

The Echinoderm Newsletter<sup>1</sup>

No. 3. August 1971

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It is with many apologies that we distribute copies of Newsletter No. 3. We had originally planned to issue No. 3 about a year ago, but for numerous reasons we didn't do it on time, and now it is 1971! This means, of course, that some of the information we give below is out of date, and we apologize for this. We fondly hope that future issues will appear on a regular basis, for obviously a newsletter which is issued only once every two years is of very little use.

Although we are determined to be more punctual with future Newsletters, the content and value of the Newsletters will depend entirely on contributions from echinoderm workers. Thus we would very much like to receive from you lists of recent publications and papers in press (published or submitted within the past two years), information on current research projects, in fact anything you think would be appropriate for circulation to the echinoderm community.

We apologize, too, for numerous errors in the original name and address list. Enclosed is a list of corrections.

We thank Mr. D. K. Serafy for his generous help with the preparation of this Newsletter.

David L. Pawson  
Maureen E. Downey

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1

The Echinoderms Newsletter is not part of the scientific literature, and should not be cited, abstracted, or reprinted as a published document.

### Gigantic Starfish

Weight - Miss Elisabeth POPE (see *The Fisherman*, June, 1970) is working on a huge starfish collected at Noumea, New Caledonia. It is a new species. When alive, the specimen was about 63 cm. across, and weighed 5.5 kilograms. This would appear to be by far the most massive starfish on record.

Size - While dredging from R/V Alaminos in the Gulf of Mexico, Miss Maureen DOWNEY watched anxiously as the dredge was brought aboard the ship, for precariously balanced across the mouth of the dredge was a huge brisingid starfish in perfect condition. A paper is now in press describing it as a new genus and species. The specimen is approximately 1.13 meters across.

It is perhaps fortunate that most echinoderms are much smaller than these giants, for otherwise museums would have the same problems storing echinoderms as they do with whale skeletons.

### Forthcoming Conference

The First International Congress of Systematic and Evolutionary Biology is to be held at the University of Colorado, Boulder, Colorado, U.S.A., on August 4 - 11, 1973. It is organized by the International Association for Plant Taxonomy and the Society for Systematic Zoology. The first announcement of the Congress was published in the December, 1970 issue of the botanical journal Taxon. Please see that announcement for further details.

While studying variation in Lytechinus variegatus (Lmk.) in Bermuda one of us (DLP) was intrigued by the variety of material with which Lytechinus covers its aboral surface. Pieces of algae and broken shell were most popular, but a variety of man-made objects were also found. One urchin was clinging steadfastly to a plastic spoon; another to a small paper cup; the pop-off tops of beer cans are becoming increasingly fashionable, as are small pieces of colored glass.

The story is told of a boat operator at the Bermuda Biological Station who lost his wallet somewhere in Harrington Sound, Bermuda. Several days later the same boat operator took a party of students into Harrington Sound to do some diving. One student found a Lytechinus with a \$5 bill wrapped around its aboral surface. A second student then found an urchin carrying \$10 bill. Finally, a third student found a specimen carrying the missing wallet!

### Suggestions and Requests

Alan J. DARTNALL would like to examine starfishes identified as Patiriella exigua (Lamarck) from St. Paul Island, the east coast of Africa north of Durban, Madagascar and the Cocos Islands.

M. K. DURKIN wishes to determine the whereabouts of type material of species in the echinoid genus Holaster.

Richard L. TURNER would like to receive information on the distribution and brood protection in the asteroid Ctenodiscus. He is also interested in correspondence on the effects of lime (quicklime) on echinoderms and other soft-bodied invertebrates.

D. B. JAMES and R. S. Lal MOHAN recently completed a bibliography of the echinoderms of the Indian Ocean. They would like to receive titles of references on Indian Ocean echinoderms which are not included in their bibliography.

D. K. SERAFY is looking for specimens of Lytechinus variegatus pallidus or Lytechinus sp. from the Cape Verdes.

Several correspondents have suggested the foundation of a publication dealing exclusively with the echinoderms (similar in nature to Veliger, Crustaceana, etc.), even to the point of proposing names (Pluteus, Pentagon, etc.) for the journal. This idea would appear to merit discussion along several lines. Such questions as: Is such a journal really necessary? Would there be enough interest and contributions to make the venture self-supporting? Aren't there enough journals already? and others must be answered. We will be happy to circulate opinions for or against an echinoderms journal; if you have something to say about it, please write.

Does anybody have any new ideas concerning long-term preservation media for echinoderms? Has anybody discovered a simple, effective method for preserving color?

Current Research Projects

- G. J. BAKUS - ecology of coral reef holothurians; toxicity in holothurians and its effect on inshore fishes.
- J. C. BAUER - biology and productivity of Diadema antillarum and some other common sea urchins.
- J. Fr. BOCKELIE - Ordovician cystoids of Norway; morphology, systematics, ecology and stratigraphy.
- Einar BRUN - Revision of Scandinavian asteroids. Ecology and taxonomy of genus Henricia in North European waters.
- A. M. CHRISTENSEN - feeding biology of asteroids.
- Barbara CORRY - echinoderm physiology, particularly Axiognathus (= Amphipholis) squamata.
- M. K. DURKIN - phylogeny, morphology and ecology of the echinoid genera Holaster and Salenia.
- Judith J. EASTWOOD - spectral sensitivity, neural and morphological development of larval Lytechinus variegatus.
- I. EMERSON - ecology of asteroid populations in Newfoundland embayments.
- Lucienne FENAUX - maturation of gonads in irregular sea urchins Spatangus purpureus, Echinocardium mediterraneum and Brissus unicolor; larval development of Echinocardium mediterraneum.
- B. M. HEATFIELD - physiology of echinoderm skeleton formation; light and scanning microscopy of skeleton; ultrastructure of skeleton-forming tissue in regenerating spines of echinoids.
- E. P. HODGKIN - asteroid fauna of South-Western Australia.
- Michel JANGOUX - anatomy and comparative histophysiology of asteroid digestive tracts.
- Margit JENSEN - Strongylocentrotus droebachiensis, S. pallidus and Psammechinus miliaris; feeding, growth and longevity of populations from Norwegian Fjords.
- Phyllis T. JOHNSON - protein uptake by epithelial cells of Strongylocentrotus species, through radioactive isotope methods.

