

DISTRIBUTION AND ABUNDANCE OF CIRRIPEDE LARVAE (CIRRIPIEDIA: THORACICA) IN THE NORTHERN ARABIAN SEA

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ABSTRACT: Cirripede larvae obtained in the zooplankton samples of the 'North Arabian Sea Ecological and Environmental Research' (NASEER) cruise I (January, 1992) have been studied for their distribution and abundance. They were collected in the northern Arabian Sea waters (22°51'N to 24°58'N, 60°05'E to 65°59'E). Thirty two samples were taken at 18 stations. The maximum number of larvae were collected from a station near Indus cone (Sta.8), whereas an off shore station (Sta. 37) and one near the Makran coast (Sta.60) had poor representation. Regular coastal collections from Manora Channel (24°48'N, 66°59'E), during the study period of one year (1994), have been also included to supplement the NASEER samples. Only one naupliar stage (VI) and a cyprid stage were identified. Relative abundance in day and night samples were also studied.

KEY WORDS: Distribution and abundance, cirripede larvae, northern Arabian Sea.

INTRODUCTION

Cirripedes are exclusively marine; approximately two-thirds of the nearly 900 described species are sessile, attaching to rocks, shells and corals (Barnes, 1987). However, they all have free swimming larval stages. The youngest is a nauplius which can be easily recognized by the triangularly shield-shaped carapace. Six naupliar stages are succeeded by a single nonfeeding cyprid stage. The cyprid larva is the settling stage, achieved in a single moult and subsequently transformed into the juvenile barnacle (Anderson, 1994).

The present study is based on the distribution and abundance of cirripede larvae in the northern Arabian Sea (Fig.1). Identification of the larval stages were made from their morphological characters, following Stubbings (1940) and Anderson (1994). Stage determination was based on the setation of the antennule, especially the preaxial setae. Miller and Roughgarden (1994) have recognized six stages. The stages are defined as follows:

"Stage I, no preaxial setae, all simple setae, no trunk spines.

Stage II, no preaxial setae, one pair of trunk spines.

Stage III, one preaxial seta, one pair of trunk spines.

Stage IV, two preaxial setae, four post axial setae, 3-5 pairs of trunk spines.

Stage V, three preaxial setae, five postaxial setae, 3-5 pairs of trunk spines (two abdominal and 1-3 thoracic).

Stage VI, three preaxial setae, six postaxial setae, 8 pairs of trunk spines (two abdominal and six thoracic)".

In the present study naupliar stage VI and a cyprid stage have been observed. These stage VI nauplii are referable to *Lepas* spp. and *Balanus* spp. In one specimen from Sta.

