satisfy ourselves about our own weaknesses. The responsibility is nicely divided; it is just as much the duty of the students to learn as of the lecturer to teach, and neither student nor teacher has the material for a considered judgment upon the matter. That is why the "hobby" system, with occasional rewards for exceptional success, is so popular. It can be worked best by letting things go their own way.

The present state of things, which all agree in deploring, can be altered by drawing a clear distinction between a society's hobbies and the nation's purposes, and entrusting them to separate administrative management. Mr. Carnegie has made it clear that the financial detachment of a voluntary society is not essential to the successful organization of scientific research.—F. R. S. in *Nature*.

SCIENTIFIC BOOKS

Studies in Edrioasteroidea. I.–IX. By F. A. Bather. Published by author at "Tabo," Marryat Road, Wimbledon, England, October, 1915. Pp. 136, 13 plates. Price 10s.

This book by the well-known authority on echinoderms contains a series of articles that were published from 1898 to date in the *Geological Magazine,* but of which no separata were distributed because the plates were lost while in store. In consequence of this unfortunate circumstance several authors, the present writer among them, have become guilty of ignoring important results of Dr. Bather's studies.

The earlier papers contain elaborate descriptions of all known Edrioasteroidea based on so careful preparation of specimens that months were spent in several cases in cleaning a single specimen. By this method the finest details, notably in our North American *Edrioaster bigsbyi,* were brought out, such as the hydropore and the small plates of the periproct. Three new genera are distinguished, but most important are the three concluding articles, published in 1915, which contain the morphology and bionomics of the Edrioasteroidea, a comparison of their structure with that of the Asterozoa, and a discussion of the genetic relations to other Echinoderms. In these chapters Dr. Bather not only succeeds in demonstrating much closer resemblances between these early pelmatozoans and the Asteroidea than were hitherto suspected, but also in tracing the probable course of derivation of the Asteroids from the Edrioasteroidea. These conclusions give the work a distinctive value for all students of phylogeny.

The book is finely illustrated with diagrams and a dozen plates of good photographs and very lucid drawings. Rudolf Ruedemann

New York State Museum

SPECIAL ARTICLES

ADAPTABILITY OF A SEA GRASS

While dredging during July, 1915, in the Gulf of Mexico near the Dry Tortugas on the Carnegie Institution's yacht, *Anton Dohrn,* the writer's attention was attracted to two comparatively rare plants. These plants, which are species found only in the western hemisphere, were remarkable not only for their curious and interesting morphology, but rather for the unusual conditions under which they were found growing. Although spermatophytes, these plants came up in the dredges with marine algæ from a depth of sixteen to eighteen fathoms, *i. e.,* ninety-six to a hundred and eight feet. The algæ associated with them were the usual species found in those waters, viz., *Caulerpa, Halimeda, Penicillus, Codium, Udotea, Acetabularia,* etc. Bottom samples taken with a clasper on the sounding instrument showed the Gulf floor here to consist of a fine white mud composed of calcareous débris such as broken corals, molluscan shells and echinoderm tests.

All the plants were carefully picked out of the miscellaneous material which came up in the dredges and preserved. These on being later brought north were identified by the writer as two species of *Halophila* du Petit Thouars, and the only members of the genus, as remarked above, to be found in North or South America, and belonging in the order Hydrocharitales. A brief description of these two species is given as they have a limited range in the tropical waters of the western

hemisphere; the smaller particularly has been collected at only a few stations in the West Indies.

The larger and more widely distributed is *Halophila Engelmanii* Aschers. It is a delicate plant creeping over the muddy bottom and rooting at the nodes by white fibrous roots. The leaves are very short petioled, serrate and produced in whorls or clusters, so accurately described by Bailey Balfour[1] for *H. stipulacea* (Forsk.) Aschers., which he found on the island of Rodriguez in 1874. The plants are dicœcious with axillary inflorescence. Small,[2] who has collected the species in the Florida Key region, says the flowers and fruit have not been seen; however, the author collected pistillate flowers and ripe fruits in abundance in all the dredges in which the plant came up. The flowers are invested in a bibracteate axillary spathe on a short pedicel. The original description of the species by Ascherson[3] is rather vague as to the flowers since he classified the species largely by the leaves and Bentham and Hooker[4] give the species a casual and somewhat doubtful treatment. A great many of the older writers on the genus in describing the flowers of *Halophila* mistook the pistil with the hypanthium to be all pistil, and what are the true styles to be long stigmas, thus completely overlooking the perianth. The pistillate flower really consists of a small flask-shaped ovary, sessile in the spathe formed by the two bracts and prolonged into an elongated hypanthium, 3 mm. in length, on top of which is the three-parted perianth. This species, although it has not been figured in any works so far as the writer's knowledge goes, does not differ materially from *H. stipulacea* (Forsk.) Aschers., found in the Indian Ocean and described with such elaborate and careful drawings by Balfour,[5] except that the stipular bracts at the nodes are lacking.