- A. M. MACKIE - chemical basis of escape responses of marine invertebrates to predatory starfish.
- Konrad MAERKEL - Structure of teeth of regular and irregular sea urchins; growth of the sea urchin test.
- C. W. MAJOR - physiology of echinoderms; iodine organification in Cucumaria frondosa.
- Mary D. MALONE - Distribution and ecology of Irish echinoderms. Particular interest in populations of Paracentrotus lividus and Antedon bifida.
- T. R. MARCUS - ultrastructure of echinoderm tissues, particularly echinoids.
- David NICHOLS - hydrodynamics of the echinoderm water-vascular system; structure of echinoderm skeleton.
- P. B. NOBLE - effects of adenosine nucleotides on cleavage of Strongylocentrotus droebachiensis and Cucumaria frondosa.
- Kayo OKAZAKI - in vitro culture of the primary mesenchyme cells of sea urchin larvae. Crystallographic studies on larval spicules of sea urchins.
- R. J. PENTREATH - uptake of heavy metals by echinoderms.
- Irwin POLLS - behavioral aspects of righting in the asteroids Henricia leviusulca and Leptasterias aequalis.
- H. W. RASMUSSEN - Cretaceous Crinoidea (Comatulida and Roveacrinida) of England and France; Lower Tertiary Crinoidea, Ophiuroidea and Asteroidea from England and Denmark.
- G. D. RUGGIERI - effects of extracts from various echinoderms on the development of the sea urchin.
- K. SATYANARAYANARAO - gonads of asteroids and echinoids - biochemistry and histochemistry.
- R. L. SINGLETARY - ecology of some amphiuroid ophiuroids from Biscayne Bay, Florida.
- Yutaka TAHARA - secondary sexual characters in sea urchins - their morphology and development.
- R. L. TURNER - the asteroid Ctenodiscus crispatus; plate orientation and morphology with respect to growth stages; variation of external characteristics; reproductive biology.
- R. L. VADAS - ecology and population dynamics of benthic marine algae and Strongylocentrotus droebachiensis.

Kathleen A. WOOLLEY - digestive physiology of Asteroidea - enzyme localization in pyloric caeca.

C. W. WRIGHT - Swedish Upper Cretaceous asteroids.

Dusan ZAVODNIK - ecology and dynamics of echinoderms in littoral benthic communities; monograph of Adriatic echinoderms.

Recent Publications and Papers in Press

This list is compiled only from information supplied to the Newsletter by authors.

BAKUS, G. J., 1968. Defense mechanisms and ecology of some tropical holothurians. Marine Biology 2 (1): 23-32.

\_\_\_\_\_. Energetics and feeding in shallow marine waters. International Review of General and Experimental Zoology (Academic Press) V. 4: 275-369. In press.

BRUN, E., 1968. Extreme population density of the starfish Asterias rubens L. on a bed of Iceland scallop, Chlamys islandica (O.F. Müller). Astarte 1 (32): 1-4.

\_\_\_\_\_. 1969. Aggregation of Ophiothrix fragilis (Abildgaard). Nytt Mag. Zool. 17: 153-160.

\_\_\_\_\_. Asterias hispida Pennant, 1777 and Uraster hispida (Pennant) Forbes, 1840 (Echinodermata, Asteridae): Proposed suppression under the plenary powers in favour of Leptasterias muelleri (M. Sars, 1846). Bull. zool. Nomencl. In press.

CASO, M. E. Un caso de parasitismo de Balcis intermedia (Cantraine) sobre Holothuria glaberrima. In press.

\_\_\_\_\_. La familia Psolidae. Descripción de una nueva especie del género Psolus. Psolus conchae n. sp. In press.

\_\_\_\_\_. Ecología y morfología de Holothuria glaberrima Selenka. In press.

\_\_\_\_\_. Situación taxonómica actual, morfología externa y ecología de Platasterias latiradiata Gray en el - estudio de los Equinodermos. Trabajo presentado en el IV Congreso Nacional de Oceanografía efectuado en la -- Ciudad de México del 17 al 19 de noviembre de 1969. In press.

CURREY, J. D. and NICHOLS, D. 1969. The question of the organic matrix of echinoderm skeletons. Proc. Malac. Soc., 38 (5). In press.



