SOME ASPECTS OF THE BIOLOGY OF *RHOPALOPHTHALMUS TATTERSALLAE* PILLAI, 1961 (CRUSTACEA, MYSIDACEA) AND EXTENSION OF RANGE INTO THE KHOR AL SABIYA, KUWAIT (ARABIAN GULF)

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Abstract.—*Rhopalophthalmus tattersallae* Pillai was collected from the Khor al Sabiya, Kuwait, extending its known range from the Indian Ocean to the northern Arabian Gulf. Population density was greatest in early fall when juveniles predominated and was lowest in mid-winter. Spawning activity was greatest in April, May, July, and August, and lowest in mid-winter. Brood size was correlated with body size; largest females and broods occurred January through May and smallest females and broods occurred July through November. Sex ratio was close to 1:1 on most dates. A small number of *R. tattersallae* were parasitized by an unidentified dajid isopod.

Rhopalopthalmus tattersallae was described by Pillai (1961; cited in Pillai 1965) from specimens collected in coastal waters off Kerala State, India. To my knowledge, there have been no subsequent records of its occurrence. Fifteen species of *Rhopalophthalmus* have been described (Mauchline 1980) and all are inhabitants of neritic or estuarine waters (Tattersall 1957; Hodge 1963; Pillai 1965, 1973; Mauchline & Murano 1977; Wooldridge & Erasmus 1980). This paper presents some basic life history information for *R. tattersallae* and records its range extension into the northern Arabian Gulf.

Methods.—Daytime zooplankton collections were taken at stations in Kuwait Bay and the Khor al Sabiya (Fig. 1) from September 1981 through September 1982. Duplicate step-oblique tows were made with a 0.5 m diameter plankton net outfitted with 0.202 mm and 0.505 mm mesh. The sampling schedule is summarized in Table 1. Sample volumes were measured with a digital flow meter. Additional samples were collected at Station 614 on 27 May and 21 September 1982 specifically for mysids. A 0.505 mm mesh net was towed near-bottom (horizontally); sample volumes were not recorded.

All mysids were sorted from each sample, identified to life stage, and carapace length (CL) measured (tip of the rostrum to the posterior border of the carapace).

Brood sizes (number of larvae) were determined only for those females whose marsupia appeared undisturbed. The presence of an unidentified ectoparasitic isopod (Dajidae) was recorded.

Monthly population density in the Khor al Sabiya (Stations 614 & 615) was based upon the September and October 1981 0.202 mm collections and the November through August 0.505 mm mesh collections. To facilitate interpretation of seasonal changes in population structure and breeding, samples were pooled for each date at the Khor al Sabiya stations. Assumptions were made, then, that the populations at the two stations in the Khor were structurally similar and that the 0.202 and 0.505 mm mesh nets were similarly efficient in sampling all life stages of this species.