H. Baillonis Aschers., the other and smaller species found in the dredging operations, is the only one in the genus that is monecious. Early writers suspected the monecism of this species, but Holm's[6] work on the species confirmed the suspicion. Holm's work also has been very careful and accurate, but his plates do not show the peculiar arrangement of the staminate and pistillate flowers lying in such close proximity in the spathe as to suggest self-fertilization. Close pollination, however, does not seem to be of general occurrence in the genus. In appearance *H. Baillonis* Aschers. resembles very much *H. ovalis* (R. Br.) J. D. Hook, which is the most widely distributed species in the genus occurring throughout the Indian Ocean and South Sea, except that *H. Baillonis* is monecious and has serrated leaves.

The fertilization of *Halophila* has never been actually seen, but the researches of both Balfour and Holm on the morphology of the anther and pollen have led to the supposition that the manner of fertilization is similar to that of *Zostera marina* as observed by Clavaud[7] and Engler[8] except that in the latter plant the pollen grains individually are elongated cylindrical bodies, while the pollen of *Halophila* occurs in the anther sacs in coiled, spiral chains, the pollen grains adhering to each other by a mucilaginous substance. These chains are carried from the proterandrous staminate flowers to the long filiform styles of the pistillate flowers in other spathes by the water current, the chains getting entangled on these styles and fertilizing the ovules.

However interesting the structure of these lowly submerged plants may be, the peculiar conditions under which they were found grow-

[1] Balfour, B., "On the Genus *Halophila*," *Trans. Bot. Soc.*, Edinburgh, XII., pp. 290–334, 1879.

[2] Small, J. K., "Flora of the Florida Keys," New York, 1913, p. 5.

[3] Ascherson, P., "Neumayer Anleit. zu Wissen. *Beobacht. auf Reisen*," 1857, p. 368.

[4] Bentham & Hooker, "Genera Plantarum," f. III., p. 435.

[5] Balfour, *loc. cit.*

[6] Holm, Th., "Recherches anatomiques et morphologiques sur deux Monocotyledones Submergeés," *Bihang. till. K. Svenska. Vet.- Akad. Handlingar*, Bd. 9, No. 13, 1885.

[7] Clavaud, Armand, "Sur le veritable mode de Fecondation du Zostera marina," *Ann. Soc. Linn. Bordeaux*, p. 109, 1878.

[8] Engler, A., *Botan. Zeit.*, p. 654, 1879.

ing give them still further interest and help to confirm an idea recently expressed by T. W. Vaughan[9] in his geologic research on the origin of the islands in the waters in which these species of *Halophila* grow, viz., that South Florida and the adjacent Keys have undergone a recent depression. The material of which these islands is formed was deposited in Pliocene times, this material being contributed by various agencies, coral reefs and calcareous mud precipitated by denitrifying bacteria, etc. The land thus formed suffered a series of oscillations which Vaughan tabulates and which the writer here reproduces from Dr. Vaughan's paper.

Oscillations of South Florida

Recent—	Uplift. Depression (modern reefs).
Pleistocene—	Depression (Pleistocene reefs, part of which stood as much as 18 feet above sea level). Uplift.
Pliocene—	Depression (some coral reefs but no well-developed reefs).

Vaughan says in part concerning these movements:

Pliocene deposition was followed by uplift which was succeeded by depression during the Pleistocene subsidence along a curve from the eastern side of Biscayne Bay, first trending south and then bending west, a barrier coral reef flourished, separated by a channel from the main bank on which the Miami oolite was forming or had formed in strongly agitated waters. West of the coral reef, on an extensive flat in shoal water, the Key West oolite was formed, while still further to the westward the Tortugas were outlined under the influence of water and currents.

This period of events was succeeded by the elevation of the entire key region to more than fifty feet above its previous level. This uplift was succeeded by a depression, lowering the surface thirty feet or more, establishing the same relation of the sea level to the land that now prevails. Subsequent to the beginning of the last depression the present barrier reef has developed seaward of the keys on a platform already prepared for it, the Marquesas have been formed by winds and currents and coral reefs have reestablished themselves in the Tortugas.

From this it is seen that the land in the region in which these two species of *Halophila* have been collected has in Recent times undergone a considerable depression. The writer therefore assumes that these plants grew, in earlier times, in much shallower water and in depths at which they are more generally found to-day. Small[10] mentions the genus as occurring in "shallow water," Balfour collected *H. ovalis* on Rodriguez on the reefs surrounding the island "on shoals just uncovered at low water" and *H. stipulacea* in "slightly deeper places where it is submerged." Baron d'Eggers,[11] who collected *H. Baillonis* Aschers. in Saint Thomas harbor, says:

The plant grows in coarse sand at a depth of two to four fathoms, here and there.

