

## THE OCEAN-STRIDER *HALOBATES* (HETEROPTERA: GERRIDAE)\*

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### ABSTRACT

The genus *Halobates*, first described by Eschscholtz (1822) was monographed by Herring (1961), with notes on biology and known distribution of the 38 known species and a key for their separation. More recently Savilov (1967) provided additional information on the distribution of the Pacific species. Our knowledge on the biology and ecology of these unique oceanic insects is very scanty.

Ten species of *Halobates* have been recorded from the Indian Ocean and the adjacent seas. These include 2 oceanic species, *H. micans* and *H. germanus*, which only occur in the open ocean many miles away from land, and 8 species confined to coastal waters. *H. micans*, a circumtropical species, is widely distributed between the latitudes of 30°N to 30°S in the Atlantic between the latitudes of 10°N to 10°S in the Pacific; and between 20°N to 20°S in the Indian Ocean. *H. germanus* is also widely distributed in the three oceans; in the Indian Ocean it often occurs together with *H. micans* in areas north of latitude 25°S. Most of the coastal species (*H. alluadi*, *H. formidabilis*, *H. flaviventris*, *H. galatea*, *H. hayanus*, *H. poseidon*, *H. proavus*, and *H. tethys*) are rather restricted in their distribution in the Indian Ocean area, but *H. flaviventris* is found from the Bay of Bengal to the coast of Tanzania.

Relatively few of the zooplankton samples collected during the International Indian Ocean Expedition contain *Halobates*, since the sampling methods used were not originally designed to collect samples from the sea surface. However, these samples have provided some additional information on the biology and distribution of the two Indian Ocean striders *Halobates germanus* was collected at 26 stations between latitudes 20°N and 23°S and between longitudes 38°E and 97°E. From the samples analysed there appears to be no definite breeding season. Nymphs were collected in most months (except June - September and December). Females collected in any month were found to have their abdomens packed with well developed eggs. *Halobates micans* was collected only from 15 stations between latitudes 19°N and 10°S and between longitudes 61°E and 93°E.

Our knowledge of the limits of distribution of oceanic *Halobates* is still very incomplete. From available data they seem to be largely determined by the climatic conditions of the water, and there is no doubt that wind as well as water current play an important role in their distribution. An understanding of the relative importance of these two dispersive factors may help us to understand the distributions not only of *Halobates* but also of other pleuston organisms.

### INTRODUCTION

THE only known truly oceanic insects belong to the genus *Halobates*. The first species were described by Eschscholtz in 1822. Since then several other species have been added, but it was not until 1883 that a monograph on the genus was produced (White, 1883). *Halobates* species are fairly common in the oceans,

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and are widely known by voyagers. Many of the early descriptions and observations on these insects were made by members of ocean expeditions such as those of the "Challenger" and the "Dana". Since these observers were mostly general naturalists and not entomologists, the literature on the genus contains many misidentifications and other taxonomic errors. The first good comprehensive account on the genus was published by Herring (1961), who attempted to bring together all the existing literature on *Halobates* and to describe correctly hitherto undescribed or misidentified species. He also provided information on the distribution of the better known species and some notes on biology. More recently Savilov (1967) made a study of the Pacific Ocean species and discussed the distribution of seven species, dealing with the two commonest, *H. sericeus* and *H. micans*, in some detail. Most of his data were based on collections made on the Russian research vessel "Vityaz".

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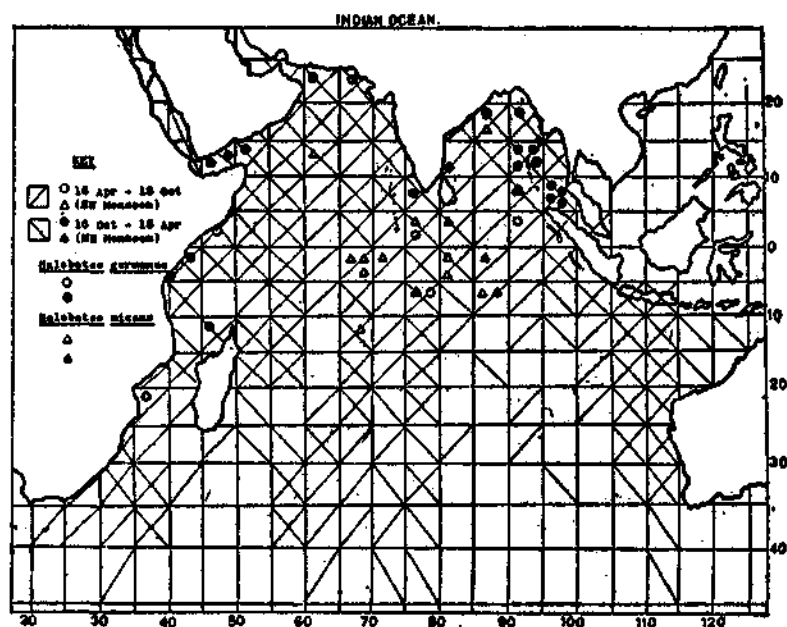


Fig. 1

During the International Indian Ocean Expedition, specimens of *Halobates* have been collected from 42 stations on 17 cruises between 1962 and 1965. Of these, only 12 samples contain more than 1 specimen. This is probably due to the fact that the sampling method employed was not particularly suited to catch such surface organisms. 12 of the 42 samples consist only of nymphs, hence positive specific identification of these specimens was difficult. The samples comprise

adults of only two species, *Halobates germanus* (26 stations) and *H. micans* (16 stations). A list of the specimens with their station numbers is given in Table 1, and the distribution of the two species, based on data collected during the HIOE, is given in Fig. 1.

