

Recent Octocorals

FREDERICK M. BAYER

Biologist, U. S. National Museum, Washington 25, D. C.

Very little has been written about the ecology of octocorals, and one who would learn more about it is left the choice of piecing together an imperfect picture from the scattered information to be found in systematic treatises, or going out into the field and accumulating data first-hand. In lieu of the latter desirable alternative, this bibliography of the major systematic works from which a certain amount of ecological data may be gained, is presented.

Members of the subclass Octocorallia are found in nearly all marine waters, from pole to pole and from the low tide mark to over 2000 fathoms. In the temperate and tropical Atlantic, the predominant shallow water forms belong to the order Gorgonacea and chiefly to the families Gorgoniidae, Plexauridae and Muriceidae. In the Indo-Pacific, however, the Gorgonacea are inconspicuous in shallow water, whereas the Alcyonacean families Nephthyidae, Siphonogorgiidae, and especially Alcyoniidae form the principal element.

Certain families are characteristically, though not exclusively, shallow water inhabitants, such as the Gorgoniidae and Plexauridae in the Gorgonacea, the Alcyoniidae in the Alcyonacea, and the Renillidae in the Pennatulacea. Other families are almost exclusively deep water inhabitants, such as the Primnoidae and Chrysogorgiidae in the Gorgonacea and the Umbellulidae in the Pennatulacea, or have wide bathymetric ranges but with the genera bathymetrically restricted. There are, of course, some unusual cases, such as the genus *Teleso*, generically represented from low tide down to more than 1500 fathoms, although no species as now understood is especially wide ranging in depth. Another is the isidid, *Acanella eburnea*, found from about 175 to nearly 1000 fathoms.

The physiological requirements of the octocorals seem to parallel more or less closely those of the scleractinian (madreporarian) corals. As in that order, there is among the octocorals a distinct reef-dwelling group whose temperature, oxygen and salinity requirements are probably rather narrow. The non-reef-dwelling types obviously inhabit a wider variety of situations. Unfortunately, very little research has been done on the subject, and definite limits have been established for relatively few physiological factors and for very few species.

It seems a reasonable supposition that certain octocorals may be useful indicators of restricted ecological situations, but it is yet to be learned exactly what these special situations are and by what species they are indicated.

The structure of most octocorals unfortunately does not lend itself to satisfactory preservation in the fossil record, and we can therefore not expect to infer much about palaeoecology from a study of recent octocoral ecology.

CARY, LEWIS R. 1. Observations upon the growth-rate and oecology of gorgonians: Papers from the Tortugas Laboratory of the Carnegie Institution of Washington, vol. 5, pp. 79-90, 2 pls., 1914.

The growth rates of two species were studied and the results given in tabular form. The peak breeding season of *Plexaura flexuosa* is given as June; the nature of bottom best suited to the attachment of planulae is described. The agents destructive to gorgonian colonies are discussed, and some regeneration experiments described.

2. The Gorgonaceae as a factor in the formation of coral reefs: Papers from the Department of Marine Biology of the Carnegie Institution of Washington, vol. 9, pp. 341-362, 9 tables, 6 plates. (Publication 213.) 1918.

In order to determine the contribution to the mass of a Florida reef by Gorgonacea, the spicule content of the common reef species was calculated, and the reef population estimated. The rate of growth and of disintegration was investigated, and the conclusion reached that gorgonians contain more than 5 tons of calcium carbonate per acre of reef, and that about a ton an acre is added to the reef yearly.

3. A study of respiration in Alcyonaria: Papers from the Department of Marine Biology of the Carnegie Institution of Washington, vol. 12, pp. 185-191, 1918.

The oxygen consumption and death temperature of twelve species of alcyonarians common at the Dry Tortugas was determined. [This information may have considerable ecological significance. E.g., the highest respiration rate found was in *Gorgonia flabellum*, a species normally associated with outer reefs rather than inshore waters.]

4. Studies on Alcyonaria at Tortugas: Carnegie Institution of Washington. Year Book 16, 1917. pp. 175-177, 1918.

The growth rate experiments commenced earlier were continued (reported in Year Books for 1912, pp. 131-134; 1914, pp. 196-199; 1915, pp. 200-201 [1916]; and 1917, pp. 194-195). Temperature resistance and oxygen consumption for a number of species was investigated.

5. Studies on Alcyonaria in the Pacific Ocean: Carnegie Institution of Washington. Year Book 17, 1918, pp. 163-168, 1919.

The growth rates of the four important species

of the Tutuila reef alcyonarian fauna were studied; respiration rate of a number of Samoan species was determined. The composition of the reef limestone was studied in regard to the alcyonarian component.