In studies of mysid populations in which

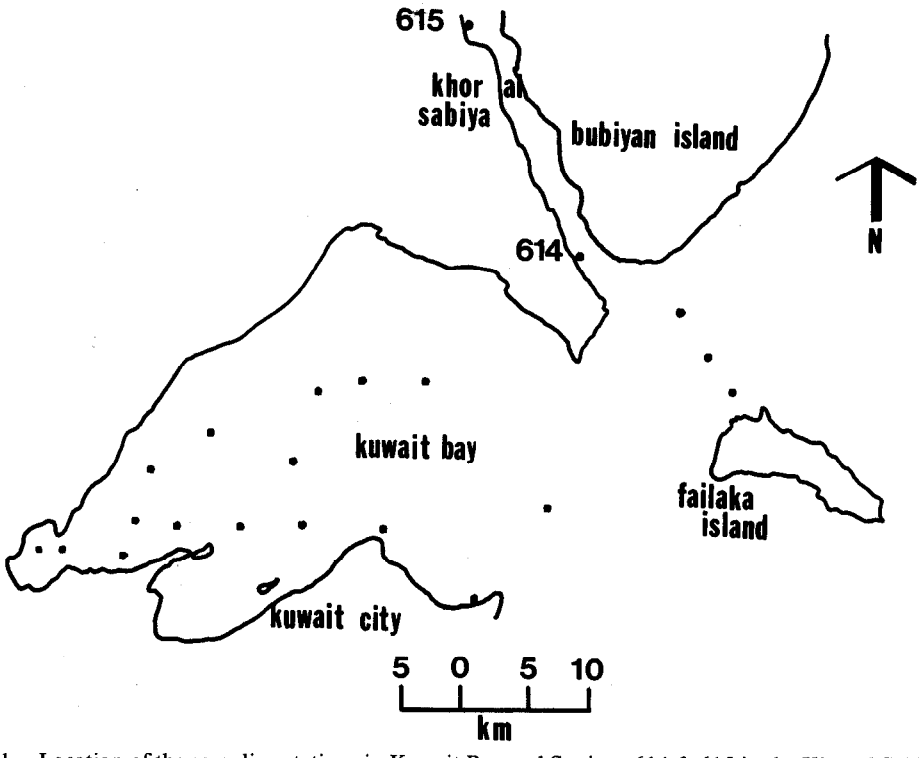


Fig. 1. Location of the sampling stations in Kuwait Bay and Stations 614 & 615 in the Khor al Sabiya used to survey the *Rhopalophthalmus tattersallae* population during 1981–1982.

longitudinal differences in population structure have been observed, there have either been marked differences in habitat (e.g., depth) within the water body (Mauchline 1970) or there was evidence for recruitment, transport and maturation of a coastally spawned population (Hulburt 1957). Since the Khor al Sabiya stations were of similar depth, temperature, salinity and dissolved oxygen (Dames & Moore 1983) and since there was no evidence of recruitment from Kuwait Bay (see below), the first assumption seems tenable.

The second assumption, that of comparable sampling abilities of the two gears, is more questionable. Sampling rates of the two gears were generally similar in the Khor al Sabiya (12.6 vs. 12.7 m^3/minute for the 0.202 and 0.505 mesh, respectively; Dames & Moore 1983). A limited comparison of sampling efficiencies for Penaeidae mysis and postlarval stages found that abundance estimates of the two gears were comparable: 0.202 mm abundance = $-1.38 + 1.1$ (0.505 mm abundance); $r_{10} = 0.986$; $P < 0.01$ (Dames & Moore, unpublished data).

ANOVA (Sokal and Rohlf 1981) was used to test for differences in mean CL of mature females by sampling date, and regression analysis was used to evaluate the relationship between brood size and CL.

Results and discussion.—The Khor al Sabiya is a river-like channel separating the Sabiya peninsula on the northeastern shore of Kuwait Bay from Kuwait's Bubiyan Island (Fig. 1). Maximum depth is about 18 m but study areas averaged <10 m. Bottom sediments at Station 614 were generally rock-mud and shell debris and at Station 615, muddy sand and shell debris. Extremes in water temperature occurred during February (12.1°C surface, 11.8°C bottom) and

Table 1.—Sampling schedule for *Rhopalophthalmus tattersallae* in the Khor al Sabiya, Kuwait, September 1981 to September 1982.

Date	Mesh size 0.202 mm	Mesh size 0.505 mm	Date	Mesh size 0.202 mm	Mesh size 0.505 mm
17 Sep 81	X		26 Apr	X[a]	
27 Sep	X		12 May	X	X
14 Oct	X		18 May	X[a]	
28 Oct	X		27 May		X[b]
10 Nov		X	7 Jun	X	X
17 Nov		X	5 Jul	X[a]	
16 Dec		X	27 Jul	X	X
11 Jan 82		X	9 Aug	X[a]	
20 Feb		X	18 Aug	X	X
3 Mar	X	X	29 Aug	X[a]	
11 Apr	X	X	21 Sep		X[b]

[a] Station 614 only.
[b] Non-quantitative, near-bottom samples.

June (29.9°, 27.9°). Extremes in salinity occurred during April (32.6‰, 32.7‰) and June (40.4, 40.5‰) (Dames & Moore 1983).

Rhopalophthalmus tattersallae was collected throughout the year in the Khor al Sabiya but occurred in only 26% of the samples from Kuwait Bay. Highest densities occurred during autumn. Thereafter density declined through February before it increased again from April through August (Fig. 2). Concentrations of mysids were higher at Station 614 near the mouth of the Khor al Sabiya than at Station 615.