TABLE 1

Species	Station Number	Number of Specimens and Sex or Instar
<i>Halobates germanus</i>	Identification	
	AB A2	2 m, 4 f
	A5	2 f, 12 n
	16	1 m, 1 f
	17	1 f
	20	3 m
	21	1 n
	27	1 m, 1 n
	28	1 m
	29	3 n
	32	1 m
	43	1 f
	185	1 f
	368	1 f
	414	2 f
	420	1 n
Ar	Do 25	1 f
	Ki 304	2 f
	562	1 f
	677	1 m
	687	1 n
	Me 49	4 m, 2 f
	161	1 n
	Um 1-4	1 f
	Va 1782	1 n
	Vi 5221	1 f
	5261	1 n
	AB 97	1 f
	116	1 m
Ar	Lu 62	1 n
	92	2 m
	Di 5348	1 m
	5355	1 n
	5363	1 f
	5387	1 f
	Di 5470	4 m, 6 f
	Pi 6	1 f
	18	2 n
	28	1 n
	29	1 m
	31	1 m
	14	1 n
	Um 1-12	1 m

\*m - male; f - female; n - nymph.

SPECIES OF *HALOBATES* FROM INDIAN OCEAN

*Halobates germanus* and *H. micans*, which belong to the open-ocean group of the genus, have both been recorded previously from the Indian Ocean (Herring, 1961). In addition, 8 other coastal species have been reported: *H. alluadi*, *H. formidabilis*, *H. flaviventris*, *H. galatea*, *H. hayanus*, *H. poseidon*, (*H. proavus* and *H. tethys*). Most of these coastal species are somewhat restricted in their distribution, but *H. flaviventris* has been found from the Bay of Bengal to the coast of Tanzania.

*Halobates germanus* is the smaller of the two oceanic species. It occurs in the Indian Ocean and adjacent seas throughout the Indo-Malayan region, and extends into the Pacific Ocean as far east as the Society Islands. It can be seen from Fig. 1 that most of the samples were collected from near-shore stations, and the majority (77%) were collected during the Northeast Monsoon. Only three samples came from locations some distance from land, and all of these were collected during the Southwest Monsoon. The area from which *H. germanus* was obtained during IIOE lies between latitudes 20°N and 23°S, and between longitudes 38°E and 97°E. Whether these limits represent the full range of this species in the Indian Ocean is uncertain as we have only a few data.

*Halobates micans* is the most widely distributed of all *Halobates* species known. It is the only species found in the Atlantic Ocean, where it occupies the area between 40°N and 40°S. In the Pacific it is much more restricted in its distribution, occupying the zone roughly between 20°N and 20°S (Herring, 1961; Savilov, 1967). As indicated on Fig. 1, this species occurs mainly in the open ocean far from land. It is rather curious that only two of the samples were taken during the Northeast Monsoon, all the others having been collected during the Southwest Monsoon (in contrast to *H. germanus*). The area from which this species was collected during the IIOE lies between latitudes 19°N and 10°S and longitudes 61°E and 93°E. Here, too, we are uncertain whether this represents the full extent of the range of *H. micans* in the Indian Ocean.

Our knowledge on the distribution of the open-ocean species of *Halobates* is often limited by the paths of the various research vessels and the sampling method employed. In spite of the fact that an extensive area of Indian Ocean was surveyed by the various vessels during IIOE, as can be seen in Fig. 1 (shaded areas), the data on the distribution of *Halobates* are very poor as compared to those of other invertebrates. However, it is quite clear from Fig. 1 that no collections were obtained south of latitude 15°S, apart from one sample from the Mozambique Channel. Since even adults of *Halobates* do not possess wings and cannot fly, they must rely on physical factors for their dispersal. The main factors likely to limit their distribution are surface currents and wind. An understanding of the relative roles of these physical factors in the distribution of *Halobates* may help us to understand the distributions of other pleuston organisms.

Although they have been known for over a century, our knowledge on the biology of these marine insects is extremely poor. Most of what we know of the biology of these insects derives from observations made by earlier workers. The eggs of open-ocean *Halobates* species have been found on all sorts of floating material such as cork, seaweed, feathers, shells of *Spirula* and *Sepia*, twigs, leaves, and even pieces of coal (Lundbeck, 1914). The only recent attempt to study the biology of *Halobates* was made by Herring, who attempted unsuccessfully to rear some

of the open-ocean species. We have still no data on the length of time required for the development of the egg, how the newly hatched nymphs behave and on what they feed, etc. The adults have been observed to feed on *Porpita*, *Velella*, *Physalia*, *Salpa*, and other floating animals (Murray, 1879; Savilov, 1967). Some of the adult females from the IIOE samples were dissected and found to have their abdomens packed with well developed eggs in all months of the year (except July, the only month in which no *Halobates* were collected during the Expedition). So far we have no estimates of their generation times.

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