- DOWNEY, M. E., 1970. Marsipaster acicula, new species (Asteroidea: Echinodermata), from the Caribbean and Gulf of Mexico. Proc. Biol. Wash., vol. 83, no. 28, pp. 309-312.
- \_\_\_\_\_, 1970. Zorocallida, new order, and Doraster constellatus, new genus and species, with notes on the Zoroasteridae (Echinodermata: Asteroidea). Smithsonian Contr. to Zool., no. 64, pp. 1-18.
- \_\_\_\_\_. A new species of the genus Solaster (Echinodermata: Asteroidea) from Martinique. Proc. Biol. Soc. Wash. In press.
- \_\_\_\_\_. Two new species of the genus Tamaria (Echinodermata: Asteroidea) from the Tropical Western Atlantic. Proc. Biol. Soc. Wash. In press.
- \_\_\_\_\_. Ampheraster alaminos, a new species of the family Asteriidae (Echinodermata: Asteroidea) from the Gulf of Mexico. Proc. Biol. Soc. Wash. In press.
- \_\_\_\_\_. Midgardia xandaros n.g., n.sp., a large brisingid starfish from the Gulf of Mexico. Proc. Biol. Soc. Wash. In press.
- \_\_\_\_\_. Article on echinoderms for Peter Gray's Encyclopedia of Microscopy and Microtechnique.
- FENAUX, L., 1968. Maturation des gonades et cycle saisonnier des larves chez Arbacia lixula, Paracentrotus lividus et Psammechinus microtuberculatus (Echinides) à Villefranche-sur-Mer. Vie et Milieu, Ser A, Biologie marine, Tome XIX, I A: 1-52.
- \_\_\_\_\_, 1968. Aspects écologiques de la reproduction des Echinides et ophiurides de Villefranche-sur-Mar. Thèse de doctorat d'état, 194 pages.
- \_\_\_\_\_, 1969. Le développement larvaire chez Ophioderma longicauda (Retzius). Cah. biol. mar., Tome X: 59-62.
- \_\_\_\_\_, Les échinoplutés méditerranéens. Bull. Inst. Monaco, (1969). In press.
- \_\_\_\_\_. Maturation of the gonads and seasonal cycle of the planktonic larvae of the ophiuroid Amphiura chiajei Forbes. In press.
- FELL, F. JULIAN; The echinoids of Easter Island. In press.
- \_\_\_\_\_. Revision of Centrostephanus in the Pacific Ocean (Echinodermata: Echinoidea). In press.
- HALPERN, J., 1969. Biological investigations of the deep sea. 50. The validity and generic position of Pentagonaster parvus Perrier (Echinodermata, Asteroidea). Proc. Biol. Soc. Wash., 82: 503-506.

- \_\_\_\_\_, 1970. Growth rate of the tropical sea star Luidia senegalensis (Lamarck). Bull. Mar. Sci., 20 (3): 626-633.
- \_\_\_\_\_, 1970. Biological investigations of the deep sea. 53. New species and genera of goniasterid sea stars. Proc. Biol. Soc. Wash., 83: 1-12.
- JAMES, D. B. and J. S. PEARSE, 1970. Echinoderms from the Gulf of Suez and the northern Red Sea. J. mar. biol. Ass. India. In press.
- JENSEN, M., 1969. Age determination of echinoids. SARSIA 37: 41-44.
- \_\_\_\_\_, 1969. Breeding and growth of Psammechinus miliaris (Gmelin). OPHELIA, 7: 65-78.
- JOHNSON, P. T., 1969. The coelomic elements of sea urchins (Strongylocentrotus). I. The normal coelomocytes; their morphology and dynamics in hanging drops. J. Invertebrate Pathol. 13, 25-41.
- \_\_\_\_\_, 1969. The coelomic elements of sea urchins (Strongylocentrotus). II. Cytochemistry of the coelomocytes. Histochemis 17, 213-231.
- \_\_\_\_\_, 1969. The coelomic elements of sea urchins (Strongylocentrotus). III. In vitro reaction to bacteria.
- \_\_\_\_\_, and F. A. CHAPMAN. Abnormal epithelial growth in sea urchin spines (Strongylocentrotus franciscanus). J. Invertebrate Pathol. In press.
- \_\_\_\_\_. Infection with diatoms and other microorganisms in sea-urchin (Strongylocentrotus franciscanus). J. Invertebrate Pathol. In press.
- LIMA-VERDE, J. S. Primeira contribuição ao inventário dos equinodermas do nordeste brasileiro. Arq. Sci. Mar. Univ. Fed. Ceará, Fortaleza, IX (1), 1969. In press.
- \_\_\_\_\_, H. R. MATTHEWS, and J. FAUSTO-FILHO, 1971. On the feeding habit of the sea star Luidia senegalensis (Lamarck, 1816) (Echinodermata: Asteroidea). Arq. Sci. Mar. Univ. Fed. Ceará, Fortaleza, IX (1).
- LÜTZEN, J., 1968. Biology and Structure of Cystobia stichopi, n. sp., (Eugregarina, Family Urosporidae), a Parasite of the Holothurian Stichopus tremulus. Nytt Magasin for Zoologi, Oslo, 16: 14-19.
- \_\_\_\_\_, 1968. Unisexuality in the parasitic family Entoconchidae (Gastropoda: Prosobranchia). Malacologia, 7: 7-15.
- MÄRKEL, K., 1967. Beobachtungen an lochbewohnenden Seeigeln. Natur und Museum 97, 223-243.
- \_\_\_\_\_, 1969. Morphologie der Seeigelzähne. I. Der Zahn von Stylocidaris affinis (Phil.). Z. Morph. Tiere 64, 179-200.

