SOUTHERN CALIFORNIA ASSOCIATION OF MARINE INVERTEBRATE TAXONOMISTS

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Dr. Eric Hochberg at the Santa Barbara Museum of Natural History studying what else...a cephalopod!

This Issue

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09 JANUARY 2023, BIVALVIA PART IV, LEAD T. PHILLIPS, ZOOM

Attendees: Brent Haggin, Don Cadien, Jojo Loan, Terra Petry, Wayne Dossett, LACSD; Andrew Davenport, Wendy Enright, Lauren Valentino, Coulson Lantz, CSD; Mariah Scott University of Chicago; Paul V Scott, SBMNH Retired; Tony Phillips, DCE; Alison Fisher, Jessica Donald, Ashley Loveland, SFPUC; Ben Ferraro OCSD; Carol Paquette, MBC; Greg Lyon, CLAEMD; Kelvin Barwick, DCE; Austin Hendy, NHMLAC.

UPCOMING MEETINGS

Visit the SCAMIT website at: www.scamit.org for the most current meetings announcements.

For the business portion of the meeting Brent announced that anyone who is interested in running for a SCAMIT officer position still has time to put their name in the hat.

A reminder that the SCUM (Southern California Unified Malacologists) meeting will be held 4 February 2023 at the City of San Diego lab starting at 9 a.m. Tony asked about the CSD lab's COVID protocols and was told they have loosened somewhat, and masks will not be mandatory. It was noted that several agencies are easing in-person restrictions. SCAMIT will still try to maintain a hybrid option for meetings going forward.

Tony started his presentation by thanking collaborators, especially Paul V Scott, and the POTW agencies, for sharing their specimen vouchers. He also shared another series of volumes he's been using to look at juvenile-adult form differences in various species.

Although originally his presentation focused on the order Venerida, with recent taxonomic changes, it now encompasses 4 different orders containing 14 families.

Order Galeommatida

He highlighted Paul's recently described *Cymatioa cookae* (Willett, 1937) and showed similarities and differences with *Cymatioa electilis* (Berry 1963) and *Kurtiella coani* (Scott 1998)

He showed how similar *Cymatioa electilis* and *Rhamphidonta retifera* (Dall 1899) juveniles are (3mm or less). However, when the valves are opened and stained either with crystal violet or shirlastain to increase contrast, the teeth are distinctive.

Waldo arthuri Valentich Scott et al 2013 is almost always found on the heart urchin *Brisaster.*

Order Cardiida

Donax is found VERY shallow, as in the surf zone, and most offshore monitoring agencies won't sample it. There are two species with distinctive outlines.

Gari californica (Conrad 1849) was discussed and then compared and contrasted to *G. fucata* (Hinds 1845) with its distinctive, large external ligament.

Heterodonax pacificus (Conrad 1837) is also a very shallow/bay species with highly variable pigmentation.

Tony shared a comparison of adult-juvenile *Nuttalia nuttallii* (Conrad 1837) which is another shallow water species.

Next in the "nice growth series" category was *Cumingia californica* Conrad 1837. This is a shallow water species. He also also detailed the chondrophore.

There are five species of *Semele* in Southern California; mostly shallow but some may be found sub-tidally.

Theora lubrica Gould 1861 is an invasive species from Japan and is found in bays. It is very fragile making it difficult to see an intact hinge after bleaching the valves open.

Solecurtus guaymasensis (Lowe 1935) is a "lovely critter" and very rare.

Tagelus spp:

- *Tagelus affinis* (C. B. Adams 1852) – the pallial sinus is even with the umbo or just a bit beyond (visible through the exterior in some specimens).
- *Tagelus californianus* (Conrad 1837) the pallial sinus is short of the umbo and it has a heavier yellowish periostracum.
- *Tagelus subteres* (Conrad 1837) is brown/olive with a purplish interior.

Order Venerida

Chama arcana Bernard 1976 will only be sampled in very rocky/cobble areas.

For the Vesicomyidae, taxonomists will probably need to open and examine hinges since all three genera are externally similar.

Diplodonta orbella (Gould 1851) is extremely inflated as an adult, less so as juveniles but the hinge is morphologically consistent. *Diplodonta sericata* (Reeve 1850) may not be a valid ID and Tony will need to take a closer look. The distinction between the two species is in the periostracum with *D. orbella* being dehiscent and *D. sericata* being shiny.

Most shells in the family Veneridae are shallow/bay/intertidal. Tony detailed differences between *Chione*, *Callithaca*, *Leukoma*, *Irusella*, *Globivenus*, and *Chionista*. More distinctive are *Compsomyax* and *Tivela*. However, Tony cautioned the *Nutricola* can also be very tricky.

Tony then reviewed select juveniles of *Leukoma* and *Callithaca*, showing that *Leukoma* has crenulated ventral margins while the ventral margins of *Callithaca* are smooth.

Pitar and *Saxidomus* may be confounded – both have brown/chestnut maculations but the hinges are distinct, even at small sizes.