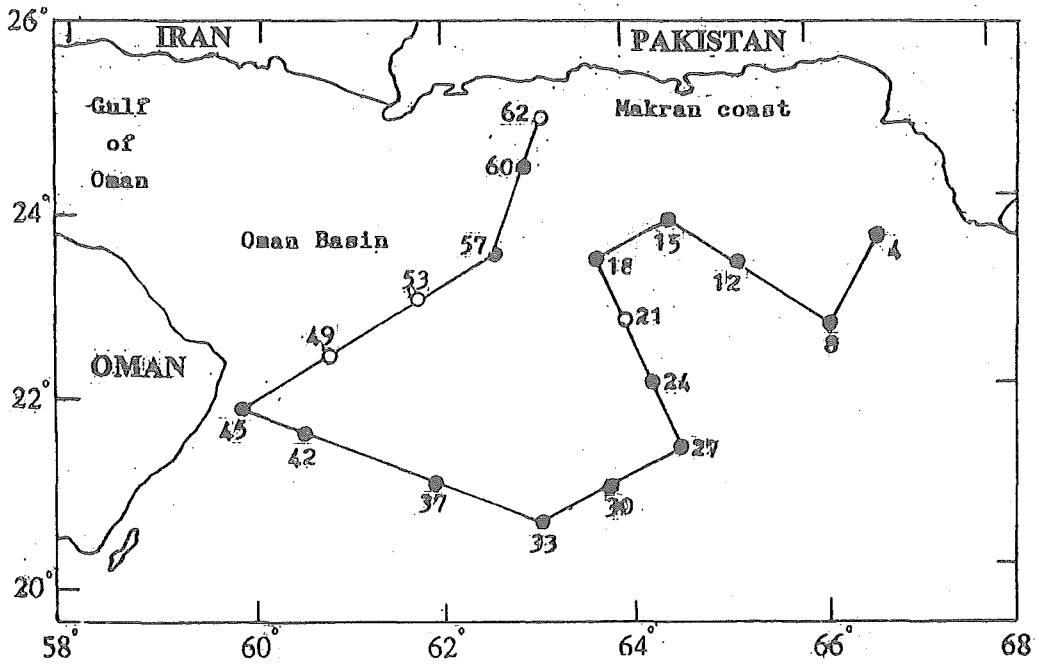


Fig.1. Map of the area where NASEER samples were taken. Circles denote station location, solid circles show the presence of larvae.

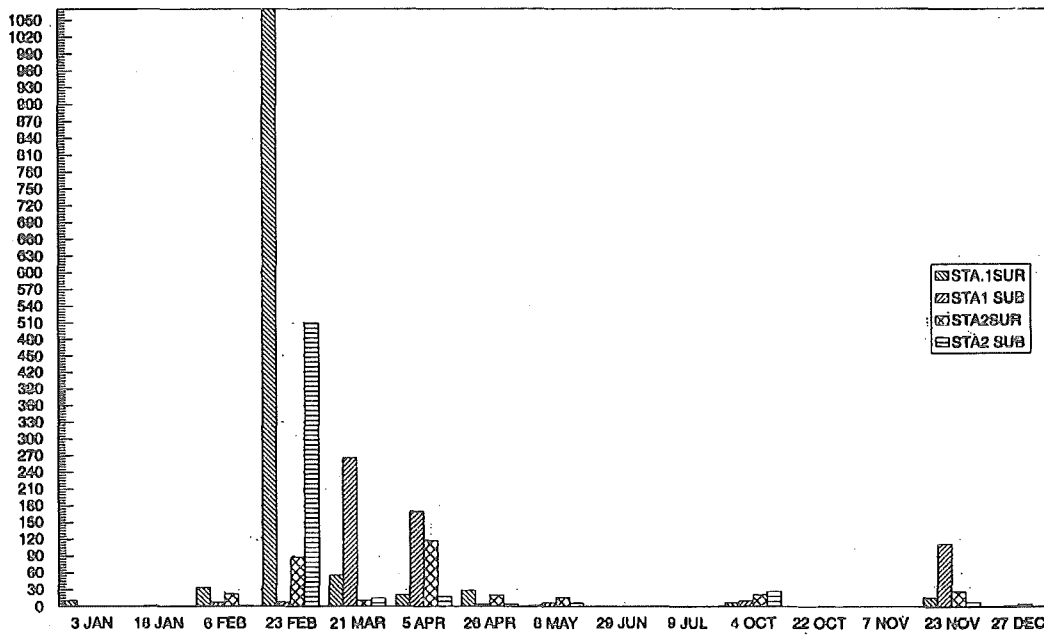


Fig.2. Seasonal abundance of cirripede larvae in coastal collections.

12 the preaxial setae are present whereas the trunk spines are absent, it is therefore described but not assigned any stage.

MATERIAL AND METHOD

The National Institute of Oceanography (NIO) is undertaking research in the northern Arabian Sea waters, under the North Arabian Sea Ecological and Environmental Research (NASEER). Cruise I, covered the entire area from 22°45'N to 24°58'N and 60°05'E to 65°59'E. A total of 32 samples were taken at 18 stations (Fig.1). A single haul was taken from each station, except stations 8,27,33,45 and 57. Samples were taken using a Bongo net of 300 micron mesh with attached horizontal flowmeter, with a tow time of 10 minutes. Samples were preserved in five percent buffered formalin. Subsamples of approximately 600 ml (1/4 of the total) have been loaned out to the Marine Reference Collection and Resource Centre (MRC).

