

Notes on Marine Water Striders of the Hawaiian Islands (Hemiptera: Gerridae)

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Marine water striders are the only insects that inhabit the open ocean. Much has been written about them in accounts of the early voyages of exploration, but modern knowledge is lacking because oceanographers tend to ignore insects and entomologists don't study marine faunas.

Studies by the junior author from January to July, 1955, at the Coconut Island Marine Laboratory of the University of Hawaii resulted in the following: 1) discovery that the open ocean species, *Halobates sericeus* Eschscholtz, feeds on a small anemone; 2) observing that the local Hawaiian species, *Halobates hawaiiensis* Usinger, feeds on any insects that fall into the water; 3) discovery of a remarkable new species of the genus *Hermatobates* on the lee side of the breakwater on the northwest corner of Coconut Island, Oahu, after a Kona storm.

Studies by the junior author at Berkeley and examination of *Halobates* collections from all of the large museums and marine laboratories of the world reveal a pattern of distribution that is unique. Only one nearly cosmopolitan species occurs in the Atlantic Ocean. In contrast to this, the Pacific abounds in species, with three or four species occurring in the open ocean thousands of miles from land and many local species living within the protecting reefs of particular island groups. Water temperatures and ocean currents seem to be the main determiners of the distribution of species. The Philippine-New Guinea area has the greatest number of species, and the genus appears to have arisen from a brackish water group known at present from Japan, Formosa, Korea, and east India.

Two questions were raised by the field work at Coconut Island, and these were the subject of further investigation by the senior author during the summer of 1956. First, it was found that *Halobates hawaiiensis* was limited to the Waikiki area of Oahu and that the individuals were consistently smaller than those collected by the Pacific Oceanic Fishery Investigations vessels off the Kona coast of Hawaii. Second, the new *Hermatobates* was found, but only under very unusual circumstances after a Kona storm at Coconut Island. The *Hermatobates* question, in particular, was a challenge, because this obscure group had been known only from the original collections in the Philippines

(*H. marchei* Coutière and Martin), the Arafura Sea (*H. baddoni* Carpenter), the Gulf of Aden (*H. djiboutensis* Coutière and Martin), and from single collections at such remote spots as the Marquesas, Japan, and Palmyra, Christmas, and Hull Islands. In Hawaii, a single specimen had been collected by Blackburn without precise locality, and a second specimen was taken by E. H. Bryan, Jr., at Gray's Raft, Waikiki, in March of 1922. In 1956, Dr. W. E. China added greatly to the taxonomic knowledge of the subfamily *Hermatobatinae*, describing the new Hawaiian species (*H. hawaiiensis*)¹ and also two additional species (*H. weddi* and *H. walkeri*) from Monte Bello Islands and the Arafura Sea (northwest of Australia). Still, only a few specimens were known and nothing had been noted on the biology of the group.

The 1956 field work started with certain clues, the most important of which was the record of the POFI collections taken "at light." Accordingly, a sealed-beam headlight was used with a six-volt storage battery. Trips were made to the breakwater where the junior author found his specimens, and also to many other places on windward and leeward Oahu. All attempts were negative for *Hermatobates*, suggesting that the bugs lived in the open ocean (and hence were blown in during the Kona storm mentioned above). While searching for *Hermatobates* in this way, it was possible to confirm the observation of the limited distribution of *Halobates hawaiiensis*. This species swarmed to the light near the Waikiki Marine Laboratory but was never seen elsewhere.

Because *Halobates hawaiiensis* had been taken along the Kona coast of Hawaii, it was decided to try there for *Hermatobates*. Using the same sealed-beam headlight, this time in a fisherman's canoe with outboard motor, the area beyond the lighthouse point at Kailua was worked, and then collecting was concentrated in toward shore at the pier across from the Kona Inn. The large form of *Halobates hawaiiensis* was common everywhere beyond the breakers to at least a mile offshore, but no *Hermatobates* were seen. Then, on returning along the breakwater at the Kailua pier, *Hermatobates* was found hopping on the surface in the midst of specimens of *Halobates*. This spot was revisited the next morning, but several hours of intensive search turned up only a single damaged specimen. From these observations it appears that: 1) *Hermatobates* is not an open ocean insect, i.e., blown in only during Kona storms; 2) it is nocturnal and positively phototropic and consequently has not been taken in the course of general daylight collecting in the past; 3) *Halobates hawaiiensis* is so restricted in its distribution that little or no gene flow occurs between the subspecifically distinct populations on Oahu and Hawaii.

¹ CHINA, W. E. 1956. A new species of the genus *Hermatobates* from the Hawaiian Islands (Hemiptera-Homoptera, Gerridae, Halobatinae). ANN. MAG. NAT. HIST. (12) 9(101):353-357.

KEY TO THE HAWAIIAN MARINE WATER STRIDERS

- 1. Middle and hind legs of approximately equal length, their claws apical; size approximately 3 mm. . . **Hermatobates hawaiiensis** China
 Middle and hind legs of unequal length, the middle ones longer and with a fringe of long hairs, their claws subapical (*Halobates*) 2
- 2. Size small, 3.5 mm.; second antennal segment about one-half as long as fourth **Halobates sericeus** Eschscholtz
 Size larger, over 4.5 mm.; second antennal segment longer than fourth **Halobates hawaiiensis** Usinger