INT. J. BIOL. BIOTECH., 4 (SPECIAL ISSUE): 41-56, 2007.

FIRST ZOEAL STAGES OF LABORATORY REARED MAJID CRABS (CRUSTACEA: BRACHYURA, MAJIDAE)

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ABSTRACT

Twenty seven species of Majid crabs have been reported from Pakistani waters (Tirmizi & Kazmi,1996). They play an important role in coastal ecology. Present information is based on the study of first zoeal stages of eight species of Majid crabs: *Achaeus lacertosus* Stimpson 1858; *Doclea muricata* (Herbst, 1788); *Acanthonyx limbatus* A. Milne Edwards,1862; *Menaethiops nodulosus* (Nobili, 1905); *Menaethiops bicornis* Alcock, 1895; *Schizophrys aspera* (H. Milne Edwards, 1834); *Schizophrys pakistanienses* Tirmizi & Kazmi, 1995 and *Micippa platipes* Rupell, 1830. They are reared under the laboratory conditions in Marine Reference Collection and Resource Centre. The first zoeae are described along with illustrations. The comparison between their morphological characters are also noted in a tabulated form.

Key Words: First zoeal stages, Majidae, Brachyura.

INTRODUCTION

According to Provenzano and Brownell (1977) there are approximately 900 species of majid crabs of family majidae, all are marine and widely distributed in the world. The family majidae is divided into seven subfamilies by Garth, 1958. Pakistani waters have six subfamilies they are referable to twenty seven species of Majid crabs reported by Tirmizi and Kazmi, 1996.

The laboratory reared first zoae of eight species of family Majidae are available for present study including those are published previously. They belonging to five subfamilies: Inachinae, Pisinae, Epialtinae, Majidae and Mithracinae. The zoae are described, illustrated and made their comparison between each first zoeal stage of eight species: *Achaeus lacertosus* Stimpson 1858 representive of subfamily Inachinae; *Doclea muricata* (Herbst, 1788) of subfamily Pisinae; *Acanthonyx limbatus* A. Milne Edwards,1862; *Menaethiops nodulosus* (Nobili, 1905); *Menaethiops bicornis* Alcock, 1895 of subfamily Epialtinae; *Schizophrys aspera* (H. Milne Edwards, 1834); *Schizophrys pakistanienses* Tirmizi & Kazmi, 1995 of subfamily Majinae and *Micippa platipes* Rupell, 1830 of subfamily Mithracinae.

MATERIALS AND METHODS

Ovigerous females of *Doclea muricata* (Herbst, 1788); *Acanthonyx limbatus* A. Milne Edwards,1862 and *Menaethiops bicornis* Alcock, 1895 are found from different localities. Live specimens were brought to the laboratory, their larvae were hatched on different occasions (Table 1). The rearing method were same as used previously. As the females were kept in glass aquaria in seawater with a salinity of 32-37^0/00 under the laboratory conditions at room temperature 17-28^{0}C and pH 7.9 until hatching occurred. The larvae were segregated and placed ten in each, five glass beakers (500 ml), containing filtered seawater of the same salinity and temperature as mention above. Each beaker was examined daily and the specimens were transferred to clean beakers filled with freshly filtered seawater, and were fed on newly hatched *Artemia* nauplii. Temporary slides were made using glycerin and 5 % formaline (3:1).

Measurements were made with a stage micrometer. The total length (TL) was determined by adding the carapace length (CL), measured from the tip of the rostral spine to the posterior midpoint of the carapace, and abdomenal length, measured from the centre of the somite 2 to the midposterior margin of the telson. Measurement are in millimeter (mm). The specimens were dissected through tungsten needle by using a Ogawa seiki binocular microscope (4x10 magnification). The illustration were made with the help of Olympus BH2 microscope (magnifications 1.25 x 4,10, 20 and 40) with Nomarski interference contrast and *camera lucida* attachment.

The spent females and the remaining larvae were catalogued preserved and deposited in Marine Reference Collection and Resource Centre (MRCC) (Table 1).

Table 1. Details of materials.

S.No.	Name of specimen	Date of Coll.	Locality	Date of hatc.	Studied by	Catalogue No.
1.	*Achaeus lacertosus*	05.11.1994	Buleji	06.11.1994	Siddiqui, 1999	BRAC 665
2.	*Doclea muricata*	27.09. 1994	Pitti creek	02.10.1994	present study	BRAC 703
3.	*Acanthonyx limbatus*	04.12.1994	Manora Channel	26.12.1994	present study	BRAC 704
4.	*Menaethiops nodulosus*	28.10.1996	Buleji	13.12.1996	Ghory & Siddiqui, 2002	BRAC 671
5.	*M. bicornis*	26.11.1996	Buleji	14.12.1996	present study	BRAC 705
6.	*Schizophrys aspera*	03.11.1983	Near Tusani	08.11.1983	Tirmizi & Kazmi, 1987	BRAC 249
7.	*S. pakistanienses*	15.11.1986	Buleji	17.11.1986	Siddiqui & Kazmi, 2000	BRAC 642
8.	*Micippa platipes*	7.02.1993	Buleji	27.02.1993	Siddiqui, 1996	BRAC 561

RESULTS

Description of the larvae

Achaeus lacertosus Stimpson 1858
Zoea I:
Size.- CL= 0.88mm, TL= 2.05mm
Duration.- 1-2 days

Carapace (Fig. 1A, A').- Dorsal spine moderate in length and curved bacwardly; rostral spine small; lateral spines absent; posterolateral margin with 8+8 plumose setae. Eyes sessile.

Antennule (Fig. 1B).- Uniramous, terminally with 2 aesthetascs and 2 setae.

Antenna (Fig. 1C).- Biramous, protopod developed, distal 1/6 of spinous process with spinulate; exopod with 3 terminal cuspidate setae, longest seta reaching to apex of spinous process; endopod rudimentry.

Mandible (Fig. 1D).- With well developed incisor and molar processes; palp absent.

Maxillule (Fig. 1E).- Coxal endite with 7 plumodenticulate setae; basial endite with 3 cuspidate and 3 plumodenticulate setae; endopod 2 segmented with 1,2+4 plumodenticulate setae from proximal to distal segments respectively.

Maxilla (Fig. 1F).- Coxal and basial endite bilobed with 4+3 and 5+4 plumodenticulate setae on proximal to distal lobes respectively; endopod bilobed with 3+2 plumodenticulate setae on proximal to distal lobes respectively; scaphognathite with 12 or 13 marginal plumose setae and with a posterior process.

Maxilliped I (Fig. 1G).- Coxopod without setae; basipod with 10 plumodenticulate setae; endopod 5 segmented with 3,2,1,2,and 4+1 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 natatory plumose setae.

Maxilliped II (Fig. 1H).- Coxopod without setae; basipod with 3 plumodenticulate setae; endopod 3 segmented with 0,1,2+2 plumodenticulate setae; exopod with 4 natatory plumose setae.

Abdomen (Fig. 1I).- Five somites each with 3 dorsomedian setules on their posterior margin; somite 2 with a pair of forwadly directed, curved dorsolateral knobs; posterolateral angle of somite 2 rounded, somite 4 and 5 less pointed and angles of somite 3 relatively enlarged.

Telson (Fig. 1I).- Forked with a single pair of lateral spine; inner posterir margin with 3 pairs of spinulous processes.

Doclea muricata (Herbst, 1788)

Zoea I:

Size.- CL=0.62mm, TL=2.01mm

Duration.- 2 days

Carapace (Fig. 2A,).- Dorsal spine long and curved backwards; rostral spine small; lateral sine absent; posterolateral margin with 6+6 plumose setae. Eyes sessile.