The Marine Reference Collection and Resource Centre made regular coastal collections from Manora Channel (24°48'N, 66°59'E) during a study period of one year (January to December, 1994). Sampling was done at two stations, approximately 1.5 kilometers apart, using a plankton net of 335 micron mesh, with a tow time of 10 minutes; surface and subsurface (5 meters depth) samples were taken.

Initially the cirripede larvae from the zooplankton samples were sorted, counted and then transferred to 70 percent alcohol. Dissections were made with entomological needles. Temporary slides were prepared in glycerin. Illustrations were made with the aid of a Nikon camera lucida Labophot-2. Total length (TL) was measured from the frontal margin to the tip of the dorsal thoracic spine.

DESCRIPTION OF THE LARVAE

Lepas spp.

Naupliar stage VI (Fig.3)

Occurrence: NASEER Cruise I

84 specimens.

TL: 7.50 - 11.05 mm.

Carapace (Fig.3A).- Shield-shaped, frontal, lateral,dorsal and posterior shield spines present. Frontolateral horns prominent. Nauplius eye absent.

Antennule (Fig.3B).- Uniramous, 5-segmented; segment 1 lacks setae, segments 2-5 with 1,3+1+1, 2+1, 4 setae, proximal to distal.

Antenna (Fig.3C).- Biramous. Exopod 8- segmented; each segment with a single seta, except the distal segment. Endopod 4-segmented with 1+3,3,2,2+2 setae, proximal to distal.

Mandible (Fig.3D).- Biramous. Exopod 5-segmented; each segment with a single seta, except the distal segment. Endopod 4-segmented; segmented 1 with gnathobase, segments 2-4 with 3,3,3+5 setae, proximal to distal.

Labrum (Fig.3E).- Broad, with 4 pairs of spines and numerous marginal setae.

Dorsal thoracic spine (Fig.3A).- Long and armed with small spinules.

