

# Notes on the Seabug *Hermatobates hawaiiensis* China (Heteroptera: Hermatobatidae)

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## INTRODUCTION

*Hermatobates* is a genus of little known seabugs occasionally found around tropical coral reefs. This genus was earlier considered as a subfamily of the Gerridae (Matsuda, 1960) but since there are many differences between *Hermatobates* and other gerrids, it has been more recently treated as a separate family, Hermatobatidae (Anderson & Polhemus, 1976; Cheng, 1977). Nine species have been described, each known from only a handful of specimens (Cheng, 1977). *H. hawaiiensis* was described by China in 1956 from a single male and two female specimens collected from Coconut Island, Oahu, Hawaii. We know of no other records of these rare insects around Hawaii waters apart from those reported here: 45 specimens, all identified as *H. hawaiiensis*, caught in neuston samples taken in nets from the sea surface around the Hawaiian Islands in 1972 and 1973.

## MATERIALS AND METHODS

The sampling was part of a nearshore larval fish survey, carried out between May, 1971 and April, 1973, around the islands of Kauai, Oahu, and Maui, in Hawaii, under the direction of Dr. John M. Miller, then at the Hawaii Institute of Marine Biology. A number of stations around each island were chosen for the investigation. At Kaneohe Bay, samples were taken at monthly intervals between May, 1971, and June, 1972; at the other stations they were taken only twice a year, once in the winter and once in the summer. Additional samples were taken at Kahe Point, Oahu; Hanalei Bay, Kauai; and La Perouse and Molokini, Maui. Numbers varied at each station during each sampling period (Table I). The samples were collected either with a conventional one-meter plankton net (Cheng, 1975) or with a pair of push nets mounted in front of a catamaran (Miller, 1973). Both types of nets were of 505  $\mu\text{m}$  mesh with 333  $\mu\text{m}$  bags at the cod ends. Under the conditions of the present study, their sampling efficiencies are quite comparable. They were operated at about two knots for three to ten minutes. In the case of pushed nets, either single or paired samples were obtained during each operation. All samples collected were preserved in seawater-formalin, and subsequently sorted for fish eggs, fish larvae, and marine insects. The specimens of *H. hawaiiensis* discussed in this study are retained in the collection of LC at the Scripps Institution of Oceanography.

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TABLE 1: Number of samples taken at each station during each month from May, 1971, to April, 1973.

Location	1971					1972					1973									
	M	J	J	A	O	D	J	F	M	A	M	J	J	A	S	O	N	D	M	A
Oahu																				
1. Sand Island								4	3		3									
2. Waikiki							4		2		2									
3. Kahala							4		4		4									
4. Haw. Kai							4		2		2									
5. Hanauma							5		5		5									
6. Sandy Beach							4		2		2									
7. Kailua							4		2		2									
8. Mokapu							2		2											
9. Kaneohe Bay	24	31	33	36	32	30	30	34	32	34	33	36	1			48	30			
10. Waimea											2	2								
11. Haleiwa							4		4		5									
12. Kaiaka							2		2		2									
13. Mokuleia								2	2		2									
14. Pokai								2	2		4									
15. Kahe Pt.								4	6		4	1								50
16. Barber's Pt.								4	2		4									
Kauai																				
1. Anahola							4					5								
2. Kalihiwai							4					4								
3. Hanalei							7				4		32							
4. Kalalau							2				2									
5. Barking Sands							2				2									
6. Waimea							4				6									
7. Hanapepe							4				4									
8. Poipu							2				2									
9. Nawiliwili							6				7									
Maui																				
1. Kahului								8			8									
2. Honolua								4			4									
3. Kekaa								2			2									
4. Lahaina								4			4									
5. Hekili								2			2									
6. Maalaea								10			4									
7. Ahihi								2			2									8
8. La Perouse								4			4									7
9. Molokini I.								4			8		22							18 15

## RESULTS

Specimens of *H. hawaiiensis* were found in only 23 out of a total of 902 samples sorted. Although sampling was carried out at 34 stations, only two stations produced positive results: Kahe Point on the Island of Oahu (21°01'N, 158°07'W), and Hanalei Bay on Kauai (22°10'N, 159°30'W). Although about equal numbers of day and night samples were collected, all but three of those containing *H. hawaiiensis* were taken at night. The location, date and time of sampling, and the total numbers of insects caught, are given in Table 2.

TABLE 2: Station location, type of net, date, sampling time, and numbers of *Hermatobates* caught per station.