- \_\_\_\_\_, 1969. Morph. d. Seeigelz. II. Die gekielten Zähne der Echinacea. Z. Morph. Tiere 66, 1-50.
- \_\_\_\_\_, 1970. Morph. d. Seeigelz. III. Die gefurchten Zähne der Diademata und Echinothuridae. Z. Morph. Tiere 66, 189-211.
- \_\_\_\_\_. The tooth skeleton of Echinometra mathaei. In press.
- MATTHEWS, H. R. and LIMA-VERDE, J.S., 1968. Notas sobre Oreaster reticulatus (Linnaeus, 1758) no nordeste brasileiro. Arq. Est. Biol. Mar. Univ. Fed. Ceará, Fortaleza, VIII (2): 223-224.
- NICHOLS, D., 1969. Echinoderms. 4th Edition. Hutchinson University Library.
- \_\_\_\_\_, 1969. Echinoderms, in Practical invertebrate zoology ed. R. P. Dales. Chapter 13.
- OKAZAKI, K., 1967. Behavior and role of the primary mesenchyme cells in morphogenesis of sea urchin embryo. The Japanese Journal of Experimental Morphology 21: 12-28.
- PAINE, R. T. and R. L. VADAS, 1969. Caloric values of benthic marine algae, and their postulated relation to Invertebrate food preference. Marine Biol. 4: 79-86.
- \_\_\_\_\_, 1969. The effects of grazing by sea urchins Stronglyocentrotus on benthic algal populations. Limnol. Oceanogr. 14: 710-719.
- PAWSON, D. L., 1970. The Marine Fauna of New Zealand: Sea Cucumbers (Holothuroidea). New Zealand Dept. Scient. Industr. Res. Bull. 52, 70 pp.
- \_\_\_\_\_, 1970. Red iron phosphate particles in holothuroid body wall. Carnegie Inst. Annual Rep. (With G. Donnay and P. E. Hare).
- \_\_\_\_\_, 1970. Echinoderm studies in Southern Chile. Antarctic J. of U.S. 5 (5).
- \_\_\_\_\_. A second New Zealand record of the giant holothurian larva Auricularia nudibranchiata Chun. New Zealand J. Marine Freshwat. Res. In press.
- \_\_\_\_\_. The molpadiid holothurians of the Southern Oceans. Biol. of Antarctic Seas. In press.
- \_\_\_\_\_. The Western Australian psolid holothurian Ceto cuvieria (Cuvier). Proc. Roy. Soc. Western Australia. In press.
- \_\_\_\_\_. Holothuroidea. In: (Title unknown) South African Biol.-Geol. Exped. to Marion and Prince Edwards Is.

- \_\_\_\_\_. Ekkentropelma brychia n.g., n.sp., an Antarctic holothurian with a "lateral" sole. Proc. Biol. Soc. Washington. In press.
- \_\_\_\_\_. Echinodermata. In: Encyclopedia Britannica (new edition). In press.
- \_\_\_\_\_. Siniotrochus phoxus n.g., n.sp., a myriotrochid holothurian new to the United States East Coast. Proc. Biol. Soc. Washington, In press.
- PENTREATH, R. J. Feeding mechanisms and the functional morphology of podia and spines in some New Zealand ophiuroids. J. Zool. 1970. In press.
- ROMAN, J. Les Echinides du Moghrébien (Plio-Pléistocène) du bassin côtier de Tarfaya (Maroc méridional). In press.
- \_\_\_\_\_. Echinides crétacés et éocènes du Bas Congo et de Cabinda (côte occidentale d'Afrique). In press.
- \_\_\_\_\_. Echinides néogènes des provinces d'Alicante et de Murcia (Espagne). In press.
- ROWE, F. W. E., 1969. A review of the genus Holothuria (Holothurioidea: Aspidochirotida). Bull. Br. Mus. nat. Hist. (Zool.) 18, No. 4: 117-170, 21 figs.
- \_\_\_\_\_. Monograph of shallow-water Indo-West Pacific Echinoderms. (With A. M. Clark). In press.
- \_\_\_\_\_. Flora and fauna of the Isles of Scilly. Parts Echinodermata and Protochordata. In press.
- RUGGIERI, G. D., 1969. In corpore fertilization and development in the sea urchin, Arbacia punctulata. Nature 223: 189.
- SERAFY, D. K., 1970. A new species of Clypeaster from the Gulf and Caribbean and a key to the species in the tropical northwestern Atlantic (Echinodermata: Echinoidea). Bull. Mar. Sci. 20 (3): 662-667.
- \_\_\_\_\_, 1971. A new species of Clypeaster (Echinodermata: Echinoidea) from San Felix Island, with a key to the Recent species of the eastern Pacific Ocean. Pac. Sci. 25 (2): 165-170.
- \_\_\_\_\_, 1971. Intraspecific variation in the brittle-star Ophiopholis aculeata (Linnaeus) in the northwestern Atlantic (Echinodermata: Ophiuroidea). Biol. Bull. 140 (2): 323-330.
- \_\_\_\_\_. A redescription of Clypeaster pallidus H. L. Clark, 1915, and a description of juvenile C. rosaceus (Linnaeus, 1758) (Echinodermata: Echinoidea). Bull. Mar. Sci. In press.

TAHARA, Y., 1968. Normal development of secondary sexual characters in the sea urchin, Echinometra mathaei. Pub. Seto Marine Biol. Lab. 16: 41-50. (With M. Okada)

\_\_\_\_\_. Development of secondary sexual characters in the sea urchin, Hemicentrotus pulcherrimus. Zool. Mag., 79. (With the senior author, M. Okada) In press.

ZAVODNIK, D., 1967. Adriatic Echinoderms inhabiting the phytal. *Thalassia jugosl.*, 3: 11-22.

\_\_\_\_\_, 1969. Les Echinodermes de la Mer Adriatique sont-ils suffisamment connus? *Thalassia jugosl.*, 5. In press.

Theses dealing with Echinoderms

In the course of his teaching and research, Dr. John Lawrence has collected a list of Masters and Doctoral theses, most of which have been written during the past 20 years. He kindly made the list available to us and we reproduce it here. Please note that some of these have already been formally published in whole or in part. Photocopies of several of them can be purchased from University Microfilms, Ann Arbor, Michigan, U.S.A.