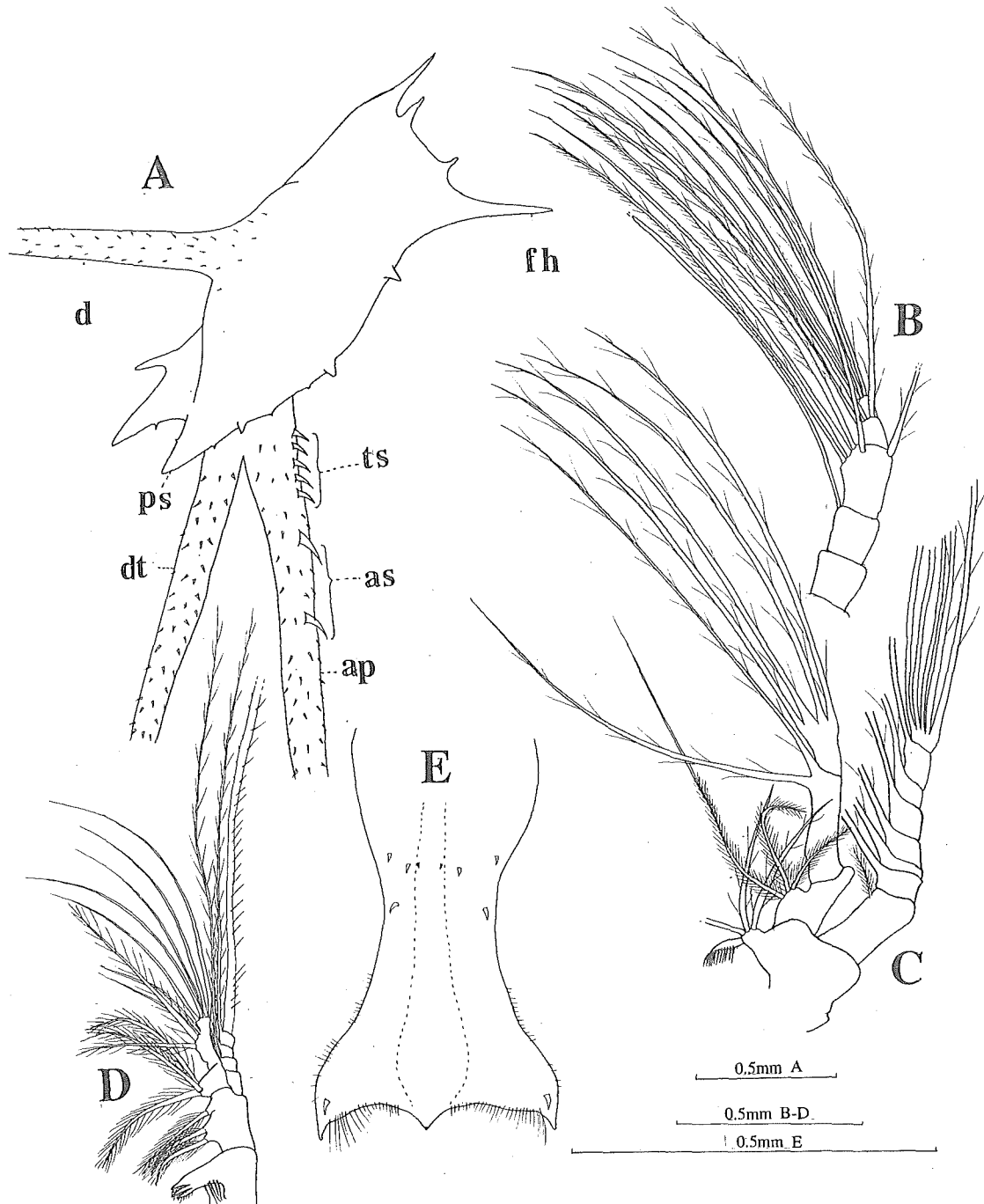


Fig.3. *Lepas* spp. naupliar stage VI: A, entire; B, antennule; C, antenna; D, mandible; E, labrum. ap, abdominal process; as, abdominal spines; d, dorsal shield spine; dt, dorsal thoracic spine; fh, frontolateral horn; ps, posterior shield spine; ts, thoracic spine.

Abdominal process (Fig.3A).- Long, spinose, 7 pairs of trunk spines (5 thoracic and 2 abdominal) present.

***Balanus* spp.**

Naupliar stage VI (Fig.4)

Occurrence: Coastal collection from Manora Channel.

2,754 specimens.

TL: 0.41-0.56 mm.

Carapace (Fig.4A).- Strongly convex, frontolateral horns short, bifid. Frontal filaments visible. Posterior shield spine shorter than frontolateral horns. Nauplius eye distinguishable as a bilobed structure.

Antennule (Fig.4B).- Uniramous, 4-segmented; segment 1 lacks setae, segments 2-4 with 1,2+1+2,2+3+1 setae, proximal to distal.

Antenna (Fig.4C).- Biramous. Exopod 9-segmented; each segment with a single seta, except the distal segment. Endopod 2-segmented with gnathobase and 3+2+3+4 setae, proximal to distal.

Mandible (Fig.4D).- Biramous. Exopod 5-segmented; each segment with a single seta, except the distal segment. Endopod 3-segmented with 1,2+1+4, 4+3 setae, proximal to distal.

Labrum (Fig.4E).- Broad, trilobed with several marginal setae.

Dorsal thoracic spine (Fig.4F).- Long, armed with small spinules.