Antennule (Fig. 2B).- Uniramous, terminally with 2 aesthetascs and 2 setae.

Antenna (Fig. 2C).- Biramous, protopod developed; distal 1/6 spinus process with spinulate; exopod with 3 terminal cuspidate setae; endopod rudimentry.

Mandible (Fig. 2D).- With well developed incisor and molar processes; palp absent.

Maxillule (Fig. 2E).- Coxal endite with 7 plumodenticulate setae; basial endite with 4 cuspidate and 3 plumodenticulate setae; endopod 2 segmented with 0,1,2+4 plumodenticulate setae from proximal to distal segments respectively..

Maxilla (Fig. 2F).- Coxal and basial endites bilobed with 6+3 and 5+4 plumodenticulate setae from proximal to distal segments respectively; endopod with 5 plumodenticulate setae; scaphognathite with 10 marginal plumose setae and with a posterior process.

Maxilliped I (Fig. 2G).- Coxopod without setae; basipod with 9 plumodenticulate setae; endopod 5 segmented with 3,2,1,2,and 4+1 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 natatory plumose setae.

Maxilliped II (Fig. 2H).- Coxopod without setae; basipod with 3 plumodenticulate setae; endopod 3 segmented with 0,1,2+2 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 natatory plumose setae.

Maxilliped III (Fig. 2I). Rudimentry.

Abdomen (Fig. 1J).- Five somites each with 2 dorsomedian setules on their posterior margin; somite 2 with a pair of forwadly directed, curved dorsolateral knobs; posterolateral angle of somite 2 -5 rounded.

Telson (Fig. 1J).- Bifurcated, with 3 pairs of spinulous processes on posterior margin of each furca.

Acanthonyx limbatus A. Milne Edwards,1862

Zoea I:

Size.- CL= 1.12mm, TL= 2.74mm

Duration.- 4 days

Carapace (Fig. 3A,).- Dorsal spine long and curved backwards; rostral spine small; lateral sine absent; posterolateral margin with 11+11 plumose setae. Eyes sessile.

Antennule (Fig. 3B).- Uniramous, terminally with 3 aesthetascs.

Antenna (Fig. 3C).- Biramous, protopod developed, distal 1/6 of spinous process with spinulate; exopod with 3 terminal cuspidate setae; endopod rudimentry.

Mandible (Fig. 3D).- With well developed incisor and molar processes; palp absent.

Maxillule (Fig. 3E).- Coxal endite with 6 plumodenticulate setae; basial endite with 3 cuspidate and 5 plumodenticulate setae; endopod 2 segmented with 0,1,4 plumodenticulate setae from proximal to distal segments respectively.

Maxilla (Fig. 3F).- Coxal and basial endite bilobed with 3+3 and 5+5 plumodenticulate setae from proximal to distal lobes respectively; endopod with 5 plumodenticulate setae; scaphognathite with 13 marginal plumose setae and with a posterior process.

Maxilliped I (Fig. 3G).- Coxopod without setae; basipod with 9 plumodenticulate setae; endopod 5 segmented with 3,2,1,2,and 4+1 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 natatory plumose setae.

Maxilliped II (Fig. 3H).- Coxopod without setae; basipod with 3 plumodenticulate setae; endopod 3 segmented with 1,1,3+1 plumodenticulate setae; exopod with 4 natatory plumose setae.

Abdomen (Fig. 3I).- Five somites each with 2 dorsomedian setules on their posterior margin; somite 2 with a pair of forwadly directed, curved dorsolateral knobs; posterolateral angle of somite 2 rounded, somite 4 and 5 less pointed and angles of somite 3 relatively enlarged.

Telson (Fig. 3I).- Forked with a single pair of lateral spine; inner posterior margin with 3 pairs of spinulous processes.

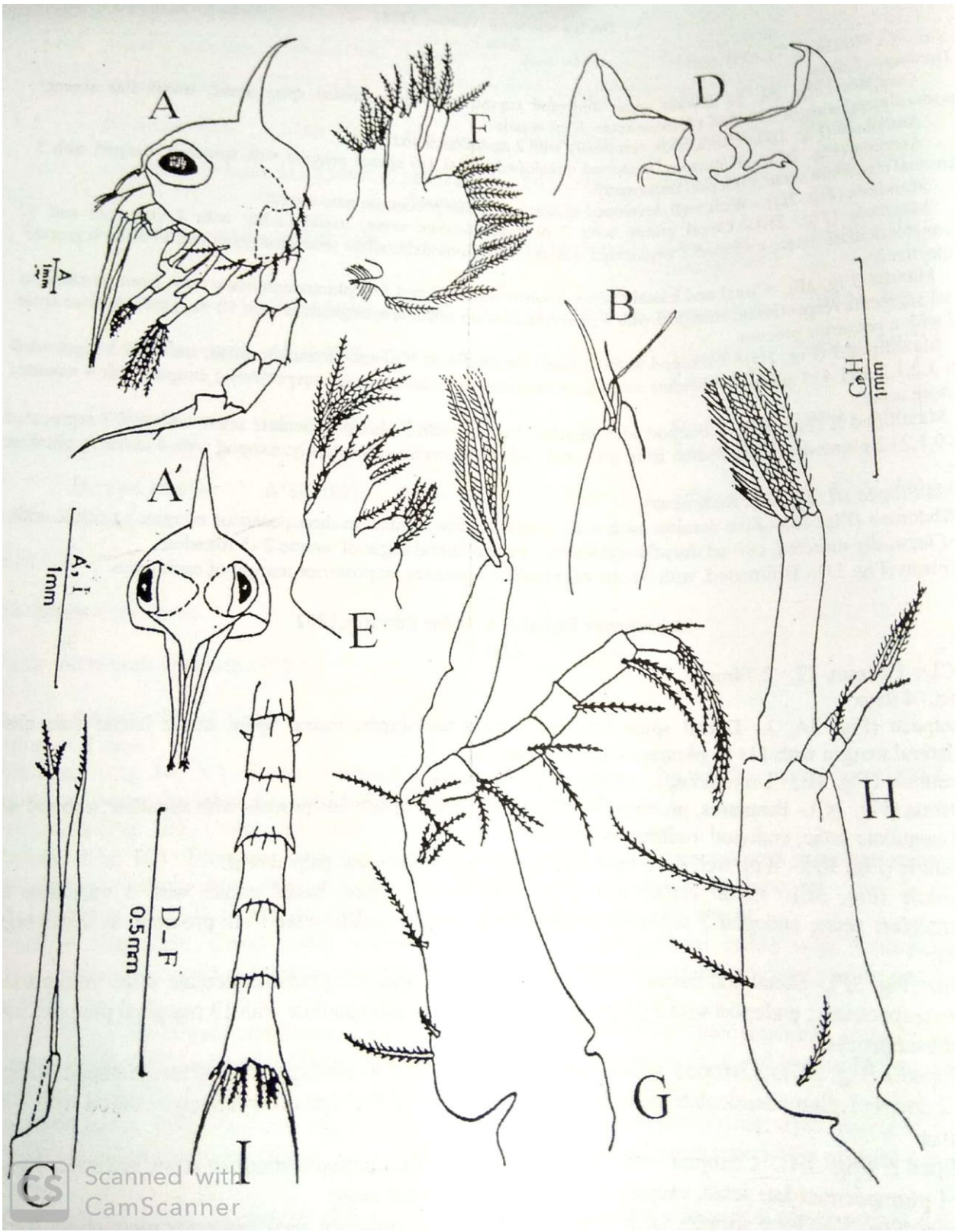

Fig. 1. ***Achaeus lacertosus*** Stimpson. Zoea I: A, lateral view; A', frontal view; B, antennule; C, antenna; D, mandible; E, maxillule; F, maxilla; G, H, maxillipeds I, II; I, abdomen with telson.(after Siddiqui, 1999).

