve in the Gulf”; common in shell middens in the Northern Gulf, where they appear to have been fashioned into pendants)
- Leukoma grata* (as *Protothaca grata*, a junior synonym; taken at the Pajaro Island anchorage, just outside Guaymas)
- **Conus princeps*
- Fusinus dupetitthouarsi* (this is an offshore species that is frequently captured, and killed, by shrimp trawlers)

Engina ferruginosa Reeve (the identity of this species is unclear, but it is likely what we now call *Morula nodulosa* or *Morula ferruginosa*)

Acanthina lugubris

Muricopsis armatus (as *Muricopsis squamulata*, a junior synonym)

Phyllonotus erythrostomus (as *Phyllonotus bicolor*, a junior synonym; the pink-mouth murex; S&R found this to be the most common large snail of their expedition; although they list it from only a few locales it was likely present at all rocky shore sites they visited—indeed, it was once the most common littoral and shallow subtidal large snail throughout the Gulf, but no longer, due to intense over-collecting; large specimens are now exceedingly rare intertidally)

Stramonita haemastoma (as *Thais biserialis*, a junior synonym)

Vasula speciosa (as *Thais centiquadrata*, a junior synonym; this species has had a tortuous nomenclatural history—other synonyms include *Thais speciosa*, *Purpura speciosa*, *Purpura centriquadra*, *Manciella speciosa*, and *Purpura triserialis*)

Mancinella tuberculata (as *Thais tuberculata*, a junior synonym)

Cerithium maculosum (it is a mystery why this is the only tidal flat site S&R collected this species, which is very abundant on tidal flats throughout the Gulf; they should have also collected it in the La Paz area, at Puerto Escondido's inner bay, in Bahía Concepción, in San Carlos Bay, on the tidal flats at Bahía de los Ángeles, and at Esteros Agiabampo and de la Luna)

**Liocerithium judithae* (as *Cerithium sculptum*, a junior synonym; one of the most common small snails in the Gulf)

Crepidula incurva

Lottia mesoleuca (as *Acmaea mesoleuca*, a junior synonym)

Tegula rugosa (encrusted with *Chthamalus anisopoma*; today, this is probably the most common species of *Tegula* in the Gulf)

Diodora inaequalis (misspelled as “*inequalis*” in Phyletic Catalogue)

***Berthellina engeli*

Pleurobranchidae (unidentified slug)

From Japanese shrimp trawlers (April 9)

Leptogorgia alba (as *Lophogorgia alba*, a junior synonym; white gorgonian; from the Japanese shrimp trawler)

Hepatus kossmanni (a gift to Ricketts from Captain Corona of Guaymas, who operated a fleet of shrimp trawlers; formerly a common species in shrimp net bycatch, now rare due to decades of bottom trawling)

**Macrobrachium jamaicense* (an amphi-American freshwater shrimp; source of specimen unknown)

Lolliguncula panamensis (Panama brief squid; taken from a Japanese shrimp trawler just south of Guaymas; identified by S. Stillman Berry)

Doryteuthis opalescens (as *Loligo opalescens*, a junior synonym; taken from a Japanese shrimp trawler just south of Guaymas; identified by S. Stillman Berry but likely a misidentification because *D. opalescens*, the California market squid, is a temperate Californian species that doesn't do well in warm waters, although it ranges south as far as the central west coast of Baja California)

April 10: Estero de la Luna (~40 miles S of Guaymas). Collection No. 22 (p. 253 in the Narrative)

Obelia dichotoma (also found on the shell of a sea turtle off Point Abreojos)

Obelia plicata

Harenactis sp. (burrowing anemone, family Haloclavidae; this genus has only 2 described species—*H. argentina* and *H. attenuata*, the latter being a Southern California species that is today not known from the Gulf)

Cerianthus sp. (5 cerianthid-like burrowing anemones are currently known from the Sea of Cortez: *Andvakia insignis*, *Cerianthus vas*, *Isarachnanthus panamensis*, *Pachycerianthus aestuari*, *Botruanthus benedini*)

**Calamactis praelongus* (holotype; type locality)

**Botruanthus benedeni* (burrowing cerianthid anemone)

**Ophiophragmus marginatus* (a sand-burrowing, long-armed brittle star; had not been reported since Lütken's original description, from Nicaragua, a century earlier)

Mellita longifissa (this is the only locality the expedition collected this small sand dollar, which ranges from the Upper Gulf to Ecuador)

Agassizia scrobiculata (heart urchin)

Paraconcaus mexicanus (as *Balanus concavus*)

Megabalanus californicus (as *Balanus tintinabulum californicus*)