Venerupis philippinarum (A. Adams & Reeve 1850) is another well-established invasive. It is distinctive and colorful with pronounced sculpturing and extremely variable pigment.

Neoleptonidae

- No pictures to share of *Bernardina bakeri* Dall 1910 yet but Paul offered to share his images.

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- Differences between *Neolepton salmoneum* (Carpenter 1864) and *Neolepton subtrigonum* (Carpenter 1857) come down to overall shape and the presence/absence of the left anterior lateral tooth

- It was noted that Neoleptonids are brooders

Cooperella subdiaphana (Carpenter 1864) is opalescent/pearly. It has a deep pallial sinus and separate siphons. It is found from bay habitats out to the mid-shelf.

Petricola carditoides (Carpenter 1864). Is found to 45m. It is distinct from *Petricola californiensis* Pilsbry & Lowe 1932 in having external divaricate sculpture. *Petricola hertzana* Coan 1997 is more subtrigonal and with a much wider pallial sinus compared *to P. carditoides*.

Order Adapedonta (new for SCAMIT Ed14)

Hiatella arctica (Linnaeus 1767) is a nestler with a highly variable shape. The cardinal teeth are obscure in adults. The juveniles often have spines amongst their sculpturing and often have commarginal folds.

Panomya norvegica (Spengler 1793) has been previously ID'ed by some as *Panopea generosa* Gould 1850. There are differences in the medial sulcus and cardinal teeth. It may occasionally be superficially similar to *Hiatella* but the sulcus of *Panomya* is a distinctive character.

The genus *Saxicavella* is now in the family Basterotiidae. The two species encountered locally can be distinguished by overall shape. Additionally, *Saxicavella nybakkeni* Scott 1994 has a sunken ligament while *Saxicavella pacifica* Dall 1916 has an external ligament.

Solen rostriformis Dunker 1862 is mostly found in bays. It is longer and thinner than *Solen sicarius* Gould 1850. Also, the pallial sinus in *S. rostriformis* extends past the adductor muscle scar while in *S. sicarius* the sinus is shy of the muscle. These two species may co-occur in deeper bays but out on the shelf it should only be *S. sicarius*.

Ensis myrae Berry 1953 may superficially resemble *S. sicarius* at small sizes but *E. myrae* is narrower and concave in curvature in comparison.

Siliqua lucida (Conrad 1837) is currently the only species of *Siliqua* on the west coast that is found south of Point Conception. Differences from the other, northern species, were mentioned and specified in the "blue book" (Coan et al 2000).

With that, Tony concluded his power point. His next bivalve presentation will be in November 2023 and will cover another three groups: the rest of the erstwhile Venerida (Mactridae, Myidae, Corbulidae, Spheniopsidae), plus the orders Pholadida, and Anomalodesmata.

13 FEBRUARY 2023, POLYCHAETE TOOLBOX REVIEW PART 3, K. BARWICK, ZOOM

Attendees: Kelvin Barwick, Tony Phillips DCE; Gregory Lyon, Jennifer Smolenski, Nicholas Galliani, Erin Oderlin, CLAEMD; Ricardo Martinez, Veronica Rodriguez, Maiko Kasuya, Adam Webb, CSD; Leslie Harris, NHMLAC; Chip Barrett, Michael Ruster, EcoAnalysts; Amanda Martinez, CSULB grad; Rob Gamber, Ernie Ruckman, OCSD; Theresa Diaz, MBC; Alison Fisher, SFPUC.

Families addressed during the Toolbox review included: Trochochaetidae, Acrocirridae, and Cirratulidae, Ctenodrilidae, Fauveliopsidae, Flabelligeridae, Ampharetidae, and Pectinariidae. Below are a few notes from the day.

Ricardo offered to look for Rick Rowe's original documents instead of just scanned copies.

Veronica's images of *Aphelochaeta phillipsi* were reviewed.

It was noted that the methyl green staining pattern of *Kirkegaardia cryptica* (Blake 1996) can be variable.

According to Tony, *Kirkegaardia* sp 1 is a synonym of *K. serratiseta*.

MARCH 2023 - canceled

3 APRIL 2023, SLRC, LEAD K. BARWICK, ZOOM

Attendance: Kelvin Barwick, Dean Pasko, Tony Phillips, DCE; Don Cadien, Brent Haggin, LACSD; Megan Lilly, Wendy Enright, Zoë Scott, Veronica Rodriguez, Katie Beauchamp, Ricardo Martinez, Andy Davenport, CSD; Jennifer Smolenski, Greg Lyon, Erin Oderlin, CLAEMD; Leslie Harris, NHMLAC; Ben Ferraro, OCSD; Marie Nydam, SOKA University.

Kelvin started the meeting by reviewing the agenda he had created. The deadlines as they currently stand are in line to be met.

Tony announced the he is stepping down from the cnidaria and platyhelminthes and a volunteer will be needed to take his place. Anyone interested please contact Tony.

Zoë gave an overview of her Tidy crosscheck.R program and how she wrote it to work with WoRMS. This tool is proving to be very useful.