The relationship between Cl and TL was significant and highly correlated ($r_{63} = 0.99$). The regression equation is: $TL_{mm} = 3.88\ CL_{mm} - 0.41$.

Spawning activity was probably greatest during April, May, July and August when large (≥2.5 mm CL) sexually mature mysids and 0.7–0.8 mm CL juveniles composed respectively from 33 to 72% and from 3 to 13% of the population. Recruitment of juveniles from April through October (they composed from 32 to 82% of the population at this time) coincided with the peak in population density (Fig. 2). The presence of small, but sexually identifiable, mysids indicated that the summer-fall generation ma-

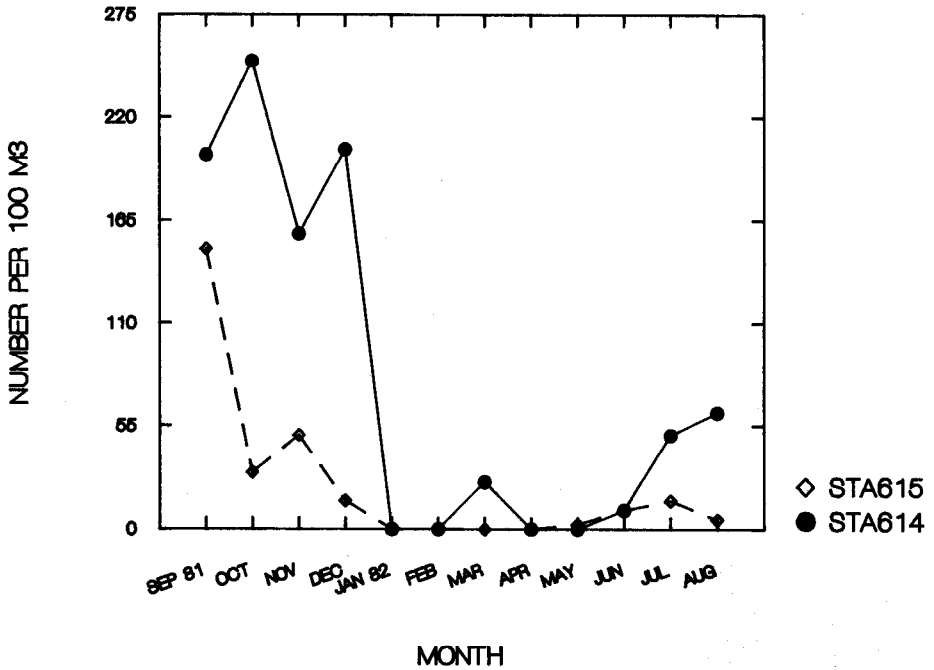


Fig. 2. Abundance (numbers/100 m³) of *Rhopalophthalmus tattersallae* in the Khor al Sabiya, Kuwait, September 1981–August 1982.

Table 2.—Percent of larvigerous *Rhopalophthalmus tattersalae* in the Khor al Sabiya, Kuwait, September 1981 to September 1982. Numbers in parentheses are numbers of specimens collected.[a]

Date	% Larvigerous	Date	% Larvigerous
17 Sep 81	25.0 (64)	12 May	80.0 (10)
27 Sep	0.0 (9)	18 May	100.0 (15)
14 Oct	16.7 (18)	27 May	14.3 (7)
28 Oct	6.3 (16)	7 Jun	50.0 (2)
10 Nov	3.6 (28)	5 Jul	0.0 (20)
17 Nov	2.4 (84)	27 Jul	75.0 (72)
16 Dec	0.7 (148)	9 Aug	66.7 (3)
11 Jan 82	7.7 (39)	18 Aug	64.0 (25)
3 Mar	33.3 (15)	21 Sep	25.0 (52)
11 Apr	66.7 (3)		

[a] Females were not collected on 20 Feb, 26 Apr and 29 Aug.

tured from September through November. These composed from 9 to 24% of the population. A relatively sparse overwintering population was characterized by large (≥2.5 mm CL) mature mysids and few juveniles. Brooding females were collected on 19 of the 22 sampling dates (Table 2) and brooding activity appeared to be greatest during May and from late July through August. The lowest incidence of brooding females occurred between mid-fall and mid-spring.