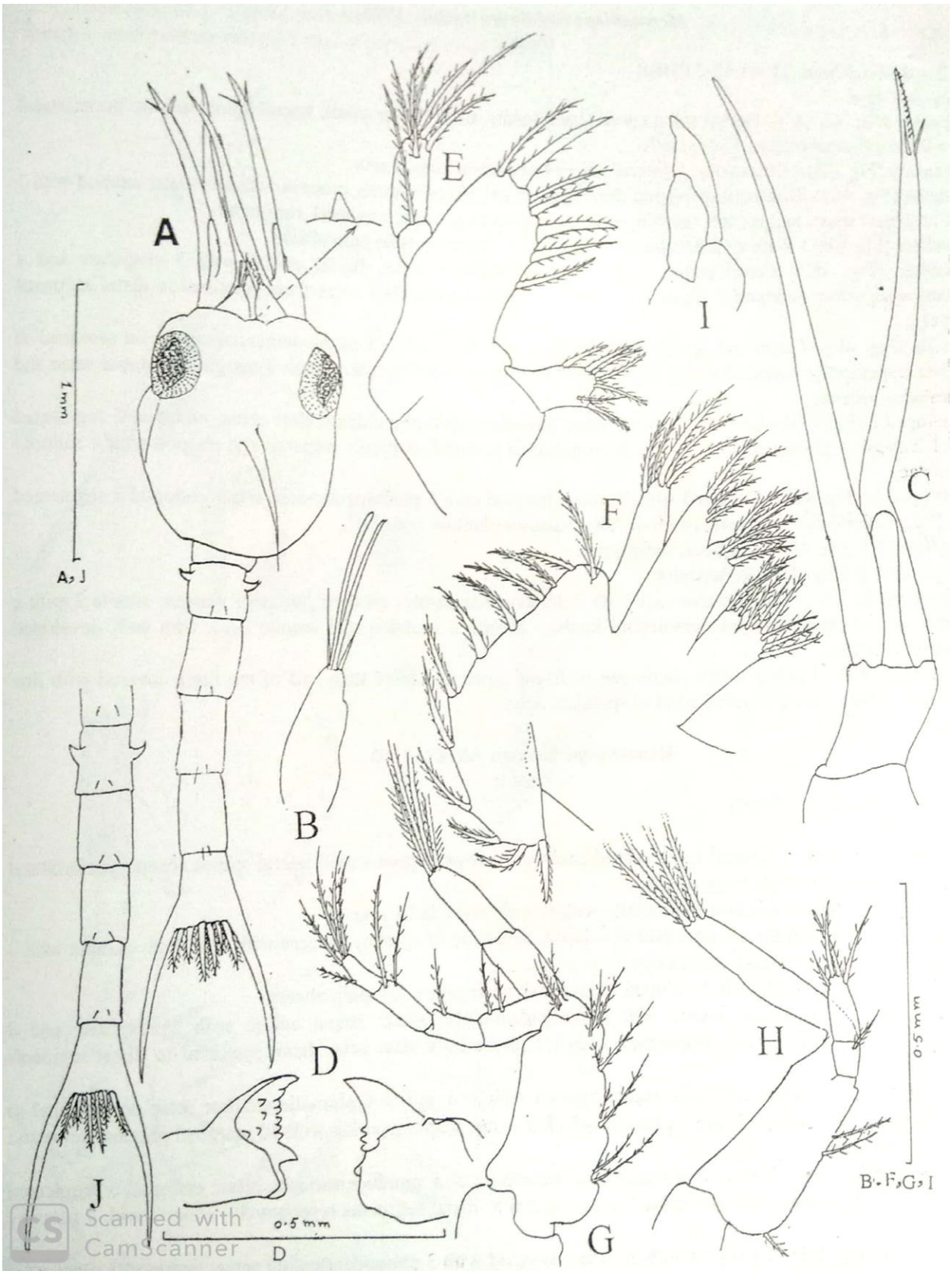

Fig. 2. ***Doclea muricata*** (Herbst, 1788). Zoea I: A, dorsal view; B, antennule; C, antenna; D, mandible; E, Maxillule; F, maxilla; G-I, maxillipeds I-III; J, abdomen with telson.

Menaethiops nodulosus (Nobili, 1905)

Zoea I:

Size.- CL= 0.94-1.02mm, TL= 1.83-2.01mm

Duration.- 4-5 days

Carapace (Fig. 4A, A').- Dorsal spine curved backwards; rostral spine small; lateral spines absent; posterlateral margin with 5+5 plumose setae. Eyes sessile.

Antennule (Fig. 4B).- Uniramous, terminally with 4 aesthetascs and 1 seta.

Antenna (Fig. 4C).- Biramous, protopod developed, distal 1/6 of spinous process with spinulate; exopod with 3 terminal cuspidate setae, longest seta reaching to apex of spinous process; endopod rudimentry.

Mandible (Fig. 4D).- With well developed incisor and molar processes; palp absent.

Maxillule (Fig. 4E).- Coxal endite with 7 plumodenticulate setae; basial endite with 3 cuspidate and 4 plumodenticulate setae; endopod 2 segmented with 1,1+4 plumodenticulate setae from proximal to distal segments respectively.

Maxilla (Fig. 4F).- Coxal and basial endite bilobed with 4+4 and 5+5 plumodenticulate setae on proximal to distal lobes respectively; endopod with 5 plumodenticulate setae; scaphognathite with 9 marginal plumose setae and with a posterior process.

Maxilliped I (Fig. 4G).- Coxopod without setae; basipod with 9 plumodenticulate setae; endopod 5 segmented with 3,2,1,2,and 4+1 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 natatory plumose setae.

Maxilliped II (Fig. 4H).- Coxopod without setae; basipod with 3 plumodenticulate setae; endopod 3 segmented with 0,1,2+2 plumodenticulate setae; exopod with 4 natatory plumose setae.

Maxilliped III (Fig. 4I).- Biramous, rudimentry.

Pereiopods I-V (Fig. 4J).- Rudimentry.

Abdomen (Fig. 4K).- Five somites each with 2 dorsomedian setules on their posterior margin; somite 2 with a pair of forwadly directed, curved dorsolateral knobs; somite 2 rounded and somite 3- 5 with well developed posterolateral processes.

Telson (Fig. 4K).- Forked with a single pair of lateral spine and more than half of the furca covered with fine spinules; inner posterir margin with 3 pairs of spinulate setae.

Menaethiops bicornis Alcock, 1895

Zoea I:

Size.- CL= 0.92mm, TL= 1.94mm

Duration.- 5 days

Carapace (Fig. 5A, A').- Dorsal spine curved backwards; rostral spine small; lateral spines absent; posterlateral margin with 5+5 plumose setae. Eyes sessile.

Antennule (Fig. 5B).- Uniramous, terminally with 4 aesthetascs and 1 seta.

Antenna (Fig. 5C).- Biramous, protopod developed, distal 1/6 of spinous process with spinulate; exopod with 3 terminal cuspidate setae, endopod rudimentry.

Mandible (Fig. 5D).- With well developed incisor and molar processes; palp absent.

Maxillule (Fig. 5E).- Coxal endite with 8 plumodenticulate setae; basial endite with 3 cuspidate and 4 plumodenticulate setae; endopod 2 segmented with 1,4 plumodenticulate setae from proximal to distal segments respectively.