**Balanus inexpectatus* (as *Balanus amphitrite inexpectatus*)

**Balanus trigonus* (attached to the blue swimming crab, *Callinectes bellicosus*)

**Chelonibia patula dentata* (type specimen) (incorrectly stated in Phyletic Catalogue as being from "Agiabampo Bay"; actually from the cheliped of the swimming crab, *Callinectes bellicosus*, from Estero de la Luna, Sonora; identified by Dora Henry as a new subspecies and described by her)

Pontogenia sp. (amphipod, in an "*Obelia* colony")

Caprella aequilibra (caprellid amphipod, in an "*Obelia* colony")

Erichkonius brasiliensis (amphipod, in an "*Obelia* colony")

Parajassa sp. (amphipod, in an "*Obelia* colony")

Clibanarius panamensis

Dardanus sinistripes

Pagurus albus

Callianassa sp. cf. *C. uncinata* and *C. rochei*

Porcellana cancrisocialis (typically found on the shells of the hermit crabs

Petrochirus californiensis and *Dardanus sinistripes*)

**Callinectes bellicosus* (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, "found at practically every suitable station," and this is still the case) [presence assumed]

Felaniella cornea (as *Felaniella sericata*, a junior synonym; a Tropical Eastern Pacific clam)

Anomalocardia subrugosa

Gloibenus fordii (as *Anomalocardia subrugosa*, a junior synonym)

**Melongena patula*

Nassarius iodes (as *Nassarius ioaedes*)

Nassarius luteostomus

Nassarius tiarula (as *Nassarius tegula*, a junior synonym)

Parametaria epamella (as *Parametaria coniformis*, a junior synonym; originally described as *Columbella epamella*)

Natica chemnitzii

Balanoglossus sp. (acorn worm)

Also mentioned in the Narrative: gorgonians with hydroids growing on them

April 11: Estero Agiabampo. Collection No. 23 (p. 261 in Narrative)

Bugula neretina (one of the most widespread bryozoans in the Gulf; also ranging from central California to Panama)

Polyodontes ocullea (scale worm, in *Cerianthus*-like tube)

Lepidonotus hupferi

“*Spirorbis* tubes” (about 15 species of Spirorbidae are known from the Gulf today)

Balanus inexpectatus (as *Balanus Amphitrite inexpectatus*)

Clibanarius panamensis

Petrochirus californiensis (the largest hermit crab in the Gulf, aka “the gentle giant”—presumably the “big hermit crabs in conch shells” in the Narrative)

Callinectes bellicosus (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [presence assumed]

Ocypode occidentalis (ghost crab; this being the only place this very common sandy beach crab was collected suggests S&R focused almost strictly on rocky shores and mudflats)

Chione californiensis (as *Chione succincta*, a junior synonym; one of the most common bivalves in the Gulf)

Dosinia dunkeri

Megapitaria squalida (as *Macrocallista squalida*, a junior synonym; one of two species called “chocolata clam,” or “almeja chocolata,” in the Gulf)

Strombus gracilior (presumably the “stalk-eyed conchs” of Narrative)

April 12: Isla Espíritu Santo, Bahía San Gabriel. Collection No. 24 (p. 266 in Narrative)

Geodia mesotriaena (the most commonly encountered sponge of the expedition)

Leucetta losangelensis (the most common calcareous sponge in the Gulf, and one of the most common sponges in the region)

**Aiptasiomorpha elongata* (anemone)

**Andvakia insignis* (anemone) (syntypes)

**Epizoanthus gabrieli* (holotype; type locality)

**Palythoa praelonga* (syntypes)

**Zoanthus danae*

Cerianthus (tube only; 5 cerianthid-like burrowing anemones are currently known from the Sea of Cortez: *Andvakia insignis*, *Cerianthus vas*, *Isarachnanthus panamensis*, *Pachycerianthus aestuari*, *Botruanthus benedini*)

Lepidonotus hupferi (a tropical scale worm)

Acromegalomma mushaensis (as *Megalomma mushaensis*; a nearly circumtropical sabellid polychaete; very common)

Acromegalomma circumspectum (identification made by Gómez and Tovar-Hernández 2008; possibly the same specimens reported by S&R as *Megalomma mushaensis*, above)

** *Acromegalomma quadrioculatum* (as *Megalomma quadrioculatum*)

Heliaster kubiniji

Phataria unifascialis

**Ophiocoma aethiops*

**Ophiocoma alexandri*

**Ophioderma panamense*

**Ophioderma teres*

**Ophionereis annulata*

**Ophiactis savignyi* (a common Tropical East Pacific 6-armed brittle star)

***Euclidaris thouarsii* (one of the most common urchins in the Gulf; collected “at practically every suitable collecting place”)

***Arbacia incisa* (*Arbacia stellata* by some workers; the name is in dispute)

Lovenia cordiformis (heart urchin; taken only at this locality)

Holothuria lubrica (= *Slenkothuria lubrica*; the sulfur cucumber; the most common sea cucumber taken during the expedition and the most common littoral cucumber in the Sea of Cortez today)

Euapta godeffroyi (a large, conspicuous synaptid cucumber; surprisingly taken at only 2 localities)

**Chthamalus anisopoma*

Ligia sp.

