that may possibly be attributed to the intensive whaling operations. The authors consider that it is possible for a decimated stock in an area to be renewed by a gradual immigration from neighbouring regions. The rapid growth of the whales is also favourable for the maintenance of the stock. They call attention, however, to the unusually high percentage of immature animals which are captured particularly at the South African stations and the comparatively slow propagation. Looked at from these points of view the whaling in South African waters is very uneconomical, and the stock here is exposed to the greatest injury.

It is, of course, impossible in these brief remarks to give an exhaustive resumé of this comprehensive paper. I have merely indicated some of the results I consider of most general interest, but I would advise all who are interested in the whale and whale investigations to make themselves familiar with this valuable and interesting work. The investigations are being continued at the station in South Georgia on the same lines, and we look forward with interest to the results which these efforts must produce.

JOHAN T. RUUD.

(1) WALTHER ARNDT. Haltung und Aufzucht von Meeresschwämmen.
(2) ARTHUR HAGMEIER. Die Züchtung verschiedener wirbelloser Meerestiere. Handb. der biologischen Arbeitsmethoden. Abt. IX, Teil 5, Heft 4. Berlin, 1930.

In the first part of this section Dr. WALTHER ARNDT gives a full account of the methods of keeping and rearing marine sponges. As he truly remarks, it is difficult to keep sponges in small vessels without frequent changes of water, but in larger aquaria with running water certain species, especially those from shallow regions, can be kept with ease. Instructions are given for the collecting of various sponges and their larvae, and the best ways of keeping them in aquaria, including temperature, lighting and circulation, besides details as to food and precautions against enemies. The larvae have only been reared in a few special cases and much is still to be known about them as the proper food is not yet determined. Another section deals with culture in the open sea, the sponges being placed in perforated vessels or, in the case of commercial sponges, growing pieces being mounted on wood or cement. The whole gives a very good idea of the methods of sponge growing.

The second part is taken up with an extensive treatise on the different methods of rearing other marine invertebrates. Cephalopods, Echinoderms, Bryozoa and Gephyrea have already been dealt with in Lieferung 278 of the present volume. Professor HAGMEIER describes the rearing of many coelenterates, mollusks and Crustacea, most of which have planktonic larvae. An elaborate general introduction deals fully with the collecting methods including traps, dredges, bottom samplers and nets, with aquaria of all kinds for keeping and rearing the animals and with methods of circulation and aeration for large and small vessels. Much attention is given to the food of the adults with their special wants, the author dividing them into groups according to their methods of feeding. In this way it is possible to combine in certain aquaria animals whose food is different,

such as detritus feeders with carnivores and herbivores, the last feeding on the algal growth on the sides of the vessel. An enormous amount of research over many years has enabled us to know fairly well the needs of each animal and this knowledge is now brought together and used in an adequate way.

In describing the rearing of the planktonic larvae the researches of ALLEN and NELSON on pure diatom cultures are shown to be fundamental, so many larvae being successfully reared on these. *Nitzschia closterium* forma *minutissima* is the most general food used in this way. The planktonic larvae may be reared either from ripe eggs and sperm brought together by the worker, or from the already naturally fertilised eggs. Amongst the former are echinoderms and many worms and mollusks, amongst the latter most of the higher crustacea which carry their eggs and such mollusks and worms which either carry them or deposit them in capsules or gelatinous masses. The coelenterates also mostly belong to the latter category.

For the food of the growing larvae, besides diatoms, Fucus sperms, green algal spores and small flagellates are used, or in some cases water rich in detritus is best. Many larvae, however, require larger and essentially animal food. This is the case with most of the decapods which catch live prey such as mollusk and worm larvae. Oyster larvae are shown to be excellent as food for crab zoeae which also eat worm and echinoderm larvae in the very early stages before spicules and chetae have developed. Coelenterates, especially hydroids and medusae, must have plankton food, mostly copepods and young mollusks, some medusae and ctenophores, however, feeding much on others of their own kind. Not only are the general facts given in this work, but special instances are quoted in detail, such as, among the coelenterates, the rearing of Aurelia through all its stages with notes on other medusae, of Clava, Metridium and Alcyonium; among the Mollusca Acanthochiton, Cumingia, Syndosyma, Mytilus, Ostrea and Cardium; and among the decapods Homarus, Portunus and Carcinus.

This is a particularly important and valuable portion of Dr. ABDERHALDEN's Compendium and will be a real boon to all those workers who are occupied with this very difficult but exceedingly interesting subject.

M. V. L.