Ongoing Provisional Species Review was discussed next:

- Action items
    - Kelvin will send out his latest spread sheet for review of the pending suggested actions.
    - If someone disagrees with the recommended action for the species they will need to provide a justification
    - If it is decided to remove a provisional it will need to be noted if the species will be moved to the temporary or permanent hold list
    - Check the hold list and see if anything can be moved back to the emend list due to documentation being uploaded since the last review
    - If satisfactory documentation is provided there will be a May 1st deadline for uploading to the toolbox
    - Editors will create an appendix in the front matter to list those species removed

Discussion ensued on including fouling communities/rip rap surveys, etc. It was decided that all are welcome.

Jennifer brought up the subject of the alphabetization of the List. The current format is that the

List is set up phylogenetically primarily and within that, alphabetic. But there are exceptions to that rule. Jen's question was how do we know when it is out of order intentionally or just a mess? Don answered that based on outcoming molecular papers and with those results being incorporated in to levels above genus, it has created some changes and therefore many things are non-alphabetical. These exceptions/changes are not denoted anywhere. Jennifer pointed out that for instance the cnidarians are very out of alpha order. Don stated that if it's a single thing out of order, it's probably accidental but if everything is jumbled it's probably intentional. Another rule regarding the formatting of the List is that synonymies are listed by order of creation. Wendy clarified that rule a bit - provisionals are only alphabetized if they are listed as synonymies. But, when a provisional is as valid described species, it is listed at the bottom of a genus/Family, etc. Don also noted that alphabetic provisionals come before numeric provisionals.

A long discussion followed regarding organization of the List. It was decided to leave it as is for now. Any changes in the future are acceptable but justification for the changes must be documented/cited.

10 APRIL 2023, TRAWL INVERTEBRATE ID REVIEW, ZOOM, LEAD M. LILLY

Attendance: Brent Haggin, Wayne Dossett, Amber Von Tungeln, Don Cadien, LACSD; Megan Lilly, Adam Webb, Maiko Kasuya, Wendy Enright, Lauren Valentino, Andrew Davenport CSD; Erin Oderlin, Greg Lyon, Jennifer Smolenski, Danielle Ayala, JoAnne Linnenbrink, CLAEMD; Ben Ferraro, OCSD; Kelvin Barwick, DCE; Dario Diehl, SCCWRP; John Rudolph, Chris Stransky, Bill Isham, WSP; Jim Mann, ABC; DJ Schuessler, MBC; Michael Mori, Cameron Yong, OCPW; Amanda Martinez, CSULB Wetland Ecology graduate.

The first section covered crustacea. Some name changes were addressed, and key characters were highlighted. In some cases, similar species were shown side by side along with the key characters that distinguish them.

A question was raised regarding *Nymphon* species. Don suggested we may not be accurately distinguishing *Nymphon pixellae* Scott 1913 from *Nymphon heterodenticulatum* Hedgpeth 1941 in the field. *N. pixellae* is much more common but it was suggested that all *Nymphon* specimens be brought back for identification in the lab.

The differences between *Paralithodes californiensis* (Benedict 1895) and *Paralithodes rathbuni* (Benedict 1895) were reviewed. *P. californiensis* has a pair of proportionately larger spines on the posterior carapace and has only a mildly bifurcated rostrum whereas *P. rathbuni* has spines that are mostly subequal along the carapace and has a deeply bifurcate rostrum.

A new key to the galatheid crabs is in the works. The old key is still accurate but does not include *Munida tenella* (now *Iridonida tenella* (Benedict 1902)). Andy is adding a couplet which will include that species and is adding more details regarding spination as well as rostrum morphology. This group is also undergoing a lot of name changes for Ed 14 so Don will be adding the names.

Megan told people to watch out for *Chorilia longipes* Dana 1851 in deeper waters and not to confuse it with *Loxorhynchus* species.

Next up was Echinodermata.

Megan reviewed the two species of *Dendraster* - *Dendraster excentricus* (Eschscholtz 1831)

and *Dendraster terminalis* (Grant & Hertlein 1938) and discussed both their morphological and habitat differences. *D. excentricus* is purple, has a relatively thick test and robust spines and lives in shallow, high energy environments. *D. terminalis* is pale, has fine spines, a relatively thin test, and lives offshore in 20 – 30m of water.

As for the regular urchins, *Centrostephanus coronatus* (Verrill 1867), while not a rare species, is not usually seen in POTW monitoring programs. People should look for it in bays or near Catalina Island. The relatively rare *Arabacia incisa* (A. Agassiz 1863) has also been sampled in the SCB.

Apostichous species possibly encountered include the shallow *Apostichopus parvimensis* (H. L. Clark 1913), the mid-shelf *Apostichopus californicus* (Stimpson 1857,) and in deeper waters (200 m+) *Apostichopus* sp A (SCAMIT 2004 §). Over time there has been some confusion in the field regarding *Apostichopus* sp A. Don speculated that it may actually be *Apostichopus johnsoni* (Théel, 1886) but the original ossicle size measurements were different than those described for *johnsoni*. More ossicle measurements are needed and the mystery continues.