Abdominal process (Fig.4F).- Long, armed with 2 parallel rows of spines on either side of the mid ventral line, 7 pairs of trunk spines (5 thoracic and 2 abdominal) present, tip of abdominal process forked into 2 furcal rami.

Unidentified stage (Fig.5)

Single specimen

Occurrence: NASEER Cruise I.

TL: 2.4mm.

Carapace (Fig.5A).- Shield-shaped, frontolateral horns prominent, posterior spines present. Nauplius eye absent.

Antennule (Fig.5B).- Uniramous, 5-segmented; segments 1 and 2 lack setae, segments 3-5 with 2+1, 2, 3+1 setae, proximal to distal.

Antenna (Fig.5C).- Biramous. Exopod 9-segmented; each with a single seta, except the distal segment. Endopod 2-segmented with 3+1+2,2+2 setae, proximal to distal.

Mandible (Fig.5D).- Biramous. Exopod with 2 setae. Endopod with 10 setae.

Labrum (Fig.5E).- Unilobed, longer than broad, bearing several small setae on either side.

Dorsal thoracic spine (Fig.5A).- Long, armed with numerous spinules.

Abdominal process (Fig.5A).- Long, armed with numerous spines trunk spines (abdominal and thoracic spines) absent.

REMARKS: This stage differs from naupliar stage VI in having larger spines on the abdominal process and in lacking the abdominal and thoracic spines. The abdominal process and dorsal thoracic spine are longer than that of *Balanus* sp.

