

latu); Volume 3, Geraniaceae to Scrophulariaceae; and the present Volume 4, the Bignoniaceae to Compositae. Two bits of data appear noteworthy. First, the ratio of Monocotyledons : Dicotyledons is 1,019 : 4,884, or roughly 1 : 4.8, as contrasted with the north-eastern United States where the ratio is 1,415 : 3,955 or roughly 1 : 2.7, and with the south-eastern United States with 1,479 : 4,045 or also roughly 1 : 2.7. The statistics for the Gramineae are 78 genera and 389 species (1 : 5) on the west coast, 110 genera and 487 species (1 : 4.4) in the north-east, and 100 genera and 476 species (1 : 4.8) in the south-eastern United States. Thus it appears that the west coast of the United States is significantly poor in numbers and diversity of species of Monocotyledons. Secondly, Abrams lists 939 species of Compositae in 176 genera (1 : 5.3) as compared with the north-eastern United States with 703 species in 115 genera (1 : 6) and the south-eastern United States with 770 species in 150 genera (1 : 6). It appears that although there are more species and genera of Compositae (though there are fewer grasses) on the west coast of the United States, the generic and specific diversity is little, if any, greater there than in the east. This does not seem to support the thesis that semi-arid regions have richer floras, in terms of diversity, than more mesic areas. The relative paucity of grasses must also cast some doubt on the general validity of this thesis.

Abrams's *Flora* comprises 6,069 species of higher plants in an area of about 324,000 square miles. It is rather startling, for botanist and layman alike, to discover that a recently published *Flora* of California comprehends something more than 5,000 species in slightly less than half the area (about 158,600 square miles). A close comparison of the two works shows, however, that this does seem to be the case. For example, in the first 420 pages of the fourth volume of Abrams's *Flora* there are only about 100 naturally occurring species (out of 770) which do not occur in some part of California. This fact suggests that the primary job of cataloguing the flora is virtually completed, for the west coast as it is for the north east, and the taxonomist may now turn his attention to some of the other fundamental questions which Abrams's inventory has exposed (one cannot help wondering how long it will be before the flora of the other two-thirds of the United States is equally well catalogued).

The completion of Abrams's *Flora*, then, enables us to formulate some of the fundamental problems presented by the flora of the west coast of the United States. Why are the Monocotyledons so poorly developed in the area? What, precisely, is the real taxonomic status of the many 'endemic' species that occur in the area? How are they to be compared with other, generally accepted, species in the area and outside it? What, indeed, is a species? How are we to recognize one when we see it and how are we to measure it? Why have we been led to regard the west coast flora as an exceptionally rich one, when, on the testimony of its published Floras, it is no richer than many other comparable floras in its same latitude, both in North America and elsewhere? These, and many more, questions will present themselves to the thoughtful student of the flora of western America. He will be grateful that he has so reliable a guide as Abrams's *Illustrated Flora of the Pacific States*.

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HYPOGEAN FAUNAS

Biologie des Eaux Souterraines, Littorales et Continentales

Par Claude Delamare Deboutteville. (*Actualités Scientifiques et Industrielles*, No. 1280.) Pp. 740. (Paris : Hermann, 1960.) 60 NF.

ORGANISMS which are to be found in the cracks and fissures of rock or within the voids of sands and gravels form the subject of this important new book. Delamare Deboutteville's *Biologie des Eaux Souterraines, Littorales et Continentales* brings together for the first time in a comprehensive and readable account the work carried out in the past thirty years by European and American zoologists on these little-known but widespread and important faunas.

He treats this niche as similar in character, whether it occurs beneath the ground, beneath the sea, or beneath the intertidal zone. Moreover, this environment is continuous between sea and land, so that organisms have been able to spread along it in the course of evolution. This view is shared by a number of other workers such as Angelier, Chappuis and Spooner, the last having coined the collective term 'hypogean', which may usefully be applied to all such faunas.

The book is divided into six parts. The first concerns the environment. After a useful survey of collecting methods it gives a well-illustrated account of the physical geography and hydrology of the habitat, together with a summary of what little is known of its physical and ethological conditions. Finally there are examples of the localization of the fauna on certain beaches.

The second and third section of the book are the most valuable for the general reader, and indeed should be read by all students of marine zoology. They include a fascinating account of the adaptations of hypogean forms, followed by descriptions of the wide range of animal life, with representatives of most of the invertebrate phyla, which are to be found in the interstices of sand and gravel. Some of the figures which illustrate only parts of such animals might, with advantage, have been replaced by figures of complete animals, but otherwise the survey is excellent.

The fourth and fifth sections are in monograph form, reprinted from *Vie et Milieu*. Though of some value to the specialist, their content could with advantage have been summarized for the general reader.

In the final part there is an interesting account of the segregation and speciation of faunas, showing how continental forms have been derived from marine species by passing along the continuous subterranean habitat.

Deboutteville does not pretend to include a complete bibliography, and even some text references are not cited; nevertheless, it will form a valuable starting point for new workers and research students.

This important and, for the most part, attractive work should help to bring to the notice of zoologists, especially in Britain where the subject has been neglected, the existence of a fascinating and important group of organisms which have as yet been studied only from the faunistic point of view. Their physiology, ethology and bionomics are virtually unknown.

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