**Bemlos macromanus* (amphipod)

Goniopsis pulchra (in mangroves)

Xanthodius sternberghii (as *Xanthodius hebes*, a junior synonym)

Pitho sexdentata

Microphrys platysoma

***Ozium tenuidactylus* (brachyuran crab)

Callinectes bellicosus (the pugnacious blue swimming crab; S&R noted this was the most common crab in the Gulf, “found at practically every suitable station,” and this is still the case) [presence assumed]

Cataleptodius occidentalis (as *Leptodius occidentalis*, a junior synonym; one of the most common and abundant small crabs in the Gulf)

Epixanthus tenuidactylus (as *Ozium tenuidactylos*, a junior synonym)

***Euclinetops lucassi* (majid crab)

Eriphia squamata (“old lumpy claws”; a very common, small, pugnacious xanthid crab ranging from the Upper Gulf to Peru)

Grapsus grapsus (Sally Lightfoot crab; taken at all rocky shore stations)

Geograpsus stormi (as *Geograpsus lividus*, a junior synonym; a circumtropical species)

Pachygrapsus socius (as *Pachygrapsus transversus*, an Atlantic species)

**Upogebia thistlei*

- Upogebia* sp. (there are 8 species of mud/ghost shrimp in this genus in the Gulf, but they are difficult to distinguish and often confused with species of other Gulf thalassinidean shrimps, such as *Pomatogebia*, *Neotrypaea*, *Naushonia*, *Callianidea*, and *Biffarius*)
- Pontonia pinnae* (a symbiont in the hatchet clam, *Pinna*)
- Megalobrachium sinuimanus* (as *Pisonella sinuimanus*)
- Crangon* sp. No. 1 (likely an unknown species of caridean shrimp, but not a *Crangon*)
- Crangon* sp. No. 2 (likely an unknown species of caridean shrimp, but not a *Crangon*)
- Clibanarius digueti* (the blue-spotted hermit crab; perhaps the most common hermit in the Gulf)
- Petrolisthes gracilis* (one of the most common porcelain crabs in the Gulf; likely this species was at every rocky shore they visited, even though they collected it only 4 times)
- Gastrodelpys dalesi* (a copepod symbiont with the sabellid polychaete *Acromegalomma circumspectum*; discovered by Gómez and Tovar-Hernández 2008)
- Acanthochitona exquisita*
- Americhiton arragonites* (as *Acanthochitona arragonites*; a single specimen taken)
- Arcopsis solida* (as *Fossularca solida*, a junior synonym; the common “garbanzo clam” of the Gulf)
- Arca mutabilis* (as *Navicula mutabilis*, a junior synonym; the “minute *Zirfaea*-like form” of the Narrative)
- Isognomon janus* (as *I. anomioides*, a junior synonym; very common, thin rock oyster on rocky shores in the Gulf but found attached to mangrove roots here)
- Saccostrea palmula* (as *O. mexicana*, a junior synonym; this is a fairly common edible oyster found throughout the Gulf, and it is also common in Northern Gulf shell middens)
- Brachidontes semilaevis* (as *Brachidontes multiformis*, a junior synonym; a very common small mytilid mussel in the Gulf)
- Carditamera affinis* (as *Carditamera affinis californica*; S&R considered this “the commonest bivalve in the Gulf”; common in shell middens in the Northern Gulf, where they appear to have been fashioned into pendants)
- Chama echinata* (as *Chama squamuligera*; Coan and Valentich-Scott [2012] consider *C. squamuligera* to be a white morph of *C. echinata*)
- Chione californiensis* (as *Chione succincta*, a junior synonym; one of the most common bivalves in the Gulf)
- Chione* sp.
- Siphonaria aequiliorata* (misspelled as “*aequilirata*”; an intertidal pulmonate; this is the “sand flat limpet” of the Narrative)
- Oliva venulata*
- Mitrella guttata* (as *Nitidella guttata*, a junior synonym; this species, one of the most common small snails in the Gulf, is considered a synonym of *Mitrella/Columbella ocellata* by some workers, but the latter is a trans-Atlantic species)

Vasula speciosa (as *Thais centiquadrata*, a junior synonym; this species has had a tortuous nomenclatural history—other synonyms include *Thais speciosa*, *Purpura speciosa*, *Purpura centiquadra*, *Manciella speciosa*, and *Purpura triserialis*)

Hipponix antiquatus

Crucibulum spinosum

Lottia strigatella (as *Acmaea strigatella*, a junior synonym)