The habitat of *H. Beccarii* Aschers., too, has been well described by Beccari[12] himself in his book, where he says:

Toward dusk on the bank of the Bintulu I caught some curious crustaceans and a small water snake. It was only after I had been wading about for some time that I discovered that the soft substance under my feet was not mud but a sheet of vegetation composed of a minute submerged plant hidden by a thin layer of fine slush so that it was not easily distinguished at first. I afterward found that in some places it was uncovered and quite exposed.

From these references it is seen that the genus is usually found in comparatively shallow water. The sea grasses in general, according to Ascherson,[13] are found in depths not over ten meters but Lorenz[14] reports *Posidonia Oceanica* (L.) Del. as occurring in the Gulf of Quarnero at a depth of eighteen to thirty-

[9] Vaughan, Thomas Wayland, U. S. Geological Survey, "Building of the Marquesas and Tortugas Atolls and A Sketch of the Florida Reef Tract," Pub. No. 183, Carnegie Inst. of Wash., D. C., 1914.

[10] Small, J. K., *loc. cit.*

[11] d'Eggers, Baron, "Flora of St. Croix and the Virgin Islands," *Smithson. Inst. Bull. Nat. Mus.*, No. 13, p. 98, Wash., D. C., 1879.

[12] Beccari, Odoardo, "Wanderings in the Great Forests of Borneo," London, p. 262.

[13] Ascherson, P., *loc. cit.*

[14] Lorenz, Th., "Physik. Verhältnisse und Verteilung der Organismen im Quarn Golfe," p. 249, Wien, 1863.

five fathoms, that is, thirty to fifty meters; however, Ascherson regards this as the extreme limit for plants of this type and possibly this depth has never been reported elsewhere.

That the two species of *Halophila* described above may have been growing in these Florida waters in Pleistocene times or even an ancestral type of *Halophila* we can have no means of ascertaining, but taking into consideration the clarity of the water at present and the ease with which light can penetrate it, it is not unreasonable to suppose that enough light can be secured by the assimilative tissues of the plants for photosynthetic activities at great depths. Now even though the plants experience some difficulty in their synthesis due to a lessened intensity of light, a change so gradual as the depression of a great area of sea bottom would seem to give a plant belonging to so plastic a group as the Hydrocharitales an ideal opportunity to react to the changing environment.

To summarize briefly, then, the occurrence of these two species of *Halophila* at an unusual depth, probably illustrates the adaptability of the genus and supplements the geological evidences for a depression of the Florida key region. In conclusion the writer wishes to express his gratitude to Professor Van Ingen, of Princeton, for suggesting that these observations might be of general interest.

HOWARD H. M. BOWMAN
UNIVERSITY OF PENNSYLVANIA

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE SPECIAL MEETING[1]

IT will be remembered that the Council of the American Association for the Advancement of Science at its Columbus, Ohio, meetings held from December 27, 1915, to January 1, 1916, voted to permit the association to hold a special meeting on January 3 and 4, 1916, in Washington as an indication of the interest of the association in the meetings of the Second Pan-American Scientific Congress which were held in Washington from December 27, 1915, to January 8, 1916.

[1] Held on January 3 and 4, 1916, in cooperation with the Second Pan-American Scientific Congress.

The opening meeting was held on Monday night, January 3, in the Memorial Continental Hall and was largely attended by members of the association and by delegates to the Pan-American Congress.

Dr. R. S. Woodward, past-president of the American Association, presided and introduced Mr. John Barrett, director general of the Bureau of American Republics and secretary general of the Second Pan-American Scientific Congress, who made an address of welcome as follows:

"I consider it a great honor and privilege to say a word this evening. While I may not be classed as a scientist in the same way as we would classify Dr. Campbell and Dr. Woodward, I can frankly say that I have learned more during the past ten days about the science of international congresses than I ever dreamed could be discovered in a lifetime.

"Speaking as the Secretary General of the Second Pan-American Scientific Congress, I extend to you all congratulations upon the holding of this joint session of the American Association for the Advancement of Science and the Second Pan-American Scientific Congress. I bring to you from the latter an expression of profound interest in what your organization is achieving and we feel flattered that you should have arranged this special meeting.

"It may interest you to know that this Second Pan-American Scientific Congress is the largest official international gathering which has ever assembled in the history of the national capital, and, at the same time, the largest Pan-American official gathering which has ever been called together in any capital of the Western Hemisphere. It is indeed fortunate, moreover, that it should meet at this remarkable time in the world's history, when the harmonious meetings and discussions of the representatives of the twenty-one American Republics should stand out so strongly in contrast to the divided conditions of Europe. The silver lining of the European war cloud, if its terrible blackness can have any such brightness hidden in its folds, is the development of Pan-American solidarity, Pan-American community of interest and Pan-American friendship and peace.

"It is also most appropriate that we should now have a great Pan-American scientific assembly. Last May there met in Washington a Pan-American Financial Conference that attracted the attention of the world. Through many years we have had Pan-American political and commercial con-