Maxilla (Fig. 5F).- Coxal and basial endite bilobed with 3+4 and 5+4 plumodenticulate setae on proximal to distal lobes respectively; endopod with 5 plumodenticulate setae; scaphognathite with 10 marginal plumose setae and with a posterior process.

Maxilliped I (Fig. 5G).- Coxopod without setae; basipod with 9 plumodenticulate setae; endopod 5 segmented with 3,2,1,2 and 4+1 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 natatory plumose setae.

Maxilliped II (Fig. 5H).- Coxopod without setae; basipod with 3 plumodenticulate setae; endopod 3 segmented with 0,1,2+2 plumodenticulate setae; exopod with 4 natatory plumose setae.

Maxilliped III (Fig. 5I).- Biramous, rudimentry.

Pereiopods I-V (Fig. 5J).- Rudimentry.

Abdomen (Fig. 5K).- Five somites each with 2 dorsomedian setules on their posterior margin; somite 2 with a pair of forwadly directed, curved dorsolateral knobs; somite 2 rounded and somite 3- 5 with well developed posterolateral processes.

Telson (Fig. 5K).- Forked with a single pair of lateral spine and more than half of the furca covered with fine spinules; inner posterir margin with 3 pairs of spinulate setae.

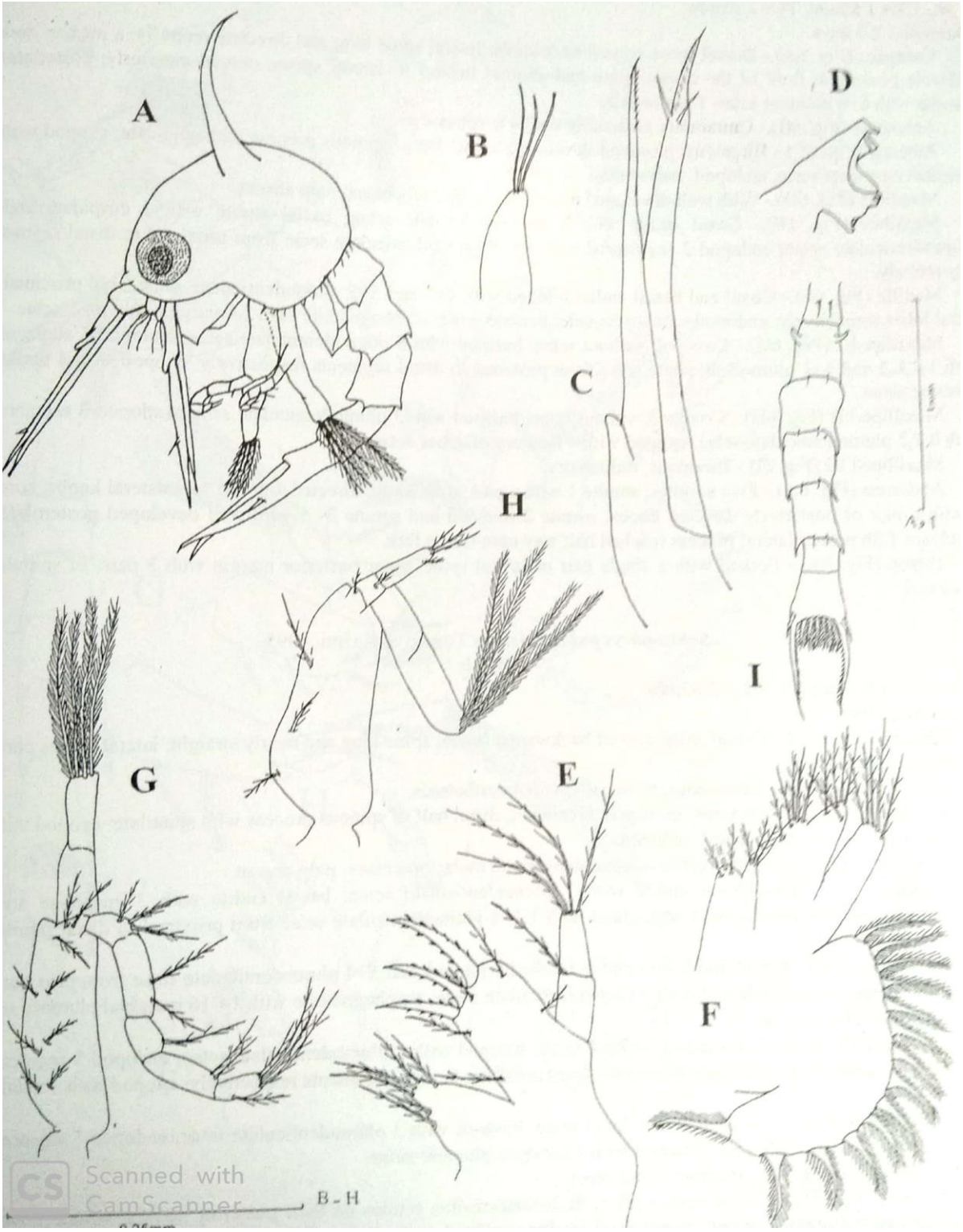

Fig. 3. ***Acanthonyx limbatus*** A. Milne Edwards. Zoea I: A, lateral view; B, antennule; C, antenna; D, mandible; E, maxillule; F, maxilla; G, H, maxillipeds I, II; I, abdomen with telson.

Schizophrys aspera (H. Milne Edwards, 1834)

Zoea I:

Size.- CL= 1.82mm, TL= 2.63mm
Duration.- 2-3 days

Carapace (Fig. 6A).- Dorsal spine curved backwards; rostral spine long and directed ventrally; a median dorsal tubercle present in front of the dorsal spine and another behind it; lateral spines curved anteriorly; posterlateral margin with 6+6 plumose setae. Eyes sessile.

Antennule (Fig. 6B).- Uniramous, terminally with 4 aesthetascs.

Antenna (Fig. 6C).- Biramous, protopod developed, distal 1/6 of spinous process with spinulate; exopod with 3 terminal cuspidate setae, endopod rudimentry.

Mandible (Fig. 6D).- With well developed incisor and molar processes; palp absent.

Maxillule (Fig. 6E).- Coxal endite with 7 plumodenticulate setae; basial endite with 3 cuspidate and 5 plumodenticulate setae; endopod 2 segmented with 1,1+4 plumodenticulate setae from proximal to distal segments respectively.

Maxilla (Fig. 6F).- Coxal and basial endite bilobed with 4+3 and 5+3 plumodenticulate setae from proximal to distal lobes respectively; endopod with 4 plumodenticulate setae; scaphognathite with 14 marginal plumose setae.

Maxilliped I (Fig. 6G).- Coxopod without setae; basipod with 8 plumodenticulate setae; endopod 5 segmented with 1,2,1,2 and 4+1 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 natatory plumose setae.

Maxilliped II (Fig. 6H).- Coxopod without setae; basipod with 3 plumodenticulate setae; endopod 3 segmented with 0,2,2 plumodenticulate setae; exopod with 4 natatory plumose setae.

Maxilliped III (Fig. 6I).- Biramous, rudimentry.

Abdomen (Fig. 6A).- Five somites; somite 1 with a pair of forwadly directed, curved dorsolateral knobs; somite 2 with a pair of posteriorly directed knobs; somite 2 rounded and somite 3- 5 with well developed posterolateral processes fifth posterolateral process reached half way upto telson fork.

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Telson (Fig. 6A).- Forked with a single pair of lateral spine; inner posterior margin with 3 pairs of spinulous processes.