For *Astropecten* depth is not as reliable an indicator as one might hope. As a general rule, *Astropecten armatus* Gray 1840 will be in shallower waters, with CSD sampling it in 10m or less. *Astropecten californicus* Fisher 1906 has a wide range of habitat and CSD has seen it from 20–100m and deeper. *Astropecten ornatissimus* Fisher 1906 is seen by CSD at 200m or deeper (unless there is a cold upwelling event) but LACSD sees them with some regularity as shallow as 80m, so use caution when separating *A. californicus* from *A. ornatissimus*. Field identification is actually better for these two species with *A. ornatissimus* always being a pale to medium orange color and *A. californicus* varying from grey to purple-grey-blue, to red. When in doubt, a count of paxillae rows will separate the two but a microscope is needed for this. There is a key to the *Astropecten* spp in the Taxonomic Toolbox on the SCAMIT website.

Sclerasterias heteropaes are usually in shallow water on cobble/mixed bottoms (LACSD sees them commonly). They have a slight constriction to the arm just before the disc that CLAEMD uses as a quick character.

Stylasterias forreri are more commonly found in association with kelp beds but CSD has found them associated with their thermistor anchor in 100m of water.

Some of the “cookie” stars were reviewed - *Ceramaster* and *Odontaster*. You will need Fisher 1911 to separate the two species of *Ceramaster* – *Ceramaster patagonicus* Sladen 1889 and *Ceramaster leptoceramus* (Fisher 1905) and the difference has to do with the furrow spines. As for *Odontaster* it has a very distinctive, large apical tooth on each jaw, but it can be overlooked as it is translucent and tusk-like and folds back upon itself and points away from the mouth/distally when in this position.

Use caution with separating *Mediaster aequalis* Stimpson 1857 and *Pseudarchaster pusillus* Fisher 1905. They have been confused in the field during previous Bight projects. Megan showed a slide with the two species side by side. Use Fisher 1911 and Ludwig 1905.

Two unusual deep water sea stars seen in previous Bight projects are *Myxoderma platyacanthum* (H. L. Clark 1913) and *Thrissacanthias penicillatus* (Fisher 1905). *M. platyacanthum* is slimy and pale and has large rows of pedicellaria running down the dorsal surface of the arms. *T. penicillatus* is not slimy and has rows of pedicellaria that run transversely across the arms. It

also has large, obvious arm spines. Both have been sampled ≥ 400m by CSD.

Mollusca were next and Megan gave a quick run through of some the snails and slugs that could possibly be encountered.

There are two similar species within the Philinoidea: *Philine auriformis* Suter 1909 and *Philinorbis albus* (Mattox 1958). Megan reviewed some of the morphological differences that can be used in the field. Sadly, the native species, *P. alba* has become very rare in the last 30 years or so and is very infrequently sampled. The same cannot be said for the introduced species, *P. auriformis*.

Octopus species were discussed, and Megan had to force herself to keep moving since this is her favorite group and she could have waxed philosophic for hours. She briefly reviewed the differences between the "two spot" species, *Octopus bimaculatus* Verrill 1883 and *Octopus bimaculoides* Pickford & McConnaughey 1949. Both habitat differences (*O. bimaculoides* tends to be in bays/quiet water areas and *O. bimaculatus* tends to be in subtidal areas) and ocelli differences were reviewed. The other octopus species that can cause confusion in the field are *Octopus rubscens* Berry 1953 and *Octopus veligero* Berry 1953. Definite caution needs to be used when identifying these two. Watch for differences in maculae (2 prs of dark maculae on *O. veligero* that are not an option in *O. rubescens*), arm to mantle ratio (shorter arms, proportionately, in *O. veligero*), and the "fairy light" display often given by *O. veligero*. Megan showed pictures of all these characters in her presentation. A reminder was given that the distinctive stellate granules in the skin of *Octopus californicus* (Berry 1911) are cartilaginous, and they are not ephemeral.

Cnidaria – sea pens, gorgonians, and octocorals oh my! Counting protocols for these colonial animals were reviewed. With sea pens such as *Acanthoptilum*, you count the bulbs if you get a large haul with fragmented animals. As for the *Thesea*, *Heterogorgia* and *Telesto* - good luck and do your best.

There was a brief discussion regarding *Thesea* - *Thesea* sp A Ljubenkov 1986 § has much larger polyps than *Thesea* sp B and is also bright white and much more robust. It's very rare. Also watch out for *Heterogorgia* which could be confused with *Thesea* if examination is not careful. See Tony Phillip's B'13 cnidaria presentation for photos and descriptions of these animals.

It was noted in Megan's slide on *Eugorgia rubens* Verrill 1868 that there might be more than one species represented. Those present felt that the animal pictured on the left was the true *E. rubens* which is a more delicate animal with fine branches. The thick, robust animal pictured on the right, it was felt, was incorrectly identified. An interesting discussion ensued regarding the best way to identify gorgonians in the field and consensus was reached that most gorgonians should be photographed (from multiple angles) in the field and then a branch should be brought back to the lab for sclerite preps and/or saved for Beth Horvath at Westmont College.