6. Studies on the coral reefs of Tutuila, American Samoa, with especial reference to the Alcyonaria: Papers Tortugas Laboratory of Carnegie Institution of Washington, vol. 27, pp. 53-98, 14 figs., pls. 1-7. (Publication 413.) 1931.

The physical environment is described for Pago Pago Harbor, and in more detail, for the Utelei reefs. The relationship that the reef surface character bears to alcyonarian distribution is briefly considered. The four important alcyonarian species found on Tutuila are identified and their structure and spicule content discussed. Temperature and respiration experiments were carried out and correlated with the distribution of the species on the reefs in relation to environmental factors. The relative area of reef surface covered by Alcyonaria was estimated and growth rates established for the four species in order to determine their importance as reef building organisms. The present and former composition of the reefs was studied to discover what contribution the Alcyonaria have made to the formation of reef limestone.

- GOHAR, H. A. F. A description and some biological studies of a new alcyonarian species *Clavularia hamra* Gohar: Publ. Mar. Biol. Sta. Ghardaqa, vol. 6, pp. 1-13, 1948.

Morphological descr. accompanied by discussion of behavior, physiology, incl. relationship with zooxanthellae and epizootic organisms.

- HICKSON, SYDNEY J. 1. Die Alcyoniden der Siboga-Expedition. 1. Coralliidae: Siboga-Expedition, Monographie 13c, pp. 1-8, pl. 1, 1907.

Depth and locality given; character of bottom may be ascertained from the general station list; see under Tydeman, M.-G. F.

2. The Pennatulacea of the Siboga Expedition, with a general survey of the order: Siboga-Expedition, Monographie 14, pp. 1-265, 45 figs., pls. 1-10, chart, 1916.

Locality and depth given for those species taken by the "Siboga." Character of bottom can be found by referring to the general station list. See under Tydeman. A section on geographical distribution provides general information concerning pennatulid distribution in the Malay Archipelago.

- JUNGENSEN, HECTOR F. E. Pennatulida: The Danish Ingolf-Expedition, vol. 5, part 1: pp. 1-95, 3 text figs. 1 chart, 3 plates, 1904.

The usual collection data are given. A section entitled "General review of the occurrence and distribution of the northern pennatulids" is of general interest.

- KÜNKENTHAL, WILLY. 1. Alcyonacea: Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898-1899. Band 13, Teil 1, Lieferung 1, pp. 1-111, pls. 1-12, 1906.

For all species that were taken by the "Valdivia" (12) the usual collection data are available

through the station list in the faunistic part (p. 4); the descriptions of those not taken by the "Valdivia" are accompanied by more or less complete data. The Faunistischer Teil also includes an account of the geographical distribution of Alcyonacea which contains some ecological data of a general nature. There is a final chapter on the evolutionary development and geographical distribution that is of interest.

2. (ANO BROCH, HJALMAR). Penatulacea: Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898-1899: Band 13, Teil 1, Lieferung 2, i-vi + 113-576 pp., 295 figs., pls. 13-29, 17 charts, 1911.

The usual collection data, frequently including bottom character, is present for those species taken by the "Valdivia" (pp. 132-133). There is a short section on the regularity of distribution, with discussions of the Mediterranean, Red Sea, Arctic, and Antarctic faunas, bipolarity, and the influence of temperature and of water pressure upon the distribution of pennatulids. The ranges of various families, genera, and species is discussed in a separate section.

- MANSEN, F. JENSENIUS. Octocorallia (Stolonifera, Telestacea, Xenideia, Alcyonacea, Gorgonacea): The Danish Ingolf-Expedition, volume 5, no. 13, pp. 1-65, 53 figs., pl. 1, 1944.

Locality, depth, and bottom temperature given; geographical distribution of the species discussed; a separate discussion of the zoogeography and ecology.

- NUTTING, CHARLES CLEVELAND. 1. Alcyonaria of the Californian coast: U. S. National Museum, Proc. vol. 35, pp. 681-727, pls. 84-91, 1909.

Locality and depth given; character of bottom, and in some cases bottom temperature, can be had by reference to the published station lists of the "Albatross." A chart showing bathymetric and geographical distribution of the species concerned is also present.

2. The Gorgonacea of the Siboga Expedition: III, The Muriceidae, Siboga-Expedition, Monographie 13b, pp. 1-108, pls. 1-22, 1910. IV, The Plexauridae, Monographie 13b¹, pp. 1-19, pls. 1-4, 1910. V, The Isidae, Monographie 13b², pp. 1-23, pls. 1-6, 1910. VI, The Gorgonellidae, Monographie 13b³, pp. 1-39, pls. 1-11, 1910. VII, The Gorgonidae, Monographie 13b⁴, pp. 1-9, pls. 1-3, 1910. VIII, The Scleraxonia, Monographie 13b⁵, pp. 1-62, pls. 1-12, 1911.