Schizophrys pakistanienses Tirmizi & Kazmi, 1995

Zoea I:

Size.- CL =1.8-2mm, TL = 2.4-2.83mm
Duration.- 2 days

Carapace (Fig. 7A).- Dorsal spine curved backwards; rostral spine long and nearly straight; lateral spines curved anteriorly. Eyes sessile.

Antennule (Fig. 7B).- Uniramous, terminally with 4 aesthetascs.

Antenna (Fig. 7C).- Biramous, protopod developed, distal half of spinous process with spinulate; exopod with 3 terminal cuspidate setae, endopod rudimentry.

Mandible (Fig. 7D).- With well developed incisor and molar processes; palp absent.

Maxillule (Fig. 7E).- Coxal endite with 7 plumodenticulate setae; basial endite with 3 cuspidate and 4 plumodenticulate setae; endopod 2 segmented with 1,1+4 plumodenticulate setae from proximal to distal segments respectively.

Maxilla (Fig. 7F).- Coxal and basial endite bilobed with 3+4 and 5+4 plumodenticulate setae from proximal to distal lobes respectively; endopod with 5 plumodenticulate setae; scaphognathite with 14-16 marginal plumose setae and with a posterior process.

Maxilliped I (Fig. 7G).- Coxopod without setae; basipod with 8 plumodenticulate setae; endopod 5 segmented with 3,2,1,1+1and 4+1 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 natatory plumose setae.

Maxilliped II (Fig. 7H).- Coxopod without setae; basipod with 3 plumodenticulate setae; endopod 3 segmented with 2,1,4 plumodenticulate setae; exopod with 4 natatory plumose setae.

Maxilliped III (Fig. 7I).- Biramous, rudimentry.

Abdomen (Fig. 7J).- Five somites each with 2 dorsomedian setules on their posterior margin; somite 1 with a pair of forwadly directed, curved dorsolateral knobs; somite 2 with a pair of posteriorly directed knobs; somite 2 rounded and somite 3- 5 with well developed posterolateral processes, fifth posterolateral process reached upto central indentation of telson fork.

Telson (Fig. 7J).- Forked with a single pair of lateral spine; inner posterior margin with 3 pairs of spinulous processes.

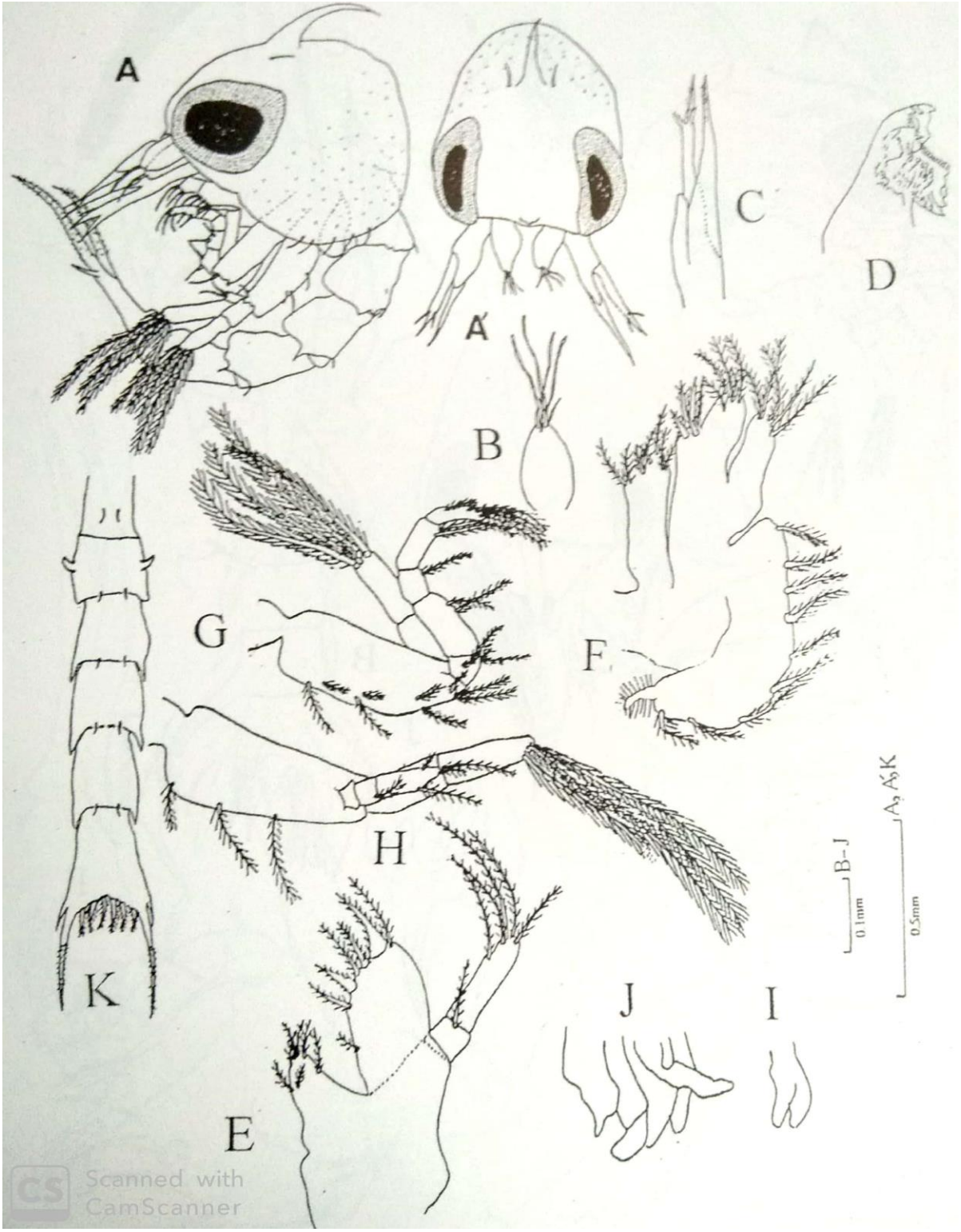

Fig. 4. ***Menaetiops nodulosus*** (Nobili, 1905). Zoea I: A, lateral view; A', frontal view; B, antennule; C, antenna; D, mandible; E, maxillule; F, maxilla; G - I, maxillipeds I-III; J, pereiopods I-V; K, abdomen with telson. (after Ghory and Siddiqui, 2002).