The list is, of course, far from complete; if you send us additional titles we can include them in the next Newsletter.

Master's theses

- Berrill, M. 1965. The ethology of the synaptid holothuroid Opheodesoma spectabilis. University of Hawaii.
- Bierman, J. A. 1943. Echinoderm larvae of Beaufort, North Carolina. Duke University.
- Burchill, B. R. 1963. Studies on the metachromatic granules in the egg of the sea urchin Lytechinus variegatus. Florida State University.
- Culver, S. 1961. Observations on the biology of the sand dollar Mellita quinquiesperforata (Leske). Duke University.
- Doherty, B. 1961. An electrophoretic study of the blood proteins of some marine invertebrates. Stanford University.
- Greenberg, M. J. 1955. Some chemical and physiological properties of the jelly-coat of the egg of Lytechinus variegatus. Florida State University.
- Holland, L. Z. 1964. Variation of perivisceral fluid protein content with reproductive and nutritional state in the purple sea urchin. Stanford University.
- Lyons, R. B. 1960. Antigenic anatomy of the sea urchin Strongylocentrotus purpuratus. University of Oregon.
- McPherson, B. F. 1964. Contributions to the biology of the sea urchin Tripneustes ventricosus. University of Miami.
- Moss, J. A. 1971. Changes in the carbohydrate, lipid and protein levels with age and season in the sand dollar Mellita quinquiesperforata. University of South Florida.
- Riesman, A. W. 1965. The histology and anatomy of the intestinal tract of Dendraster excentricus, a clypeastroid echinoid. University of California, Los Angeles.

Serafy, D. K. 1971. Systematic studies of Clypeaster and Ophiopholis (Echinodermata). University of Maine.

Thomas, L. P. 1959. A systematic study of the shallow water brittle stars of the family Amphiuridae of Florida. University of Miami.

Uter, A. 1966. Physiological location of shedding substance in radial nerve complex of starfish (Asterias forbesi). American University.

Ph.D. theses

Aldrich, F. A. 1956. On the functional morphology of the alimentary canal of the sea star Asterias forbesi (Desor). Rutgers University.

Alender, C. B. 1964. The venom from the heads of the globiferous pedicellariae of the sea urchin, Tripneustes gratilla (Linnaeus). University of Hawaii.

Allen, W. V. 1965. Lipogenesis in the seastar Pisaster ochraceus (Brandt). Stanford University.

Araki, G. S. 1964. On the physiology of feeding and digestion in the sea star Patiria miniata. Stanford University.

Austin, W. C. 1966. Feeding mechanisms, digestive tracts, and circulatory systems in the ophiuroids Ophiothrix spiculata Le Conte, 1851 and Ophiura luetkeni (Lyman, 1860). Stanford University.

Berger, J. 1963. The morphology, systematics, and biology of the entocommensal ciliates of echinoids. University of Illinois.

Blake, D. B. 1966. Skeletal structures in selected asteroids of the Order Phanerozoia. University of California.

Booolootian, R. A. 1957. The coagulation of echinoderm body fluids. Stanford University.

Brumbaugh, J. H. 1965. The anatomy, diet, and tentacular feeding mechanisms of the dendrochirote holothurian, Cucumaria curata Cowles 1907. Stanford University.

Campbell, J. L. 1966. The haemal and digestive systems of the purple sea urchin Strongylocentrotus purpuratus (Stimpson). University of California, Los Angeles.

Castro, P. 1969. Symbiosis between Echinoecus pentagonus (Crustacea, Brachyura) and its host in Hawaii, Echinothrix calamaris (Echinoidea). University of Hawaii.

- Chesher, R. H. 1967. The systematics of sympatric species in West Indian Spatangoids: a revision of the genera Brissopsis, Plethotaenia, Paleopneustes, and Saviniaster. University of Miami.
- Chia, F. S. 1964. The development and reproductive biology of a brooding starfish Leptasterias hexactis. University of Washington.
- Cocanour, B. A. 1969. Growth and reproduction of the sand dollar Echinarachnius parma (Echinodermata: Echinoidea). University of Maine.
- Devaney, D. M. 1968. The systematics and post-larval changes in ophiocomid brittlestars. University of Hawaii.
- Doezema, C. P. 1967. Glycogen synthesis, storage and utilization in the purple sea urchin, Strongylocentrotus purpuratus. Stanford University.
- Ebert, T. A. 1966. Local variations of growth, feeding, regeneration and size structure in a natural population of the sea urchin, Strongylocentrotus purpuratus (Stimpson). University of Oregon.
- Ernst, E. J. 1967. The distribution, ecology, environmental behavior, and possible hybridization of the sea stars, Asterias forbesi and Asterias vulgaris, in the sublittoral zone of Long Island. New York University.
- Farmanfarmaian, A. A. 1958. The respiratory surface of the purple sea urchin (Strongylocentrotus purpuratus). Stanford University.
- Feder, H. M. 1956. Natural history notes on the starfish Pisaster ochraceus (Brandt, 1835) in the Monterey Bay area. Stanford University.
- Ferguson, J. C. 1963. The physiological mechanisms of nutrient transport in the starfish Asterias forbesi. Cornell University.
- Greenfield, L. J. 1959. Biochemical and environmental factors involved in the reproductive cycle of the sea star Pisaster ochraceus (Brandt). Stanford University.
- Gupta, K. C. 1967. Marine sterols. University of Hawaii.
- Hathaway, R. R. 1961. Studies on interactions between spermatozoa and eggs. of Arbacia punctulata and other echinoderms. Florida State University.
- Heatfield, B. M. 1969. Calcification and growth of regenerating spines of the sea urchin, Strongylocentrotus purpuratus (Stimpson). University of California, Los Angeles.
- Hetzel, H. R. 1960. Studies of holothurian coelomocytes with special reference to Cucumaria miniata. University of Washington.