Locality, depth and character of bottom given; in addition, a distribution of species by station is given at the end of each part.

3. Descriptions of the Alcyonaria collected by the U. S. Fisheries steamer "Albatross," mainly in Japanese waters, during 1906: U. S. National Museum, Proc. vol. 43, 1-104 pp., pls. 1-21, 1912.

Locality, depth, and character of bottom given; bottom temperature available in published station lists of the "Albatross." A table showing distribution of species by stations is present, together with a chart of the geographical and bathymetric distribution of the species concerned.

STUDER, THÉOPHILE. Supplementary report on the Alcyonaria collected by H.M.S. Challenger during the years 1873-1876: Report on the scientific results of H.M.S. Challenger, Zoology, vol. 32, pp. 1-31, pls. 1-6. (Part 81), 1889.

The section on geographical distribution gives the species taken at each station; there is also a general account of their bathymetric distribution and discussion of the faunas at the different levels. These cover all the species taken by the "Challenger."

THOMSON, J. ARTHUR, (AND DEAN, LAURA M. I.). The Alcyonacea of the Siboga Expedition, with an addendum to the Gorgonacea. Siboga-Expedition, Monographie 13d, 227 pp., 1 figure, pls. 1-28, 1931.

Locality, depth and character of bottom given.

TYDEMAN, M.-G. F. Liste des Stations de la Campagne Scientifique du "Siboga." in Weber, Max. Introduction et description de l'Expedition: Siboga-Expedition, Monographie 1, 159 pp., + 1-16, chart. (Latter pp. are devoted to the station list.) 1902.

VERSLUYS, J. I. Die Gorgoniden der Siboga-Expedi-

tion. I, Die Chrysogorgiidae. Siboga-Expedition, Monographie 13, 120 pp., figures 1-170, 1902.

Locality, depth, and character of bottom given.

2. Die Gorgoniden der Siboga-Expedition. II, Die Primnoidae: Siboga-Expedition, Monographie 13a, 187 pp., figs. 1-178, 10 pls., 1906.

The usual collection data are given for all species taken by the "Siboga." In the zoogeographical part, the bathymetric distribution of known species and of genera is discussed, as well as the horizontal distribution.

3. Die Alcyoniden der Siboga-Expedition. II, *Pseudocladochonus hicksoni* n.g. n.sp.: Siboga-Expedition, Monographie 13c, pp. 9-39, pls. 2-3, figs. 1-16, 1907.

Locality, depth, and character of bottom given. The new genus is compared with fossil forms in a separate section.

WRIGHT, EDWARD PERCEVAL (AND STUDER, THÉOPHILE). Report on the Alcyonaria collected by H.M.S. Challenger during the years 1873-1876: Report on the scientific results of H.M.S. Challenger, Zoology, vol. 31, i-lxxii + 1-314 pp., pls. 1-43, 1889.

Depth and character of bottom given. There is a separate section on geographical distribution and another on bathymetrical distribution.

Recent Coelenterates other than Scleractinia and Octocorallia

The following few titles are listed in the hope that they will form a key to the scattered literature on the ecology of other coelenterate groups that may interest the ecologist. The list is by no means exhaustive, but an effort has been made to include a few references to each group not treated more thoroughly elsewhere.

HYDROZOA

BROCH, HJALMAR. 1. Hydroida: In: Kükenthal, Willy. Handbuch der Zoologie: vol. 1, no. 3, pp. 422-458, 1924.

Generalities concerning the ecology, as well as sections on morphology, physiology, distribution, and classification. The selected bibliography contains a section on ecology.

2. Untersuchungen an Stylasteriden (Hydrokorallen). Teil I. (Stylasterinae): Norske Videnskaps-Akademi Skrifter, math.-naturw. kl. 1936, no. 8, pp. 1-103, textf. 1-32, pls. 1-13, 1936.

Depth, geographic locality, and sometimes other habitat data are mentioned in the specific descriptions.

3. Investigations on Stylasteridae (Hydrocorals). (Distichoporinae, Sporadoporinae): Norske Videnskaps Akademi Skrifter, math.-naturw. kl. 1942, no. 3, 113 pp., textf. 1-38, pls. 1-6, 1942.

Depth, geographic locality, and sometimes other habitat data given in the systematic descriptions. A zoogeographic summary is presented.

4. Post-glacial interchange between Pacific and Atlantic deeper living boreal faunas?: Norske Geografisk Tidsskrift vol. 12, no. 3, pp. 126-141, figs. 1-7, 1949.