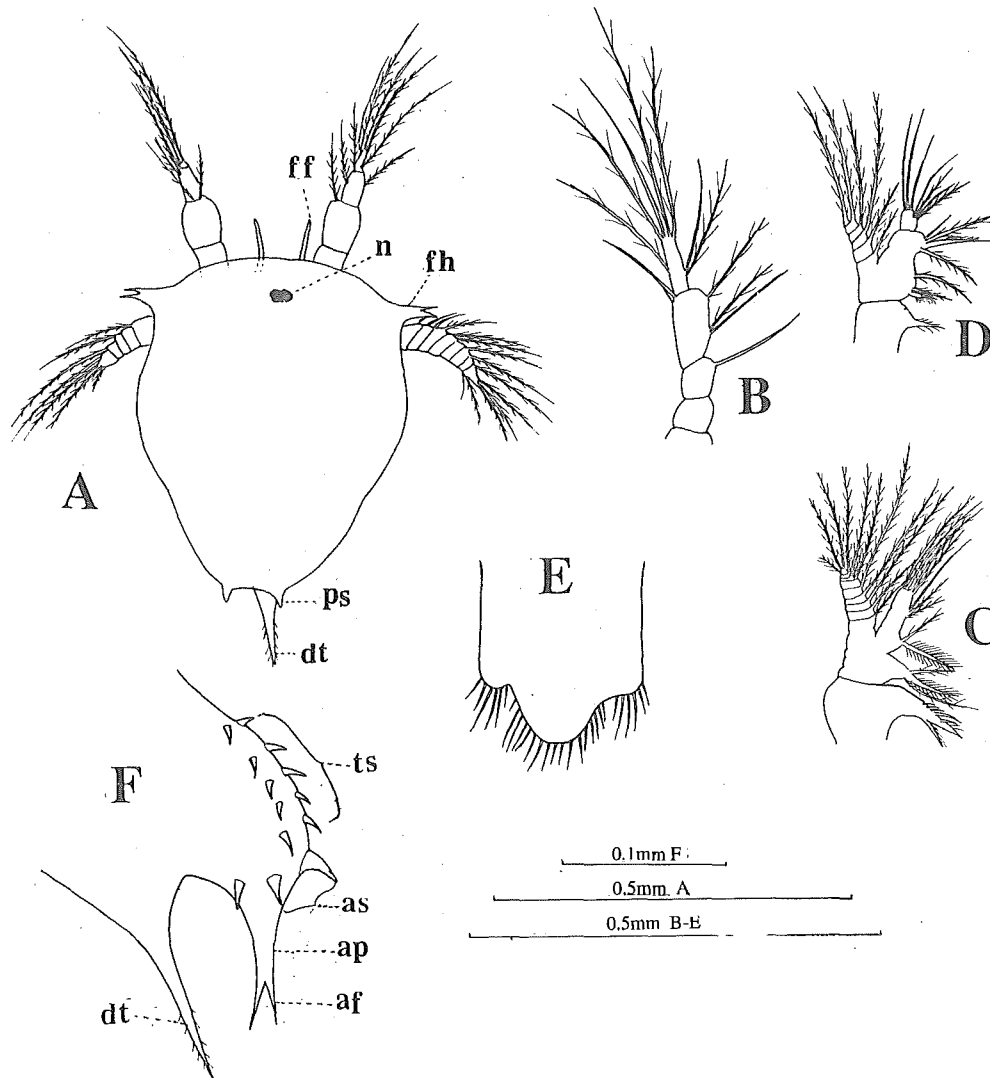


Fig.4. *Balanus* spp. naupliar stage VI: A, entire; B, antennule; C, antenna; D, mandible; E, labrum; F, abdominal process. af, abdominal furca; ap, abdominal process; as, abdominal spine; dt, dorsal thoracic spine; ff, frontal filament; fh, frontolateral horn; n, naupliar eye; ps, postero shield spine; ts, thoracic spine.

Table 1: Occurrence and abundance of cirripede larvae at different stations of NASEER Cruise I.

Sta. No.	Date	Latitude	Longitude	Day(D)/Night (N)	No. of larvae	
					Nauplii	Cyprids
4	09.01.92	23°50'N	66° 29'E	N	03	1
8B	10.01.92	22° 51'N	66° 59'E	N	16	1
8C	10.01.92	22° 51'N	65° 59'e	D	09	1
8D	10.01.92	22° 51'N	65° 59'E	N	10	-
12	11.01.92	23° 30'N	65° 02'E	D	03	1
15	12.01.92	24° 00'N	64° 22'E	N	03	1
18	12.01.92	23° 38'n	63° 38'E	D	02	3
21	13.01.92	22° 53'n	63° 58'E	N	-	-
24	13.01.92	22° 07'N	64° 18'E	D	02	4
27A	14.01.92	21° 24'N	64° 40'E	N	08	1
27B	14.01.92	21° 25'N	64° 21'E	D	03	1
27C	14.01.92	21° 25'N	64° 21'E	D	-	2
27D	14.01.92	21° 25'N	64° 21'E	N	08	-
30	15.01.92	20° 56'N	63° 59'E	N	01	1
33A	15.01.92	20° 33'N	63° 17'E	D	05	3
33B	15.01.95	20° 26'N	63° 15'E	N	01	-
33C	16.01.92	20° 33'N	63° 17'E	D	-	-
33D	16.01.92	20° 33'N	63° 17'E	D	-	8
37	17.01.92	20° 53'N	62° 13'E	N	01	-
42	17.01.92	21° 26'N	60° 52'E	D	02	-
45A	18.01.92	21° 45'N	60° 05'E	N	-	-
45B	18.01.92	21° 45'N	60° 05'E	D	-	-
45C	18.01.92	21° 45'N	60° 05'E	D	01	-
45D	18.01.92	21° 45'N	60° 05'E	N	01	-
49	19.01.92	22° 22'N	61° 01'E	D	-	-
53	20.01.92	23° 05'N	61° 58'E	N	-	-
57A	21.01.92	23° 38'N	62° 54'E	D	-	-
57B	21.01.92	23° 38'N	62° 54'E	N	05	-
57C	21.01.92	23° 38'N	62° 54'E	N	-	-
57D	21.01.92	23° 38'N	62° 54'E	D	01	1
60	22.01.92	24° 26'N	63° 03'E	N	01	-
62	22.01.92	24° 58'N	63° 08'E	D	-	-

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