Brooding females ranged in size from 1.8 to 3.3 mm CL (Fig. 3) and ANOVA showed that there were significant differences between dates for mean CL of mature females ($F_{17,279} = 17.0$; $P < 0.001$). Brood size ranged from 2 to 23 larvae (Fig. 4) and the equation, Number of Larvae = $9.3\,CL_{mm} - 13.7$, was significant ($F_{1,121} = 64.0$; $P < 0.001$).

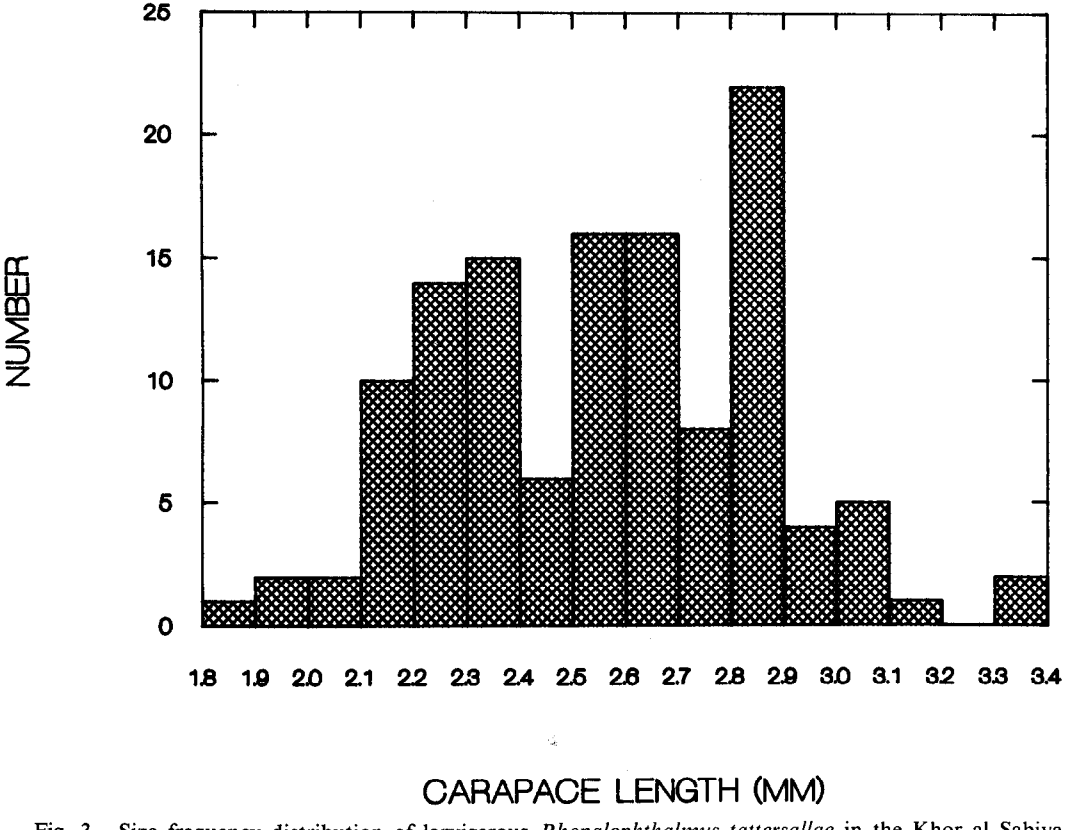


Fig. 3. Size frequency distribution of larvigerous *Rhopalophthalmus tattersallae* in the Khor al Sabiya, Kuwait, September 1981–1982.

