

volcanoes. They are due, he thinks, to extensive movements along a major thrust or thrusts, which originate beneath the Pacific Ocean basin and rise gently to their outcrop. These surfaces of rupture are of vast extent; it is possible that their area may amount to hundreds of thousands of square miles.

There may also have been movements along the minor thrust-faults, for the shock was strongly felt at many places along their outcrops, but, so far as Prof. Willis was able to observe, there do not seem to have been any displacements left visible at the surface.
C. DAVISON.

Dibranchiate Cephalopods of Japanese Waters.¹

A STUDY of the late Dr. Sasaki's monograph is a sufficient reminder that the death of this accomplished specialist was a serious loss to systematic zoology. The writer of this review wishes to take the opportunity of expressing his feeling of personal loss and his appreciation of Dr. Sasaki's courtesy and kindness.

This monograph is devoted to the cephalopods of Japan and the area between Bering Straits and the Bonin Islands and Formosa. It embodies the results of a study of no less than 10,000 specimens, which must be the largest collection of cephalopods ever handled by a single investigator. The cephalopods of Japan have been studied in the past by able systematists such as Appellöf, Wülker, and Stillman Berry. We have, however, for a long time required a critical study of this fauna.

The chief importance of Dr. Sasaki's work lies in the fact that it provides this intensive and critical study. The author deals with 125 species referable to 52 genera. Each species is very exhaustively described, and the author does not confine his attentions to the external parts, 'gladii', etc., which have been usually the principal objects of taxonomic study. In many instances he describes internal structures (radula and reproductive organs) which have been too often neglected. He supplies valuable tables of measurements by which the variation of the species may be assessed, and the copious and admirably clear text-figures are a noteworthy feature of the volume. This is work of a kind that is always needed and is perhaps too little forthcoming in the study of a group

¹ *Journal of the Faculty of Agriculture, Hokkaido Imperial University, Sapporo, Japan. Vol. 20, Supplementary No.: "A Monograph of the Dibranchiate Cephalopods of the Japanese and adjacent Waters". By Madoka Sasaki. Pp. v+357+30 plates. Tokyo: Maruzen Co., Ltd., 1929.*

like the cephalopods. Concurrently with the output of descriptions of new species, etc., we require a constant critical taxonomic revision, a deeper exploration of anatomical features and a fuller analysis of variation, in order that our genera and species may as nearly as possible reflect the divergences in the natural populations from which our material is abstracted.

In his treatment of the broad outlines of classification, Dr. Sasaki does not depart from the lines laid down by earlier workers, and one could have wished that he had discussed decapod phylogeny and classification to some extent. He does not accept Naef's threefold division of the Decapoda, but retains the older and unsatisfactory Myopsida and Egopsida. He divides the Octopoda into Pinnata and Apinna, which are exactly equivalent to Grimpe's earlier Cirrata and Incirrata. Sasaki's names, however, may eventually prove more appropriate, as Berry's *Lætmoteuthis* (in most respects a 'cirrate' form) seems to be devoid of cirrhi.

Sasaki's amplified account of the rare octopod *Watasella* is a very welcome addition to our knowledge of an interesting group intermediate between the Decapoda and Octopoda. He does not, however, discuss the highly important question as to whether the 'filaments' of *Watasella* are homologous with the arms. Finally, he makes valuable additions to our knowledge of the structure and classification of the Pacific octopods, though it is a pity that by an inadvertence which, had he been able to correct the proofs, he would doubtless have remedied, he includes in his definition of *Polypus* (= *Octopus*) "Nor (*sic*) cartilaginous stylets present internally". The "cartilaginous" (chitinous) stylets of *Octopus*, last vestige of the shell, have been figured in several species.

G. C. R.

Copals and Damars.

AT a recent meeting of the Royal Society of Arts an interesting paper on East Indian copals and damars was presented by Mr. A. F. Suter, which has appeared in *Jour. Roy. Soc. Arts*, vol. 77, April 19. The distribution of resiniferous plants is world-wide. Of the resins known to commerce the two chief groups are the copals and the damars. This division of the major resins is somewhat arbitrary, being based upon the difference of their physical characteristics, but is, however, quite a useful one.

There are eight commercial copals, their names indicating the country of origin, namely: Macassar or Manilla, Kauri, Congo, Zanzibar or Lindi, Mozambique or Inhambane, Sierra Leone, Angola (Benguela), and Demerara. The first two are obtained from species of *Coniferæ* (*Agathis*), whilst all the others come from leguminous species of trees. The damar-producing trees all belong, so far as present known, to the order *Dipterocarpaceæ*. They are largely collected in the Federated Malay States, Sumatra, and Borneo.

Considerable confusion has existed in the past on the subject of copals and damars. Mr. Suter states that the name copal, which is the Mexican for resin, is unknown in the East, where both copals and damars are known as damar, the Malay name for resin or a torch made of resin. In

Europe, in the trade, both groups have been erroneously called gums, on account of their physical similarity to true gums. The author's paper mainly concerns copals, and deals chiefly with Macassar or Manilla copal which is obtained from *Agathis alba*, where it occurs most commonly in the Dutch East Indies; the tree is also found in the Celebes, the Moluccas, Borneo, Sumatra, and New Guinea. It is also present in the Philippines, where it is exploited, and in the Federated Malay States, where the resin is not as yet collected. The *Agathis* has characteristics in common with the Araucaria, and Mr. Suter deals at length with the tree and its habitat, the nature of the resin, and the methods of tapping the trees.

The various types of Macassar copal known in the trade are (a) hard or fossil copal, of unknown but often very great age, and very hard, (b) half-hard copal, less hard and much younger, (c) soft or spirit-soluble copal. The first is found either in the crotches of branches in old trees or else dug from the ground under old trees or where trees at one time existed; the other two are of recent origin, and are obtained by tapping the trees. Mr. Suter directed attention to the very efficient Dutch Forestry Department, which has studied the copal business and industry with great thoroughness.