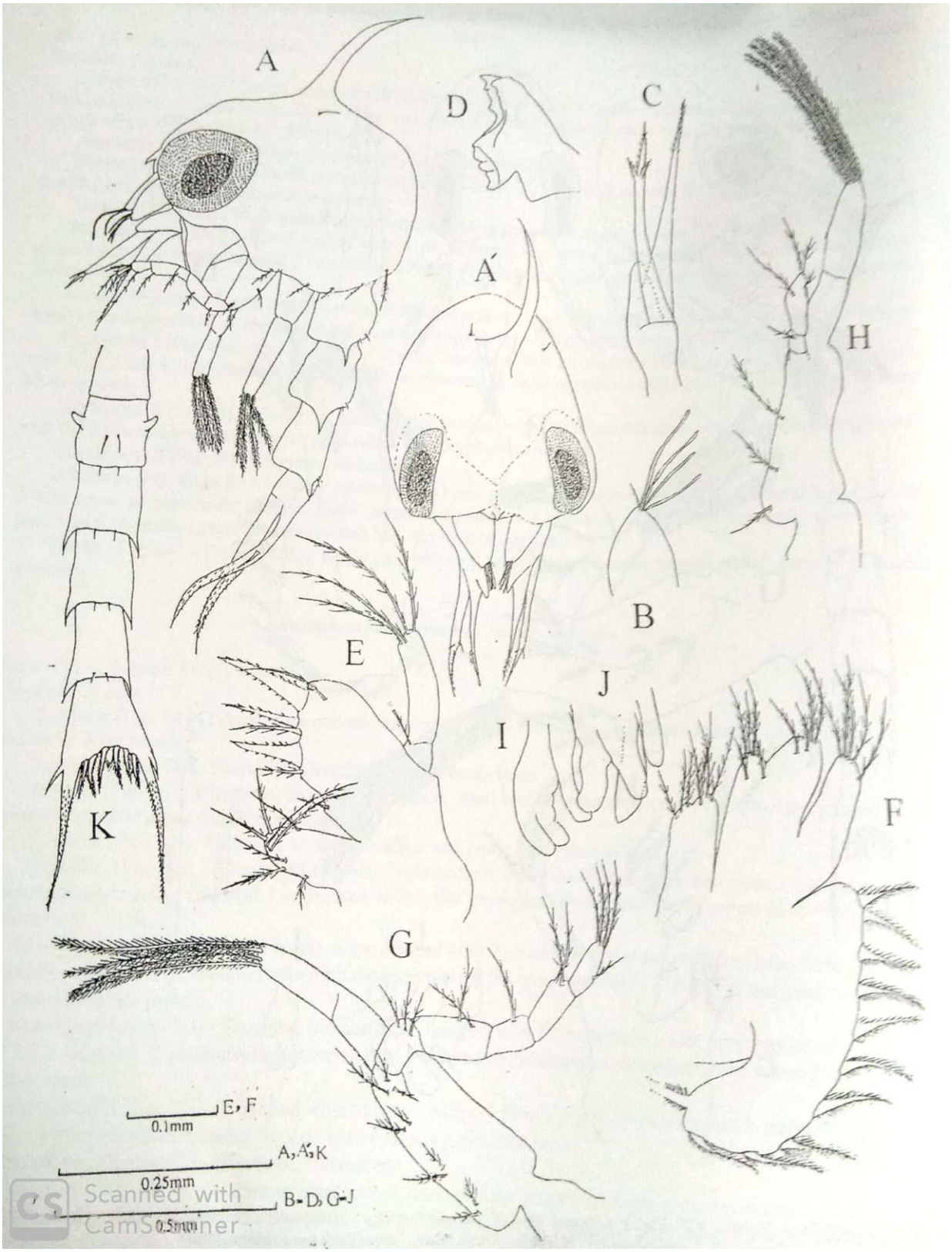

Fig. 5. ***Menaethiops bicornis*** Alcock, 1895. Zoea I: A, lateral view; A', frontal view; B, antennule; C, antenna; D, mandible; E, maxillule; F, maxilla; G - I, maxillipeds I-III; J, pereiopods I-V; K, abdomen with telson.

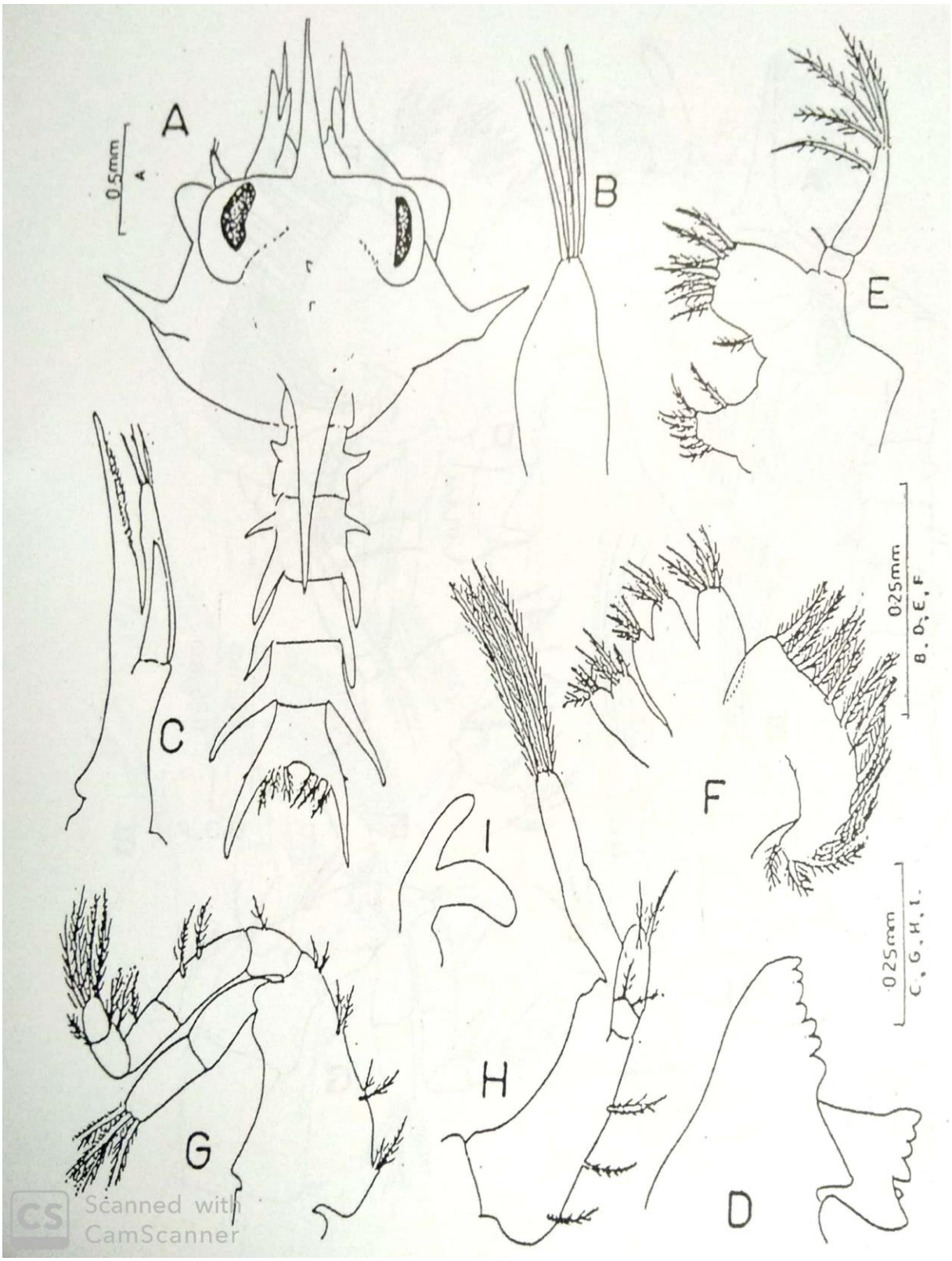

Fig. 6. ***Schizophrys aspera*** (H. Milne Edwards, 1834). Zoea I: A, dorsal view; B, antennule; C, antenna;D, mandible; E, Maxillule; F, maxilla; G-I, maxillipeds I-III. (after Tirmizi and Kazmi, 1987).