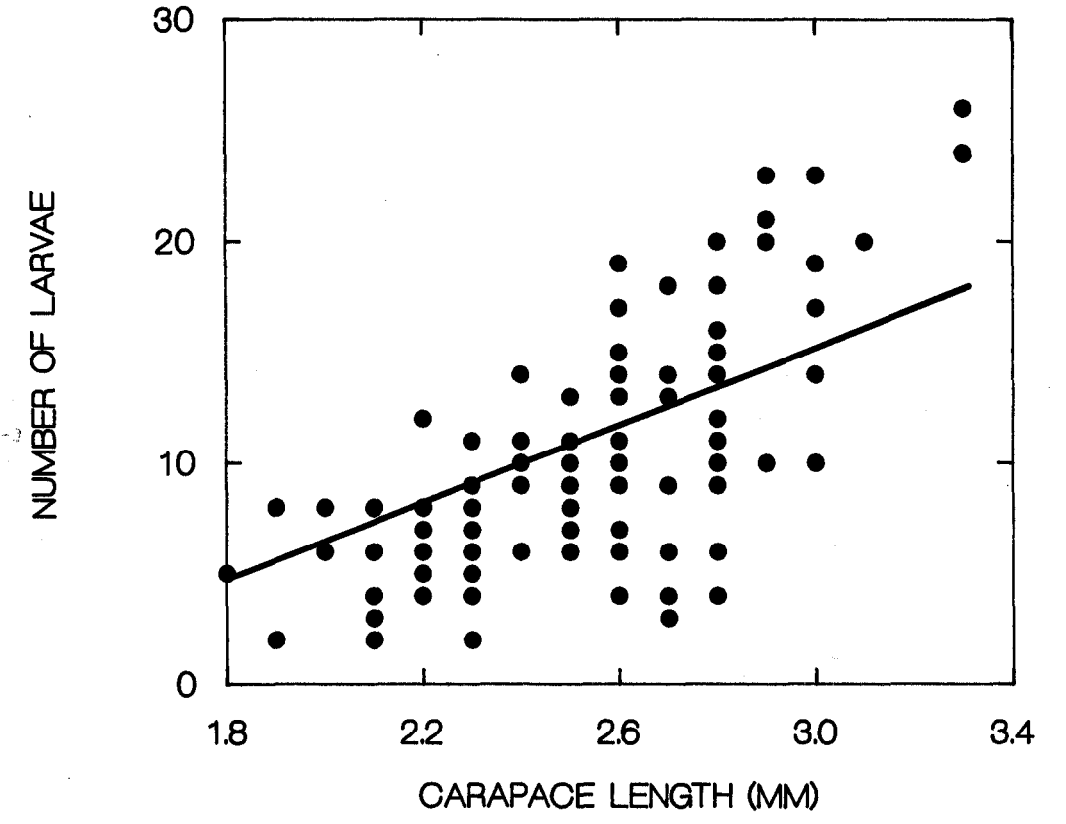
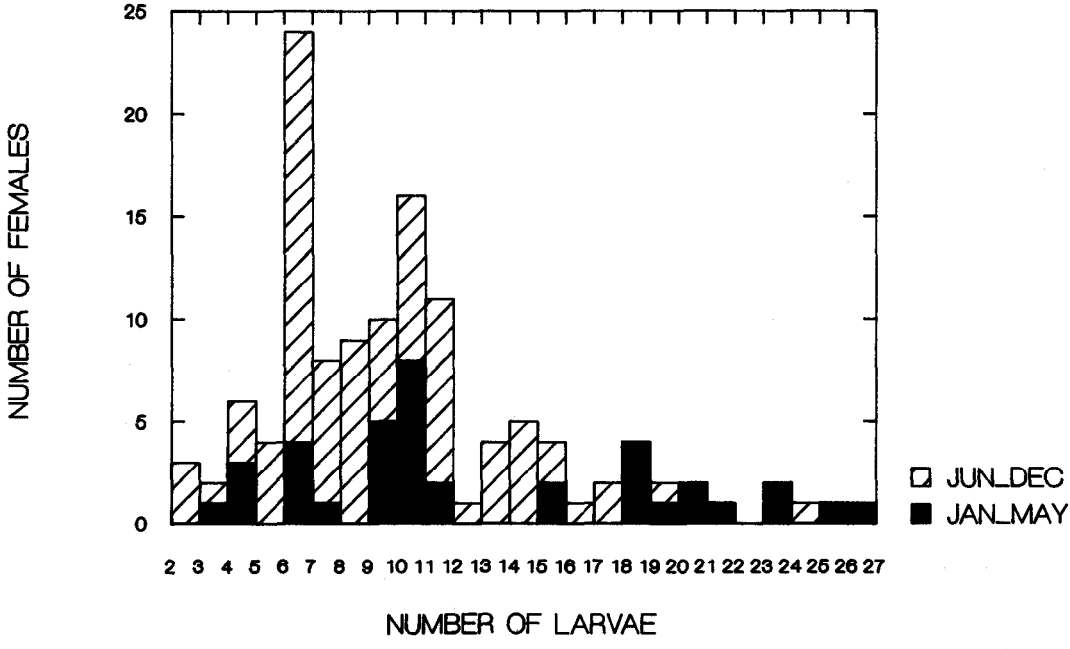


