

NEW COPEPODA OF THE BLACK SEA¹⁾

A. MARCUS

The first studies of the Harpacticoida along the Rumanian shore of the Black Sea are due to Jakubisiak (4; 5).

The group was also the subject of several notes (7; 8), and even of a number of syntheses by known specialists like F. Por and M. Şerban (12; 13, 16).

Although at present the Copepoda of the Black Sea are rather well known, it is still possible to find new systematic units by thorough ecological studies of the fauna of different facies.

While studying a rich material numbering thousands of Copepoda from the sandy and rocky facies of the Rumanian Black Sea coast I found three species new for the Science, of which two belong to the order Harpacticoida and one belongs to the order Cyclopoida Syphonostoma.

The Copepoda of the sandy facies were made available to us by the research staff of the Rumanian People's Republic Academy. The material from the rocky facies was collected by the workers of the Department of Marine biology, "Gr. Antipa" Museum.

1. *Mesochra pontica*, sp. n.

The genus *Mesochra* is represented in the Black Sea by seven species, namely: *pestai*, *pygmaea*, *rapiens*, *heldti*, *aestuarii*, *armoricana*, *xenopoda*.

While studying the rocky facies, among the diatoma and microphytic algae from the silt covering the immersed rocks I came upon several female and male individuals belonging to a new species which I name *Mesochra pontica*.

The type is deposited in the collection of the "Gr. Antipa" Museum, No. 51.

Among the seven mentioned species, *Mesochra pontica* resembles most *M. xenopoda* and *M. armoricana*, which are the only species of the genus *Mesochra* that are provided with six setae in the last joint of endopodite of leg 3, and this character is met with in our species too.

Mesochra pontica resembles *M. xenopoda* by the size of the rostrum, the shape of the furcal setae, the shape and length of the joints of leg 1 in

¹⁾ The photos were made in the laboratory of the Museum.

the female and the male, the number of joints and the structure of the endopodite in the leg 3 of the male, the number of setae of leg 5 in the female and male; at the same time it differs from the latter species by the formula of the armature of legs 1-4, the length of setae of endopodite of leg 3 in the male, the structure of leg 5 in the female and male.

Our species resembles *Mesochra armoricana* by the formula of the armature of the legs 2-4, the structure and the number of setae of leg 5 in the male, and differs from that species by the size of the rostrum, the shape of the furcal setae, the shape and the length of the joints of leg 1 in the female and the male, the structure and the number of setae of leg 5 in the female, and the number of joints of the endopodite of leg 3 in the male.

♀ Length: 0.43 mm. Body elongate, cylindrical, rather broadened in anterior portion; in shape rather characteristic of the genus (fig. 1 A). Rostrum large, prominent, truncate, similar to that of *Mesochra xenopoda*, but differing from the short one of *M. armoricana*. Ornamentation of urosome consists of irregularly arranged denticles, similarly as in *M. xenopoda*. Anal operculum slightly curved, outlined with slender setae, the latter feature being met with in both allied species. Furcal branches (fig. 1 C) short, distanced, rectangular, bearing usual furcal setae as in *M. xenopoda* but unlike the inner furcal setae of *M. armoricana*, which are broadened in anterior portion (9).

Antennula short (fig. 1 B), six jointed, the third joint bearing a sensorial appendage. Last three joints more elongate.

Antenna consists of one biarticulated endopodite bearing 4 apical geniculate setae and three lateral setae and a small unarticulated exopodite.

Oral pieces relatively feebly developed as in all members of the genus.

First pair of legs (fig. 2A) consists of two triarticulated branches. The proximal joint of the endopodite is longer than the exopodite and is bearing an inner seta. The distal joint bears a spine, a geniculate seta apically, and a shorter seta subapically. The three joints of the exopodite are of nearly equal length. The last joint bears two spines and two geniculate setae. The 1st leg in *Mesochra pontica* is very similar to that in *M. xenopoda*, but differs from that of *Mesochra armoricana* in which the exopodite is longer than the proximal joint of the endopodite, and the distal joint of both endopodite and exopodite is elongated.

In the 2nd to 4th pairs of legs the exopodite is triarticulated and the endopodite is biarticulated. Their joints diminish in length, the last joint of the endopodite of 2nd pair of legs reaching half length of distal joint of exopodite while last joint of endopodite of leg 4 scarcely reaches half length of median joint of exopodite.

The armature of legs 2 to 4 as follows:

	Exopodite	Endopodite
P 1	0.1.022	1.120
P 2	0.1.123	1.221
P 3	0.1.223	1.321
P 4	0.1.223	1.221