Regarding the deep water anemones: *Urticina columbiana* Verrill 1922, Don noted, has calcareous granules in the column that give it a rough texture and distinguish it from the verrucae of the Hormathiidae anemones. He also pointed out that *Liponema brevicorne* (McMurrich 1893) has deciduous tentacles so if they're treated roughly during sampling you might see them as "bald", but the aboral sucker is still distinctive.

Sponges, Bryozoa, and more. There are some slight differences amongst the agencies in protocols

for these animals but we tried to reach an agreement with regards to approach. CSD tends not to count the bryozoan mats based on expediency. Don stated that many of these mats are akin to drift kelp and are not part of the epibenthic community, thereby providing an actual ecological argument for not counting them.

At the end of the presentation Dario posed a couple of discussion questions. The first dealt with Photo Vouchers:

- What animals are common enough to voucher as a photo?
- Are there photographable features that make it unique?

The response was a consensus that a single photo would likely not be enough to be an acceptable photo voucher. The photos need to clearly show the distinguishing features of the organism in a way that makes it identifiable from the photos. Don followed up with an emphasis on the characters being conclusive and exclusive. A simple overview photo of large animals may not be sufficient. There must be clear photos of the detailed characters. This could, and likely will, require multiple images of a single specimen. If this can not be obtained, then a photo of the organism should be taken and a representative tissue sample taken and placed in 95% EtOH for genetic analysis. Additionally tissue samples of larger organisms (i.e. sponges) should be taken if the animal is too large to bring in from the field. All that being said, photos are encouraged, even when bringing back the entire animals themselves.

The second discussion question dealt with fouling vs infauna vs pelagic organisms and what should be done with them. It was generally agreed to use your best judgement in the field as to whether a species meets the definition of an "epibenthic" organism and if it should be identified and counted. If time allows, it would be best to count and record the organisms and they can be excluded from the analysis later if they are deemed to be fouling or pelagic. Kelvin waxed philosophical about the purpose of trawls and what the data are actually supposed to mean. The end message seemed to be that each agency will continue to do their best and slight differences will be addressed during the post-field data meetings. The same "use your best judgement" was drawn for how to distinguish "fouling" communities. There's a line to be drawn with regards to what's reasonable effort to identify the organisms especially if there is the potential for the species to later be excluded from the data analysis.

The final question was regarding subsampling *Brisaster/Brissopsis* from large hauls for positive identification in the laboratory. It was decided that subsampling 30 individuals for identification worked well in Bight '18 and would be employed again for Bight '23.

Dario also mentioned that Regina at the NHMLAC is interested in collecting more megabenthic invertebrate DNA samples. Modest, humorous discussion of the future of eDNA followed.

Mary Wicksten offered (via email) to help out with any unusual decapods we may come across during our efforts.

The meeting closed out with an adorable series of photos of *Moreiradromia sarraburrei* (Rathbun 1910) wearing its distinctive "sponge hat".

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IN MEMORIAM, DR ERIC HOCHBERG

Dr. F. G. Hochberg, aka "Eric", passed away on May 31st 2023 and this tribute to him is long over-due. Included below are rememberances and contributions from SCAMIT members who knew and cared for him. The world lost a great scientist and an even better human being when Eric passed.

My Octopus Teacher (apologies to Netflix), Megan Lilly

It's taken me awhile to write this memoriam in honor of Dr. Hochberg because I felt his loss deeply and needed time to process. When I was graduating from Humboldt State University (now Cal Poly Humboldt) in the way back times (1991), I was trying to figure out where to go and what to do with my life. I knew that I wanted to pursue marine biology but not much else. I went to my advisor, Dr. Gary Brusca, and asked for guidance. He knew I loved octopus above all else and said, "move to Santa Barbara, go the Santa Barbara Museum of Natural History and ask to meet Dr. Eric Hochberg. Tell him I sent you". And so that is exactly what I did – I moved to Santa Barbara and called the Museum to set up an appointment with Eric. Unfortunately, I came down with a horrible cold the day before my appointment, but I didn't dare cancel and reschedule as this man was my idol. So, I showed up at his office with a fever, snotty nose, cough, runny eyes and looking like death on toast. I was so nervous but determined to make a good first impression. Eric tried not to reel back in horror as I came in sniffling and sneezing, and he politely declined my proffered hand-shake. He listened calmly (only occasionally wincing and recoiling when I coughed or sneezed) as I told him about my love of all things cephalopod and how I would happily volunteer my time just to learn from him. He told me to come back once I was "*healthy*" and he would gladly accept my offer of free labor in exchange for his tutelage. And so began a mentorship that meant the world to me. I could go on writing and fill numerous pages with anecdotes and stories of my time at the Museum, first as a volunteer and later as a paid curatorial assistant, but this is the SCAMIT NL and the issues have already gotten "too fat". Therefore, I want to mention the most important aspect of my experience working with Eric (besides all the cephalopod knowledge I was able to glean from him) and it was this – Eric was one of my first male scientist role models, and first male "boss", that treated me with dignity and made me feel like a scientist. Let me explain, (don't worry, I'm not going to get on an angry soap box), it was still not a great time to be a woman in science in the late 80's/early 90's. Especially not a young, blonde, newly graduated woman in science. I had dealt with many professors and scientists that symbolically patted me on the head with an attitude of "aww how cute, this little girl wants to be scientist", and other attitudes that were even less pleasant and that I won't describe here. Dr. Hochberg never, not once, not for a split second, ever treated me with anything less than respect and was always encouraging my ideas and pushing me to better myself and to pursue