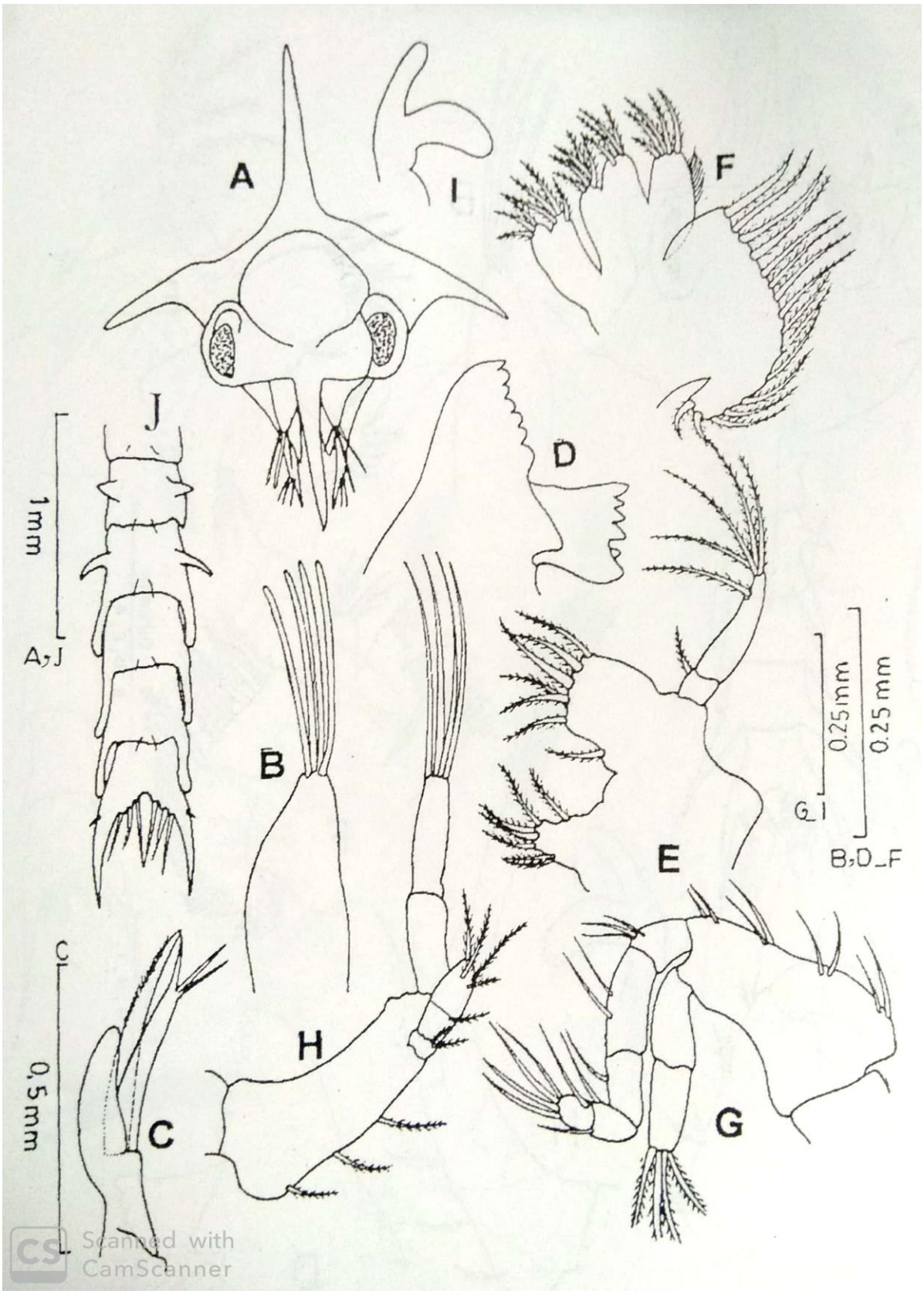

Fig. 7. ***Schizophrys pakistanienses*** Tirmizi & Kazmi, 1995. Zoea I: A, frontal view; B, antennule; C, antenna;D, mandible; E, Maxillule; F, maxilla; G-I, maxillipeds I-III; J, abdomen with telson. (after Siddiqui and Kazmi, 2000).

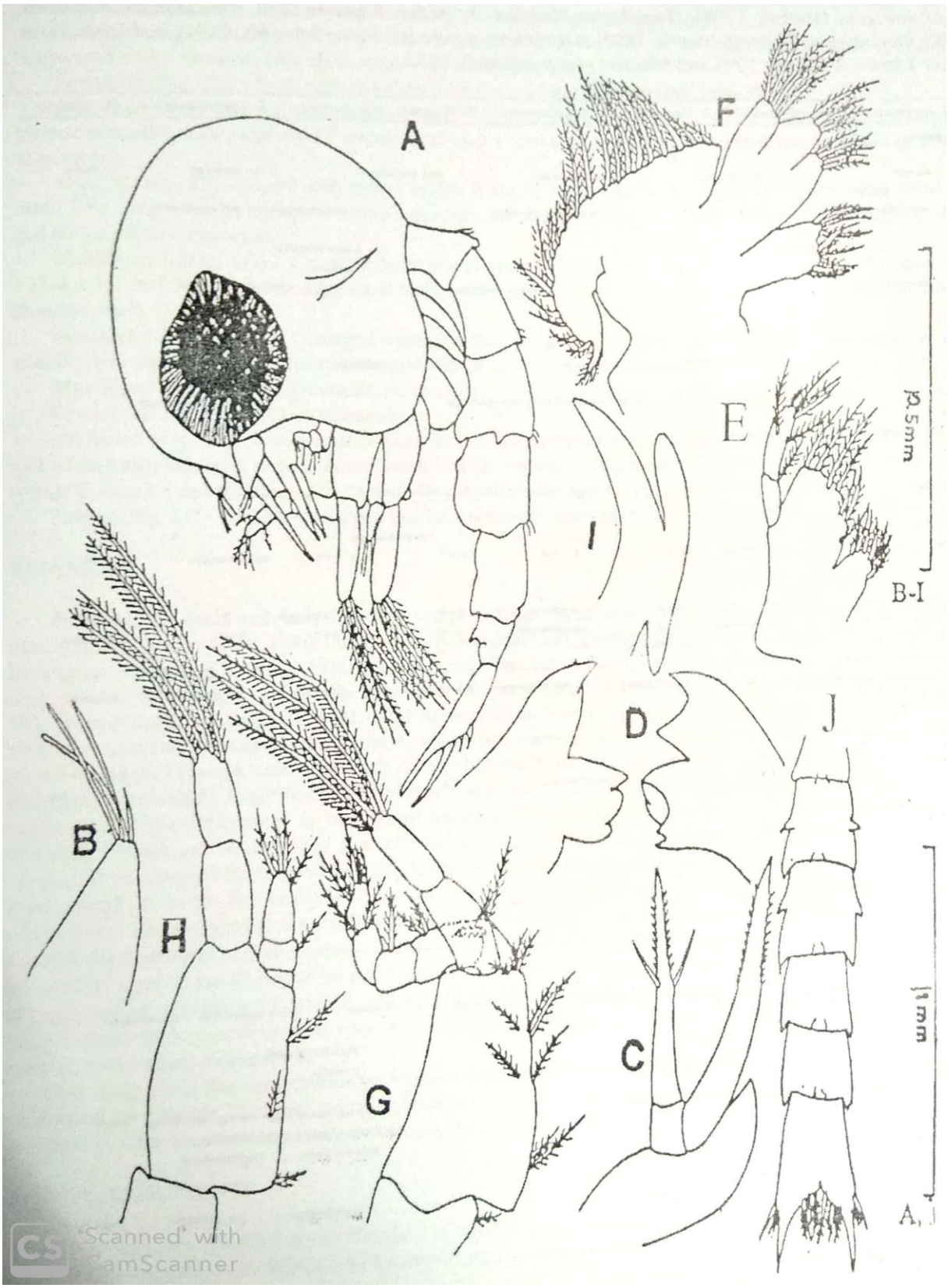

Fig. 8. ***Micippa platipes*** Ruppell, 1830. Zoea I: A, lateral view; B, antennule; C, antenna; D, mandible; E, maxillule; F, maxilla; G - I, maxillipeds I, III; J, abdomen with telson. (after Siddiqui, 1996).