- Holland, N. D. 1965. Cell proliferation in post-embryonic specimens of the purple sea urchin (Strongylocentrotus purpuratus): an autoradiographic method employing tritiated thymidine. Stanford University.
- Hopkins, T. S. 1967. Studies on the biology and carotenoid biochemistry of the sea star Henricia. University of California.
- Lavoie, M. E. 1956. How sea stars open bivalves. Syracuse University.
- Lawrence, J. M. 1966. Lipid levels in the body fluid, blood, and tissues of some marine molluscs and echinoderms in relation to the nutritional and reproductive state. Stanford University.
- Leighton, D. L. 1968. A comparative study of food selection and nutrition in the abalone, Haliotis rufescens Swanson, and the sea urchin, Strongylocentrotus purpuratus (Stimpson). University of California.
- Lohavanijaya, P. 1964. Variation in growth pattern in the sand dollar Echinarachnius parma (Lamarck). University of New Hampshire.
- McPherson, B. F. 1968. The ecology of the tropical sea urchin Eucidaris tribuloides. University of Miami.
- Mauzey, K. P. 1968. The interrelationship of feeding, reproduction, and habitat variability in Pisaster ochraceus. University of Washington.
- Oviatt, C. A. 1967. Effects of artificial light on the movement of the common starfish, Asterias forbesi (Desor). University of Rhode Island.
- Parsley, R. L. 1969. Studies on Middle Ordovician primitive Echinodermata. University of Cincinnati.
- Patent, D. W. 1968. The general and reproductive biology of the basketstar Gorgoncephalus caryi. University of California, Berkeley.
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Directory of Echinoderm Specialists - Supplement 1

The list below is undoubtedly incomplete; as new names become available they will be included in addendum sheets in succeeding newsletters. A complete new directory will be compiled periodically. Where information has been sent to us, we have entered below the interests of specialists.

Abbreviations: Taxonomic - Ast., Asteroidea; Blast., Blastoidea; Carp., Carpoidea; Crin., Crinoidea; Cyst., Cystoidea; Ech., Echinoidea; Edrio., Edrioasteroidea; Eocrin., Eocrinoidea; Helico., Helicoplacoidea; Holo., Holothuroidea; Mach., Machaeridia; Oph., Ophiuroidea.

Field - bioch., biochemistry, cryst., crystallography; dev., development; ec., ecology; emb., embryology; gen., genetics; hist., histology; morph., morphology; pal., paleontology; phyl., phylogeny; phys., physiology; pop., population dynamics; sys., systematics; tax., taxonomy; zoog., zoogeography.

ABBOTT, Dr. Donald P., Hopkins Marine Station, Pacific Grove, California 93950.

ALLISON, Dr. Edwin C., Department of Geology, San Diego State College, San Diego, California 92115.

BAKUS, Dr. Gerald J., Allan Hancock Foundation, University of Southern California, Los Angeles, California 90007. (Holo.- ec.)

BAUER, Mr. John C., University of Miami, Rosenstiel School of Marine & Atmospheric Sciences, Institute of Marine & Atmospheric Sciences, 10 Rickenbacker Causeway, Miami, Florida 33149.

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- KEEGAN, Mr. Brendan F., Department of Zoology, University College, Galway, Eire.
- LILLY, Mr. George, Bellairs Research Institute, St. James, Barbados.
- LÜTZEN, Dr. Jørgen, Institute of Comparative Anatomy, University of Copenhagen, 15, Universitetsparken, Copenhagen Ø, Denmark.
- MACKIE, Dr. A. M., University of Aberdeen, Fisheries Biochemical Research Unit, St. Fittick's Road, Torry, Aberdeen AB1 3RA, Scotland.
- MAERKEL, Dr. Konrad, Ruhr-Universität Bochum, Abt.f.Biologie, Inst.f.Spezielle Zoologie, D 463 Bochum - Querenburg, Postfach 2148, Western Germany. (Ech.-phyl., ec., hist., morph.)
- MAJOR, Dr. C. W., Department of Zoology, University of Maine, Orono, Maine.
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- MARCUS, Dr. T. R., Marine Sciences Research Lab, Memorial University,  
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Technology, Haifa, Israel.
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- NISIIYAMA, Dr. Syozo, Department of Geology, Shimane University, Matsui, Japan.
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- RUTMAN, Mrs. J., Department of Zoology, Tel Aviv University, Tel Aviv,  
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phys.)
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Maine, Orono, Maine 04473.
- VOCISANO, Dr. Rinaldo A., Department of Zoology, McGill University, Montreal  
110, Quebec, Canada. (ec., phys., calcification)
- WOOLLEY, Miss Kathleen, Department of Biology, University of Victoria,  
Victoria, British Columbia, Canada. (Ast.-phys., hist.)

Directory of Echinoderm Specialists - Supplement 2

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- HINEGARDNER, Dr. Ralph T., Division of Natural Sciences, University of California at Santa Cruz, Santa Cruz, California 95060.
- JONES, Dr. Ira, Department of Biology, Inter American University of Puerto Rico, San German, Puerto Rico 00753.
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- PATTON, Dr. Wendell K., Ohio Wesleyan University, Delaware, Ohio 43015.
- PILKINGTON, Dr. J. B., Department of Zoology, University of Otago, Dunedin, New Zealand.
- SALAZAR, Dr. Michael H., Commander, Naval Undersea Research and Development Center, 3202 E. Foothill Blvd., Pasadena, California 91107.  
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- WOLFF, Dr. W. J., Division Delta-Research, Hydrobiological Institute, Yerseke, The Netherlands.