Location and Type of net	Date	Sampling Time	Total Number of Specimens	Number Adults	Number Nymphs
Kahe Point (meter net)	5 July '72	?		11 female	
Kahe Point (push net)	14 April '73	2128-2131	1	-	1
		2135-2140	2	-	2
		2135-2140	1	-	1
		2149-2152	3	2 females	1
		2152-2157	1	1 female	-
		2152-2157	4	2 females	2
		2200-2205	2	1 female	1
		2205-2208	1	-	1
		2208-2215	1	1 male	-
		2226-2231	2	-	2
		2226-2231	3	1 male	2
		2231-2235	8	2 males	6
		2231-2235	3	1 male	2
2250-2300	1	1 female	-		
2300-2309	1	-	1		
Hanalei Bay (meter net)	5 June '72	1328-1338	1	1 female	-
		1339-1350	1	-	1
Hanalei Bay (push net)	28 August '72	2217-2220	3	1 female	2
		2220-2223	1	-	1
		2223-2226	1	1 female	-
		2226-2229	2	2 females	-
		1043-1053	1	1 female	-

The 45 *Hermatobates* specimens collected were all identified as *H. hawaiiensis* China. As can be seen from Table 2, over 50% of the positive samples contained only one specimen. About equal numbers of nymphs and adults were caught. All the nymphs belonged to the penultimate or ultimate stages; no younger nymphs were caught. Over 90% of the positive samples from each station were taken on a single day, being found in more-or-less successive samples. Our sampling result probably reflects special aspects of the ecology and behavior of these seabugs (see discussion).

Since this is the first large series of *H. hawaiiensis* specimens now available for study, we obtained data on their body dimensions and other morphological characteristics. The adults are easily distinguished from the nymphs by their larger size, sexually differentiated abdomens (see Figures 1 and 2 in Cheng, 1977) and three-segmented tarsi. In all nymphal instars the tarsi have only a single segment.

The ranges of lengths of the body and of the mid-femur (relatively constant) are given below in mm. The numbers of specimens in each stage are indicated in parentheses.

Adult males (7): 2.40-2.60; 1.04-1.10

Adult females (12): 2.70-2.90; 1.04-1.10

Ultimate nymphs, male (3): 2.00-2.15; 0.85-0.89

Ultimate nymphs, female (8): 2.20-2.30; 0.78-0.89

Penultimate nymphs (15): 1.70-1.85; 0.63-0.70

Although males of several species of *Hermatobates* have highly modified front femora (cf. Herring, 1965), those of *H. hawaiiensis* do not bear prominent tubercles. However, there is a row of about 10 spines or teeth on each of the front and mid femora. These spines are longer and more conspicuous in the adult males than in the females and nymphs.

#### DISCUSSION

The type specimens of *H. hawaiiensis* were collected by Herring in February, 1955, at Coconut Island, Kaneohe Bay, after a Kona storm. Their natural habitat was unknown, and attempts to find additional specimens were mostly unsuccessful. Since Herring saw them at night, it was suggested that they are probably nocturnal (Usinger and Herring, 1957). In fact, over 90% of our specimens were collected at night. Cheng (1977), who has observed *Hermatobates* on shores of several tropical islands, confirmed the suggestion of Esaki (1947) that the natural habitats of these marine insects are among coral reefs and marine littoral rubble. They generally hide in crevices and remain submerged at high tide, but they come out to feed at low tide during the day as well as at night. However, if they are unable to locate and crawl into suitable crevices before the habitat becomes completely covered, they can remain alive at the water surface at least until the next low tide. The specimens caught in our neuston tows were probably such strays. Since younger nymphs (of other *Hermatobates* spp.) were seldom observed hunting for food far from their substrates, it seems that they would be less likely to go adrift on incoming tides (Cheng, 1977). For this reason, perhaps, we did not catch any young nymphs in our tows.

Since these seabugs had hitherto been considered among the rarest of insects, it was surprising to find 34 specimens caught in a single night at Kahe Point (14 April, 1973) in our tows. (This is more than the entire collection of *Hermatobates* specimens in the World's museums!) As many as eight were caught in a single four-minute tow. The sea had been rather stormy prior to 14 April when we caught the most specimens in our tows.

Although more than half of our tows were taken in Kaneohe Bay, where the type specimens of *H. hawaiiensis* were found, not a single seabug was caught in any of the tows we made there, perhaps because Kaneohe Bay is normally a calm and protected inlet. We made several subsequent attempts to catch *Hermatobates* both at night and during the day at Coconut Island and on one occasion at Hanalei Bay, but all were unsuccessful. Thus we are still uncertain about the natural habitats of *H. hawaiiensis* around Hawaiian shores. However, it seems possible that they are rather common intertidal insects which have been overlooked up until now because of their unusual habitat and habits.

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