Table 2. Morphological differences between zoea I of eight species of majid crabs: *Achaeus lacertosus* Stimpson 1858, *Doclea muricata* (Herbst, 1788), *Acanthonyx limbatus* A. Milne Edwards,1862, *Menaethiops nodulosus* (Nobili, 1905), *Menaethiops bicornis* Alcock, 1895, *Schizophrys aspera* (H. Milne Edwards, 1834), and *Schizophrys pakistanienses* Tirmizi & Kazmi, 1995 and *Micippa platipes* Rupell, 1830.

Characters	*A. lacertosus*	*D. muricata*	*A. limbatus*	*M. nodulosus*	*M. bicornis*	*S. aspera*	*S. pakistanienses*	*M. platipes*
Carapace:								
spines								
rostral	small	no change	no change	no change	no change	long		
dorsal	well-developed	"	"	well-developed	"	no change	no change	absent
lateral	absent	backwardly curved	"	"	no change	backwardly curved	"	well-developed
Antennule:								
aesthetascs	2	"	3	4	"	"	"	"
setae	2	"	absent	1	"	absent	"	1
Antenna:								
protopod	well-developed	barbed	distal end barbed	no change		"	no change	"
	distal end barbed	absent						
Maxillule:								
setae								
coxal endit	7	"	6	7	8	7	"	"
basial endite	6	7	8	7	no change	8	7	"
endopod	1,2+4	no change	1,4	1,1+4	1,4	1,1+4	no change	1,2+4
Maxilla:								
setae								
coxal endite	4+3	6+3	3+3	4+4	3+4	no change	"	5+4
basial endite	5+4	no change	5+5	no change	5+4	3+5	5+4	no change
endopod	5	"	no change	5	5	4	5	6
scaphognathite	12-13	10	13	9	9-10	14	14-16	16-21
posterior process	present	no change	no change	no change	no change	absent	no change	present
Maxilliped I:								
setae								
coxopod	absent	"	"	"	"	"	"	1
basis	10	9	9	9	9	8	8	10
endopod	13	13	no change	13	no change	11		13
	no change							
Maxilliped II:								
setae								
basis	3	"	"	"	"	"	"	"
endopod	5	"	6	5	"	4	7	5
Maxilliped III:	absent	rudimentry	absent	rudimentry	"	"	"	"
Abdomen:								
somites								
dorsolateral knob on somite 2 and 3	present	no change	no change	no change	no change	developed on somite 2 and 3 both	no change	no change
	only somite 2							
posterolateral angles 3-5	small	rounded	long	"	"	long reaching half way upto telson fork	long reaching upto central indentation	small
Telson:								
furca								
lateral spine	1-pair	absent	1-pair	"	"	no change	no change	3-pairs

Micippa platipes Rupell, 1830

Zoea I:

Size.- CL= 0.63mm, TL= 1.5-1.8mm

Duration.-3-5 days

Carapace (Fig. 8A).- Dorsal spine absent; rostral spine long; lateral spines present. Eyes sessile.

Antennule (Fig. 8B).- Uniramous, terminally with 3 aesthetascs and 1 seta.

Antenna (Fig. 8C).- Biramous, protopod developed, distal half of spinous process with spinulate; exopod 2 segmented with 3 terminal cuspidate setae, endopod rudimentry.

Mandible (Fig. 8D).- With well developed incisor and molar processes; palp absent.

Maxillule (Fig. 8E).- Coxal endite with 7 plumodenticulate setae; basial endite with 4 cuspidate and 3 plumodenticulate setae; endopod 2 segmented with 1,2+4 plumodenticulate setae from proximal to distal segments respectively.

Maxilla (Fig. 8F).- Coxal and basial endite bilobed each with 5+4 plumodenticulate setae from proximal to distal lobes respectively; endopod with 6 plumodenticulate setae; scaphognathite with 16-21 marginal plumose setae and with a posterior process.

Maxilliped I (Fig. 8G).- Coxopod with 1 seta; basipod with 10 plumodenticulate setae; endopod 5 segmented with 3,2,1,2 and 3+2 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 natatory plumose setae.

Maxilliped II (Fig. 8H).- Coxopod without setae; basipod with 3 plumodenticulate setae; endopod 3 segmented with 0,1,3+1 plumodenticulate setae; exopod with 4 natatory plumose setae.

Maxilliped III (Fig. 5I).- Biramous, rudimentry.

Pereiopods I-V (Fig. 8A).- Rudimentry.

Abdomen (Fig. 8J).- Five somites each with 2 dorsomedian setules on their posterior margin; somite 2 with a pair of forwadly directed, curved dorsolateral knobs; somite 3 with a pair of dorsolateral knobs directed posteriorly; somite 2 rounded and somite 3- 5 with well developed posterolateral processes.

Telson (Fig. 8J).- Forked with 3 pairs of lateral spines; inner posterior margin with 3 pairs of spinulate setae.

REMARKS

Present study deals with only first zoeal stages of eight species of majid crabs. These larvae agrees well with the description given by Rice, 1980 for the family Majidae and subfamilies except in two subfamilies: Inachinae and Epialtinae. According to Rice, 1980 the subfamily Inachinae has no rostral spine, whereas in *Achaeus lacertosus* (Fig. 1A,A') belonging to subfamily Inachinae has very small rostral spine. In case of *Acanthonyx limbatus* (Fig. 3E), *Menaethiops nodulosus* (Fig. 4E) and *Menaethiops bicornis* (Fig. 5E), representative of subfamily Epialtinae have two segmented endopod of maxillule, which was represented unsegmented described by Rice, 1980. Through the comparision between zoea I of each other, this study shows that the zoea I (Table 2) of *Achaeus lacertosus* belonging to subfamily Inachinae, *Menaethiops nodulosus* and *Menaethiops bicornis* of subfamily Epialtinae is quite similar except the differences in number of aesthetascs and setae of maxillule and maxilla. *Doclea muricata* of subfamily Pisinae and *Acanthonyx limbatus* belonging to subfamliy Epialtinae can be differentiated from *Micippa platipes* of subfamily Mithracinae through the presence of lateral spine on carapace and the absence of 3 pairs of lateral spines on telson, in *Doclea muricata* telson without lateral spine and *Acanthonyx limbatus* with single pair of lateral spine. The abdomenal posterolateral angles on somite 3-5 small in *Micippa platipes* and *Doclea muricata* has rounded posterolateral angles, whereas *Acanthonyx limbatus* has enlarged posterolateral angles on somite 3-5. In *Schizophrys aspera* and *Schizophrys pakistanienses* is quite similar except the setal differences in maxillule, maxilla and endopod of maxilliped I and II, and length of 5th abdominal posterolateral angle, as in *Schizophrys aspera* posterolateral angle reaching half way upto telson fork and in *Schizophrys pakistanienses* posterolateral angle reaching upto central indentation.

This study gives the comprehensive information about the morphological characters of first zoeal stages of all subfamilies except one: Tychinae found in Pakistani waters. It has prove to be a great help for both plaktologist and larvaelogist of the area for taxonomic work (see Rice, 1980, 1981).

ACKNOWLEDGMENTS

The authors are grateful to Professor Dr. Quddusi B. Kazmi, Director, Marine Reference Collection and Resource Centre, University of Karachi for providing research facilities.

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(*Accepted for publication January 2007*)