Directory of Echinoderm Specialists

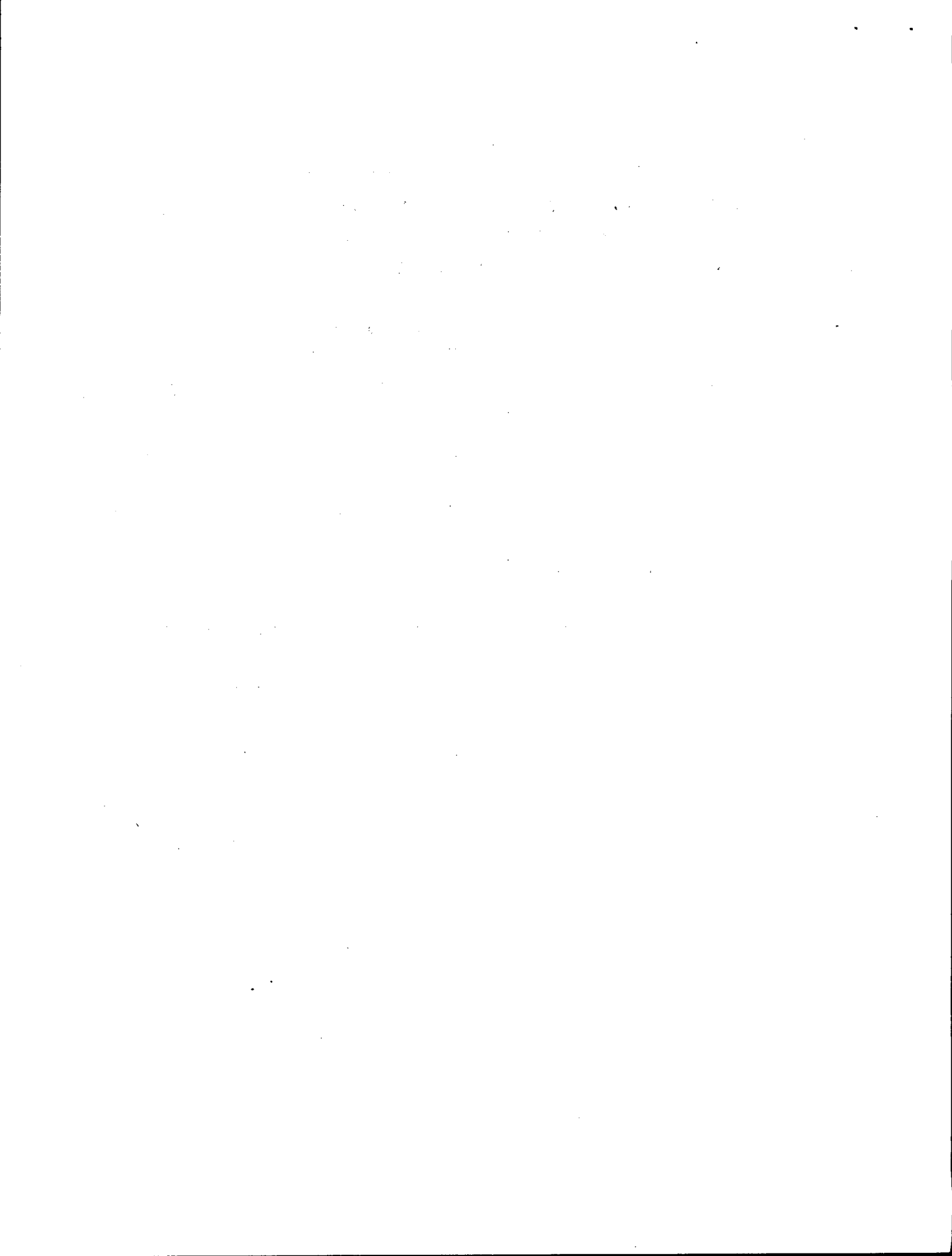
Address changes and corrections

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- BRUMBAUGH, Dr. Joseph, Department of Biology, Sonoma State College, Rohnert Park, California 94928.
- CHESSHER, Dr. R. H., Westinghouse Electric Corp., Ocean Research Laboratory, 9879 East Fern Street, Miami, Florida 33157.
- COMASCH-CARIA, Prof. Dott. Ida, Docente de Paleontologia nell'Università, Via Trentino, Cagliari, Italy.
- CRUMP, Dr. Robin, Dale Fort Field Centre, near Haverfordwest, Pembrokeshire, Wales, Great Britain. (Ast.-dev., ec., pop.).
- DIX, Dr. Trevor, School of Biological Sciences, University College of Townsville, P.O. Box 999, Townsville, Queensland, Australia.
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- HILTON, Dr. Barbara Cocanour, Biology Department, Lowell Technological Institute, Lowell, Massachusetts 08154. (Ech.-dev., ec., phys.).
- HOTCHKISS, Mr. F.H.C., Department of Biology, Yale University, New Haven, Connecticut 06520.
- JAMES, Mr. D. B., Central Marine Fisheries Research Sub-station, 93 North Beach Rd., Tuticorin 1, India. (Holo.; Oph.-sys., ec., zoog.).