Cirroctopus hochbergi O'Shea 1999
Photo credit iNaturalist

my interests. Quite simply, he believed in me and accordingly, I started to believe in myself. So, whenever my career would falter and I felt like a failure, I would remember that Eric believed in me and in my intelligence and capabilities and I would dust myself off, hold my head up, and keep going. I often wonder what would have happened to me if I hadn't met Eric right out of college. Would my path have been different? I would assume so. I tried to tell him, many times, how much he meant to me, but in typical Eric fashion, he always downplayed his role and instead complimented my determination. The world needs more Dr. Hochbergs and I'm still so heart-broken that he is gone. But he lives on every time I see an octopus and am delighted and captivated beyond measure. Out of the species named for him I believe *Cirroctopus hochbergi* O'Shea 1999, has to be my favorite. I know he loved it too.

Beth Horvath: (31 May 2023)
"Dear SCAMIT friends: Not sure if you have heard, but Eric passed away today after struggling with a somewhat long and debilitating muscular disease. Eric was an amazing and multi-talented individual who I came to know and love from my time as a volunteer in my undergraduate years to my time as a graduate student in the late 70's to his oh-so-subtle 'arm-twisting,' getting me to plunge into the realm of Gorgonian Corals in 2002. I will never forget his suggesting to me that working on the museum's gorgonian collection would be a nice 4-month sabbatical project and never once told me that only 3 weeks into that sabbatical that nearly the entire Cnidarian collection from the Allan Hancock Foundation would be appearing in the SBMNH's Invertebrate Zoology Lab. Imagine my surprise when I came into the lab one morning and found the halls FILLED with boxes of cnidarian specimens collected by the *Velero* Expeditions. Hundreds of gorgonian samples mixed in with hydroids, jellies, sea pens, etc. SO MUCH for the 4-month sabbatical project, which has now become a many-year (about 20, to be exact) research endeavor!!

We worked together as naturalists on a Baja and Sea of Cortez *Searcher* cruise that the SBMNH sponsored some years ago and was a great time introducing one of his "nephews" to the marine realm; it is a trip full of good memories that I cherish. I am glad that his physical challenges were not so advanced at that point, so that he could do the things he loved doing, exploring the marine life of Baja.

He was a good friend, companion through my graduate years and early years of teaching, mentor, colleague, advisor and teacher. I will miss him; the cephalopod community has lost an important advocate, researcher and advisor. Hard to believe that he is gone, but I have to believe that he no longer is fettered by his physical struggles. He will be missed but has earned the respect of many and that will carry on for years to come."

Gretchen Lambert (1 June 2023):
"I am so saddened by this news. Eric was a good friend for so many decades. One memory I am happy to share is from 2004. Charley had retired from Cal State Fullerton and we'd moved to Seattle in 1998 but I kept in touch with Eric periodically. He wrote or called us in fall 2004, said he was driving up to Bellingham (WA) to look over a huge collection of bryozoans being donated to the SBMNH by a bryo expert who had recently retired from Western WA State in Bellingham, I forget her name but I'm sure many of you know who I am referring to. Eric said he wanted to stop by to see us which we were delighted about. We invited him for dinner and definitely to stay overnight. While showing him around the house we pointed out my "lab", a repurposed upstairs bedroom with microscope and many boxes of ascidians. I said there were boxes in the garage, boxes everywhere, and I just did not know what I was going to do with them. He looked at me,

smiled, with a twinkle in his eyes, and in his capacity as longtime curator of marine invertebrates at SBMNH said he knew exactly what I should do with them--donate them to the museum!! Well, of course! He said they currently had only a small collection, most of it unidentified. Would I consider not only donating my collection (most of it from the U.S. west coast San Diego to Alaska so very relevant for the museum) and staying in Santa Barbara long enough to work up their collection? The next Tunicata meeting was already scheduled at UCSB for July 2005, so Charley found a colleague to work with in her lab at UCSB for a month, we found a faculty member and family who would be at Woods Hole mid June to mid July (teaching at MBL) and needed someone to take care of their house and 2 dogs and a cat, we loaded the station wagon with all those boxes of ascidians and off we went for a fabulous month in Santa Barbara. All thanks to Eric. We enjoyed seeing him often during that month, me especially since I had space in the museum with an excellent microscope. And my ascidians tripled their collection.