Fig. 4. Relationship between number of larvae and carapace length for *Rhopalophthalmus tattersallae* in the Khor al Sabiya, Kuwait, September 1981–1982.



Brood sizes were generally <10 larvae/female with only 6.6% carrying 20 or more larvae. Larger females and broods occurred from January through May and the smaller females and broods from July through September (Fig. 5). This is consistent with observations of other species of subtropical mysids which produce several generations per year (Mauchline 1980).

Male : female sex ratios were near 1:1 on most dates, but sample sizes were often small. Greatest departures from 1:1 were on 11 January (0.5:1), 27 July (0.3:1) and 18 August (2:1).

An unidentified dajid isopod was attached to the first pleonite of the 13 mysids collected. Parasitized mysids ranged in size from 1.0 to 2.2 mm CL. None of the other seven genera of mysids identified from Kuwait Bay and the Khor al Sabiya during this study (*Afromysis*?, *Dioptromysis/Kainomatomysis*?, *Erythrops* spp., *Mysidopsis, Proneomysis* and *Siriella*) were found parasitized. Most of these other taxa were quite rare with *Proneomysis* and *Siriella* the only other genera that were locally abundant.

Acknowledgments

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Literature Cited

Dames, & Moore. 1983. Aquatic Biology Investigations for Sabiya Area, Kuwait Bay and Development of Electrical Networks. Prepared for: Government of Kuwait Ministry of Electricity and Water.

Hodge, D. 1963. The distribution and ecology of the mysids in the Brisbane River.—University of Queensland Paper, Department of Zoology II: 90–104.

Hulburt, E. M. 1957. The distribution of *Neomysis americana* in the estuary of the Delaware River.—Limnology and Oceanography 2:1–11.

Mauchline, J. 1970. The biology of *Schistomysis ornata* [Crustacea, Mysidacea].—Journal of the Marine Biological Association U.K. 50:169–175.

———. 1980. The Biology of Mysids and Euphausiids.—Advances in Marine Biology, J. H. S. Blaxter, F. S. Russell and M. Yonge, eds., 18: 1–677. Academic Press. London.

———, & M. Murano. 1977. World list of the Mysidacea, Crustacea.—Journal of Tokyo University of Fisheries 64:39–88.

Pillai, N. K. 1961. Additions to the Mysidacea of Kerala.—Bulletin of the Research Institute, University of Travancore 8:15–35.

———. 1965. A review of the work on the shallow-water Mysidacea of the Indian waters.—Proceedings of the Symposium on Crustacea Held at Ernaklam from January 12 to 15, 1955, 5:1681–1728. Marine Biological Association of India, Mandapam Camp.

———. 1973. Mysidacea of the Indian Ocean.—Handbook to the International Zooplankton Collections 4:1–125. Indian Ocean Biological Centre. Kerala State, India.

Sokal, R. R., & R. J. Rohlf. 1981. Biometry. San Francisco, W. H. Freeman.

Tattersall, O. S. 1957. Report on a small collection of Mysidacea from the Sierra Leone estuary together with a survey of the genus *Rhopalophthalmus* Illig and a description of a new species of *Tenagomysis* from Lagos, Nigeria.—Proceedings of the Zoological Society of London 129: 81–128.

Wooldridge, T., & T. Erasmus. 1980. Utilization of tidal currents by estuarine zooplankton.—Estuarine, Coastal and Marine Science 11:107–114.

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Fig. 5. Distribution of *Rhopalophthalmus tattersallae* brood sizes by season in the Khor al Sabiya, Kuwait, September 1981–1982.