**Conus brunneus*

***Berthellina engeli*

***Aplysia californica*

** *Melibe leonina* (as *Chioraera leonina*, a junior synonym; the “pelagic nudibranch also found in Puget Sound”; the existence of this species in the Gulf is still uncertain)

***Dolabella auricularia* (as “*Dolabella* sp. probably *californica*” in Phyletic Catalogue; a junior synonym)

Diodora inaequalis (misspelled as “*inequalis*” in Phyletic Catalogue)

Polyclinum sp. (2 species of *Polyclinum* are known from the Gulf today, *P. laxum* and *P. vasculosum*; however, the tunicate fauna of the Gulf has never been carefully studied)

Cystodytes dellechiaiei

Also mentioned in the Narrative: a fine patch of coral in the middle of the bay, hacha, porcelain crabs

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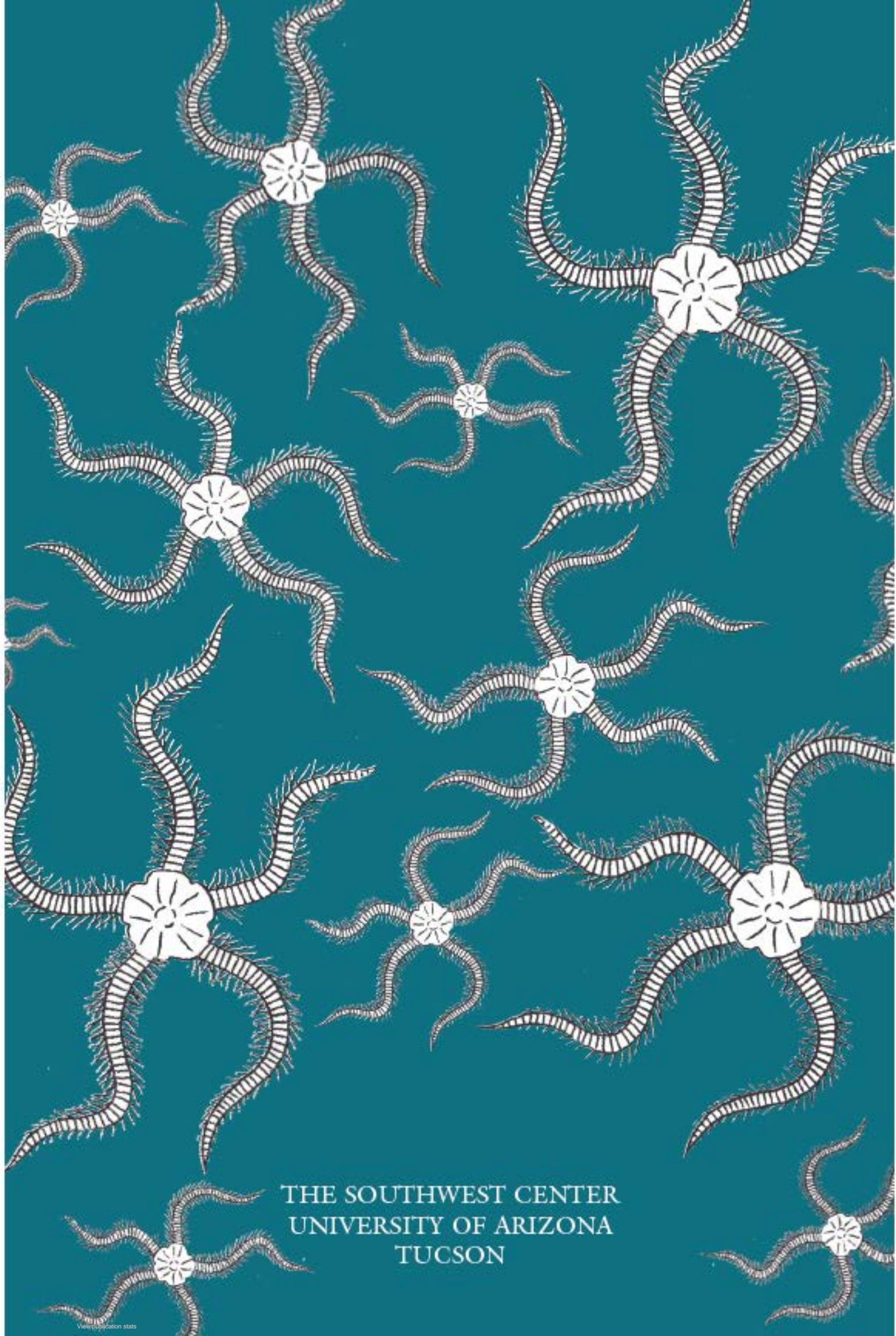
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