One of Eric's specialties was nature printing; his creations were so beautiful. He enjoyed making many trips to Japan where he learned the art of gyutaku, fish printing. He was president of the Nature Printing Soc. for various periods of time, and one year their annual meeting and week-long workshop was held at the UW Friday Harbor Labs, with classes taught by experts from around the country and a gyutaku master Eric invited from Japan. I participated in some of the classes, learned a huge amount and helped out as step-&-fetch-it for everyone since it was in Sept. with the labs mostly empty.

We also always enjoyed our visits with Eric during the various Western Soc. of Naturalists meetings. And we stayed with him at his beautiful home several times. I will miss him."

Eric Hochberg – Renaissance Man
Adapted by Paul Valentich-Scott from an article published in the Santa Barbara Independent on 27 April 2012.

Dr. Fredrick G. Hochberg (Eric) earned both his undergraduate (1965) and Ph.D. (1971) from the University of California, Santa Barbara. While in school, his fascination with marine and terrestrial animals was nourished while traveling the world and experiencing unique diving opportunities. For example, in 1970, as a grad student he participated in the TEKTITE program as an Aquanaut and lived underwater for three weeks off the Virgin Islands in the Caribbean Sea.

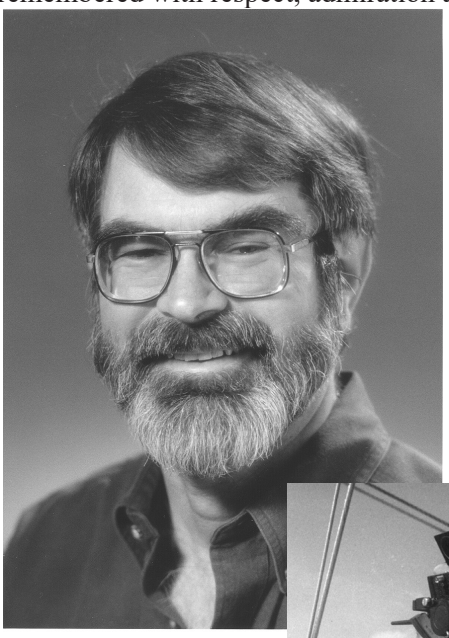
A world-renowned expert on cephalopods, Dr. Hochberg was actively involved in research on a diversity of marine and terrestrial invertebrates, in particular the taxonomy and biology of

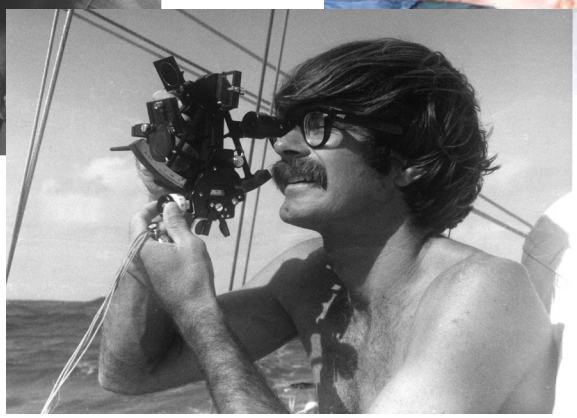
cephalopods and their parasites. He established a method for identifying closely related species of octopuses by studying the parasites that live in their kidneys, which was a great boon to world fisheries that depend on the health and populations of these animals. In 1999, Dr. Hochberg was appointed to the California Squid Scientific Research Committee to help oversee California's squid fishery. This Committee provides scientific oversight for the development of research protocols and the preparation and review of conservation and management plans for the important California cephalopod resource: *Doryteuthis opalescens*.

Dr. Hochberg co-founded and served as the past President of the Cephalopod International Advisory Council, a prestigious organization of scientists who provide advice on a variety of cephalopod-related issues from research to world fishing trends. He presided over the organization's 1997 triennial meeting in Cape Town South Africa. When the Museum hosted the annual meeting of the American Malacological Union in Santa Barbara in 1998, Eric organized a major international symposium on "Cephalopods of the North Pacific Ocean" and a subsequent week-long international workshop on cephalopod taxonomy held in the Museum's Department of Invertebrate Zoology.

Dr. Hochberg's passion for science and nature was also expressed in his creative work as an internationally recognized printmaker and artist. Eric was one of the co-founders of the Nature Printing Society.

Over the course of his work at the Museum, Dr. Hochberg named 30 new species and seven new genera, and he had a number of marine and terrestrial animals named in his honor. Eric will be remembered with respect, admiration and great fondness.





ARTHROPOD PERSONALS – SEEKING COMPANION? BY D. CADIEN

Don has created a wonderful ten-part series on various crustacea ecology and life history. We are lucky to have such a knowledgeable and humorous science writer in our midst! Below is part I in the series. Enjoy!