- MCGINNIS, Dr. M., Box 300, Letterman General Hospital, San Francisco, California 94129. (Crin.-ec., pal.).
- MARSH, Mrs. Loisetete, 6 Conon Rd., Applecross, Western Australia 6153. (Ast.-sys., ec., zoog.).
- MEYER, Dr. David L., Department of Paleobiology, Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560. (Crin.-sys., phyl. tax., pal., ec., zoog., pop., phys., morph.).
- MURAKAMI, Dr. S., Japan Sea Regional Fisheries Research Laboratory, 5939 Hamaura, Nishifunami-cho, Niigata City, Japan.
- NICHOLS, Dr. David, Department of Biological Sciences, Hatherly Laboratories, Prince of Wales Rd., Exeter EX4 4PS, England.
- OGURO, Dr. Chitaru, Department of Biology, Toyama University, Toyama, Japan. (Holo.-emb., dev., phys., hist.).
- OKAZAKI, Dr. Kayo, Department of Biology, Tokyo Metropolitan University, Setagaya-ku, Tokyo, Japan.
- OWEN, Mr. H. G. (listed as GIVEN in Directory).
- PAINE, Dr. Robert T., Department of Zoology, University of Washington, Seattle, Washington.
- PENTREATH, Dr. R. J., Fisheries Radiobiological Laboratory, Lowestoft, Suffolk, England.
- RAO, Dr. K. Satyanarayana, C.M.F.R.I., Marine Fisheries P. O., Mandapam Camp, South India. (Ast.; Ech.-phys., biochem.).
- RHO, Miss Boon Jo, Department of Biology, Ewha Womens University, Seoul, Korea. (Oph.; Ast.; Ech.; Crin.-sys.).
- ROWE, Mr. F.W.E., Department of Chemistry and Biology, The Polytechnic of Central London, 115 New Cavendish St., London W1 M 8JS, England.
- SCHROEDER, Dr. Johannes H., Institut für Geologie und Palaeontologie, Technische Universität Berlin, 1 Berlin 12, Hardenbergstrasse 35, Germany.
- SCHUETZ, Dr. Allen W., School of Hygeine and Public Health, Johns Hopkins University, 615 North Wolfe St., Baltimore, Maryland 21205.
- SERAFY, Mr. Donald Keith, Department of Zoology, University of Maine, Orono, Maine. (Ech.-tax., ec.).
- SPRINKLE, Dr. James, U.S. Geological Survey, Paleontology and Stratigraphy, Federal Center, Bldg. 25, Denver, Colorado 80225.



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1. The first part of the document discusses the importance of maintaining accurate records of all transactions.

2. It then outlines the various methods used to collect and analyze data, including surveys and interviews.

3. The next section describes the results of the study, showing a clear trend towards increased participation.

4. Finally, the document concludes with a series of recommendations for future research and implementation.

5. The overall findings suggest that the current approach is effective, but there are still areas for improvement.

6. The data indicates that the majority of respondents are satisfied with the current process.

7. However, there are some concerns regarding the accuracy of the data collection process.

8. It is recommended that future studies should focus on improving the reliability of the data.

9. The study also highlights the need for ongoing communication and feedback from participants.

10. In conclusion, the research provides valuable insights into the current state of affairs.

11. The findings are consistent with previous research in this field.

12. The study also identifies several key areas for further investigation.

13. The results suggest that the current approach is generally effective.

14. However, there are still some challenges that need to be addressed.

15. The study concludes that the current approach is a good starting point.

16. Further research is needed to refine the process and improve outcomes.

17. The study also emphasizes the importance of transparency and accountability.

18. The findings provide a clear picture of the current situation.

19. The study also identifies several key areas for future research.

20. The results suggest that the current approach is generally effective.

21. However, there are still some challenges that need to be addressed.

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25. The findings provide a clear picture of the current situation.

26. The study also identifies several key areas for future research.

27. The results suggest that the current approach is generally effective.

28. However, there are still some challenges that need to be addressed.

### Proposed Echinoderms Conference

For some time we have been discussing the possibility of holding a conference on echinoderms, to provide a forum for critical examination of several aspects of the biology and evolution of the group, and to enable echinoderm specialists to meet informally, discuss their research interests and exchange ideas. This announcement is a first circular, to determine if you would be willing and able to attend such a conference. We urge you to respond as soon as possible (use attached questionnaire) so that we can quickly make a decision to either go ahead with it or abandon the idea.

Date: September 6-8 inclusive, 1972.

Place: National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Financial arrangements: We cannot provide funds to assist travel or accommodation of participants. Some funds will be available to support or subsidize a dinner and one or more informal social gatherings.

Accommodations: Several hotels, varying in price, can be found within a reasonable distance of the museum. In a later announcement (December), we can list nearby hotels and prices.

Structure of the conference: After long discussions with colleagues, it has been decided that the three-day conference will cover all aspects of living and fossil echinoderm biology, subdivided into the following broad categories:

Evolution and relationships

Structure and diversity

General biology (ecology, reproduction, behavior, physiology, etc.)

The amount of time devoted to each category will be determined on the basis of the number of papers submitted in each category.

We are aiming at a maximum of informality, and ideal conditions for the exchange of information. We urge you to present a paper discussing your most recent research activities, presenting new ideas, or discussing proposed future research.

Please try to limit papers to 15-20 minutes. Of course, longer and shorter contributions are also acceptable. There will be ample time for discussion at the end of each paper.

Tentative program:

September 5 (evening) - informal social gathering

September 6, 7, 8. - 9:00 a.m. - 11:30 a.m. - session

11:30 a.m. - 1:30 p.m. - lunch

1:30 p.m. - 4:00 p.m. - session

Other details can be worked out later. Please reply at your earliest convenience.