The circumboreal distribution of a hydroid, two hydrocorals, and two octocorals is discussed and interpreted in light of time, currents, and other ecological factors.

DREVEY, EDWARD S., JR. Hydroids from Louisiana and Texas, with remarks on the Pleistocene biogeography of the western Gulf of Mexico: Ecology, vol. 31, no. 3, pp. 334-367, 11 figs., 1950.

Finds, out of 39 species of hydroids, six or seven which have a boreal disjunct pattern, i.e., are northern species which skip southern Florida. A lowering of the average annual isotherm at Key West by 5° C. is postulated for the Pleistocene to account for the occurrence of these "glacial relicts." Submergence of Florida is not considered. (J.W.H.).

FISHER, WALTER K. Hydrocorals of the north

Pacific Ocean: Proc. U. S. National Museum vol. 84, pp. 493-554, pls. 34-76, 1938.

The usual collection data (locality, depth bottom character, and temperature) are given for each species, and the associations at each collection station. There is a short introduction in which environmental requirements are discussed.

MOSER, FANNY. Siphonophora: In: Kükenthal, Willy. Handbuch der Zoologie vol. 1, no. 3-4, pp. 485-521, 1924-1925.

Morphology, development, physiology, ecology, distribution, phylogeny, and classification. The selected references include works on geographical distribution but not ecology per se.

MEDUSAE

BROCH, HJALMAR. Trachylina: In: Kükenthal, Willy. Handbuch der Zoologie vol. 1, no. 3, pp. 459-484, 1924.

Morphology, development, physiology, ecology, distribution, phylogeny, and classification treated in broad terms. Bibliography includes selected works on the ecology of the group.

KRUMBACH, THILO. Scyphozoa: In: Kükenthal, Willy. Handbuch der Zoologie vol. 1, no. 45, pp. 522-686, 1925.

There is a general treatment, with bibliography, after which the class is treated by orders, with a bibliography for each. There is a discussion of the ecology of each order.

MAYER, ALFRED G. The Medusae of the World. Vol. 1, Hydromedusae [Milleporinae, Anthomedusae, Leptomedusae]. pp. 1-230 + xv, pls. 1-29. Vol. 2, Hydromedusae [Leptomedusae cont., Trachymedusae, Narcomedusae]. pp. 231-498 +

xv, pls. 30-55. Vol. 3, Scyphomedusae [Carybdeidae, Stauromedusae, Coronatae, Semaestomeae, Rhizostomeae, fossil medusae]. pp. iv, 499-735, pls. 56-76. Washington, Carnegie Institution, 1910.

A systematic monograph of the medusae. The ecological information known for each species is included in the descriptions.

RUSSELL, FREDERICK STRATEN. The medusae of the British Isles. pp. xiii, 1-530, 319 text figs., pls. 1-35, Cambridge University Press, 1953.

This scholarly compendium, essentially taxonomic, contains data on the habits and distribution of each species. The taxonomic groups covered are the Anthomedusae, Leptomedusae, Linnomedusae, Trachymedusae and Narcomedusae. The extensive bibliography is not classified, with the exception that the references to the fresh water medusa *Craspedacusta* are segregated.

ANTHOZOA (other than Octocorallia and Scleractinia)

PAX, F. Hexacorallia: In: Kükenthal, Willy. Handbuch der Zoologie vol. 1, no. 6-7, pp. 770-901, 1925.

The orders are treated severally, with summary of ecology in each. The bibliographies are also separate. Actinaria, Madreporaria, Zoantharia, Antipatharia, Ceriantharia.

STEPHENSON, T. A. The British Sea Anemones: Ray Society, London. 2 vols., vol. 1, pp. xii, 148,

pls. 1-14, 1928. Vol. 2, pp. ix, 426, pls. 15-33, 1935.

In volume 1, which contains the introductory material, there is a sizeable body of general ecological material, including a classified list of literature. In volume 2, which contains the systematic descriptions, particulars of the habitat are given under each species. There is a supplemental list of literature, classified, at the end of this volume also.

CTENOPHORA

KRUMBACH, THILO. Acantharia: In: Kükenthal, Willy. Handbuch der Zoologie vol. 1, no. 7, pp. 902-995, 1925.

There is a summary section on ecology of ctenophores, but the bibliography is not classified according to subjects.

MAYER, ALFRED G. Ctenophores of the Atlantic coast of North America: Carnegie Institution of

Washington Publ. 162: 58 pp., figs. 1-76, pls. 1-16, 1912.

A taxonomic treatment without the usual collection data for individual specimens. The work is of value because of the general biological information contained, and for the synonymies, which form a guide to the previously published literature dealing with each species.

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