Pt. 1 – I'm a Cancer, what's your sign? - DB Cadien, WWRF, Los Angeles County Sanitation Districts, 31Dec23

The phylum Arthropoda contains more species than any other, contributing more to the diversity of the Earth's biome than all other phyla combined (Zhang et al 2011). Most of this dominance is terrestrial, where insects are hugely diverse relative to other forms of life (Stork 2018), but also applies to the ocean. The exceptional diversity of terrestrial arthropods is hinted at (though not directly stated) in this footnote: "There is a story, possibly apocryphal. Of the distinguished British biologist J. B. S. Haldane, who found himself in the company of a group of theologians. On being asked what one could conclude as to the nature of the Creator from a study of his creation, Haldane is said to have answered, 'An inordinate fondness for beetles' (Hutchinson 1959). The group is also quite ancient, having appeared in

A smattering of the morphological variety within marine Arthropoda
Included groups are leptostracans, tanaids, cumaceans, amphipods and decapods
Together these contribute only a fraction of the total marine arthropod diversity

the Cambrian about ½ billion years ago (Gould 1989, Conway Morris 1998). That enormous length of time has allowed them to diverge greatly on both the land and in the sea. While they did so they formed associations with other species; sometimes other arthropods, sometimes members of other groups.

This long evolution could not have occurred without symbiosis – the living together of separate forms. Indeed, the most probable explanation of the existence of the eukaryotic cell is symbiosis at the cellular level (Margulis and Bermudes 1985). Relationships between two (or more) members of such a group – the symbionts, vary. A conceptual division into three types is usual (Leung and Poulin 2008): parasitism, commensalism, and mutualism. What separates the types is the balance (or lack thereof) of benefit to the participants. In parasitism it is nearly one-sided, with

all or nearly all benefit accruing to the parasite, and little or none to the host. In commensalism, one or more of the participants benefits, with one or more are unaffected either positively or negatively. In mutualism benefit is distributed among the partners more or less equitably, with benefits for all participants. While all participants are symbionts, there is normally a division into hosts and 'symbionts'. Hosts are typically much larger than their 'symbionts', and are more likely to be negatively affected by the interaction. The partners can be loosely associated, living together in a common area such as a burrow or tube (association of the first type, not involving physical contact of the participants). An example of this is the symbiosis between bottom dwelling gobies, and alpheid shrimps (Harardа 1969, Karplus 1992, Karplus and Thompson 2011). The shrimp constructs the burrow and allows the fish to also occupy it. The goby may alert the shrimp to approaching danger and may also provide nutrients for the shrimp (Kohda et al 2017). Such interactions may be casual and easily abandoned, or obligatory. Both parties benefit; thus an example of mutualism.

First Type of relationship – close association: here in a common burrow constructed by the shrimp
In this case a mutualism (image from https://www.liveaquaria.com/article/201/?aid=201)

In addition to close association as shown above, the symbionts may also be physically attached to one another in an ectosymbiosis, or mutually occupy the host body in an endosymbiosis.

Second type of relationship: The juvenile (praniza stage) of a gnathiid isopod feeding on a fish: an ectosymbiosis, and example of parasitism (from Grutter et al 2017)

Ectosymbionts frequently can intentionally detach or be detached from the host, although as they are usually attached via mouthparts or other tenacious grasping tools (such as strong dactyls), host damage is

likely to result. The ectosymbiosis of the gnathiid praniza is temporary, and the ectosymbiont detaches after it has finished its blood meal on the host, to rest on the sea-floor and prepare for metamorphosis to the next stage of its polymorphic life. This is clearly a case of parasitism, as the fish receives only injury while the symbiont receives nutrition.

Endosymbionts are often so modified for residence within the host body that they are not recognizable as arthropods. Such is the case with the Ascothoracica (see Grygier 1982), which typically inhabit the bodies of echinoderms. They were only recognized as belonging to the phylum Arthropoda through their larval stages, which bore tell-tale legs. This is also a clear case of parasitism, with the endosymbiont benefitting from housing and food, while the host is drained of energy and damaged, and usually also prevented from reproducing.

Third type of relationship:Adult of the endosymbiont ascothoracid barnacle *Dendrogaster* removed from its echinoderm host (photo: Gustav Paulay, Florida Museum of Natural History)

There is also a series of other barnacles, the rhizocephalans, that both inhabit the body of the host as endosymbionts and exhibit external manifestations on the host (typically reproductive). These, since the main portion of the symbiont body is inside the host, are also treated as endosymbionts.

Commensalism, where one party benefits, while the other remains unaffected can be seen in the relationship between polynoid scaleworms and the starfishes whose pedal grooves they live and feed in. There is no apparent harm to the starfish, and presence of one or several worms seems not to adversely affect the larger host, while the symbionts benefit greatly from protection and the ability to scavenge food unused by the echinoderm.

Such interactions are generally of considerable interest to biologists, and there is a large and growing literature concerning them. Symbiotic relationships with various marine arthropods will be explored in a series of articles all based on a trivial but intriguing question: What might one find on the Personals page of a paper produced by and for arthropods?

Polynoid commensal *Arctonoe fragilis* in the pedal groove of the sea star *Evasterias troscheli* (photo Dave Cowies)

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