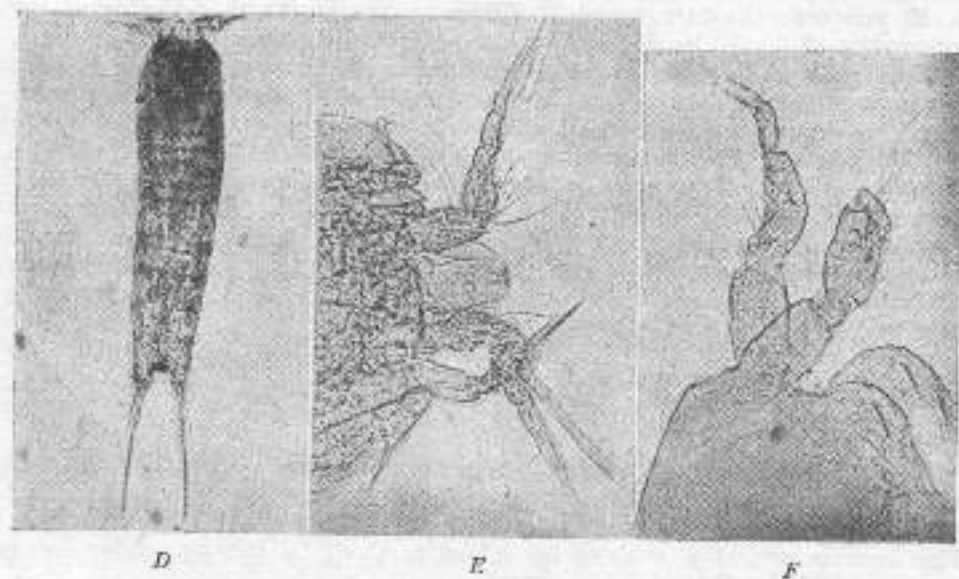
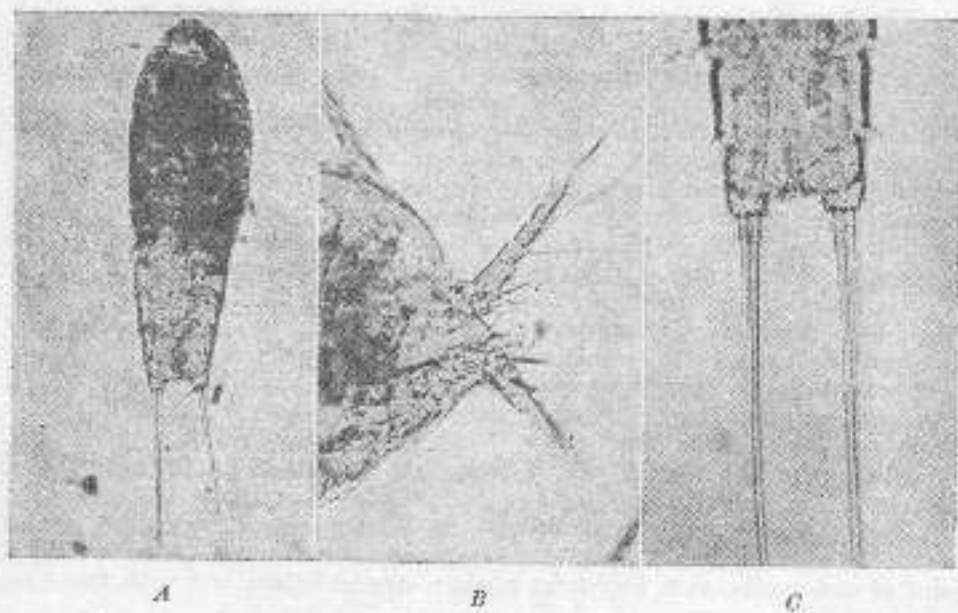


Fig. 1. *Mesochoreus ponticus* sp. n. ♀ and ♂

A: ♀; B: A₁ ♀; C: furca ♀; D: ♂; E: A₁ ♂ dorsally; F: A₁ ♂ laterally (orig.)

The formula is identical to that of *Mesochra armoricana*, and differs from that of *M. xenopoda* by the number of the setae of the last joint of endopodite of leg 2, which are arranged in a 2.1.1. manner, that is having less one seta in comparison with *M. pontica*.

The basiendopodite and exopodite of leg 5 (fig. 2E) bear five setae each. Four of the basiendopodite setae are of relatively equal length, only the second external seta is longer, nearly double, than the remaining ones. The second inner seta of the exopodite outdistances by far the remaining setae. The 5th leg is definitely differing from that of *M. armoricana*, in which the joints are separate and the basiendopodite bears six setae.

Unlike in *M. xenopoda*, in which the two joints of the 5th leg are completely fused, in several examples of *M. pontica* a very faint suture line may be observed between the two joints, but in some specimens it is not conspicuous. Both joints bear the same number of setae as in *M. xenopoda* (9); however, less significant differences may be seen in the length of the setae of the basiendopodite.

♂ Length: 0.36 mm. Shape of body and rostrum (fig. 1B), oral pieces, first, second and fourth pairs of legs do not differ from those in the female.

3rd pair of legs (fig. 2 G) consists of a triarticulated exopodite and a biarticulated endopodite both more reduced than in the female. Distal joint of endopodite with indistinct median stragulation, and with two long apical setae.

The 3rd pair of legs differs from that of the male *M. armoricana* (8), in which the endopodite is triarticulated. The number of joints and the slightly strangled shape of the distal joint of the endopodite are identical with those in *M. xenopoda* (5) from which it differs by the length of the setae of the endopodite of leg 3. In *M. pontica* the seta of the proximal joint is short, reaching only half length of distal joint while in *M. xenopoda* it is as long as the distal joint. Conversely, the apical setae of the distal joint are much longer in *M. pontica* than in *M. xenopoda*.

The joints of the 5th pair of legs are clearly delimited (fig. 2 F). Basiendopodite armed with 3 setae, exopodite with 6 and the apical seta longer than remaining setae. 5th pair of legs very similar to that of *M. armoricana* but definitely differing from that of *M. xenopoda* in which the joints are fused.

An interesting feature appear to be the separating lines of the joints in the 5th pair of legs, which are very indistinct and even then not appearing in all female specimens, while they are clear and conspicuous in the male examples.

Discussion

As it can be seen, *M. pontica* cumulates characters of both *M. xenopoda* and *M. armoricana*. On the basis of my observations I consider that *M. pontica* is related with these two species and constitutes a link between them. This species probably evolved by adapting itself to the particular living conditions of the Pontic environment.

Mesochra pontica appears to be intimately linked with the rocky substrate with silt since it has never appeared in the samples taken from the rocky facies.

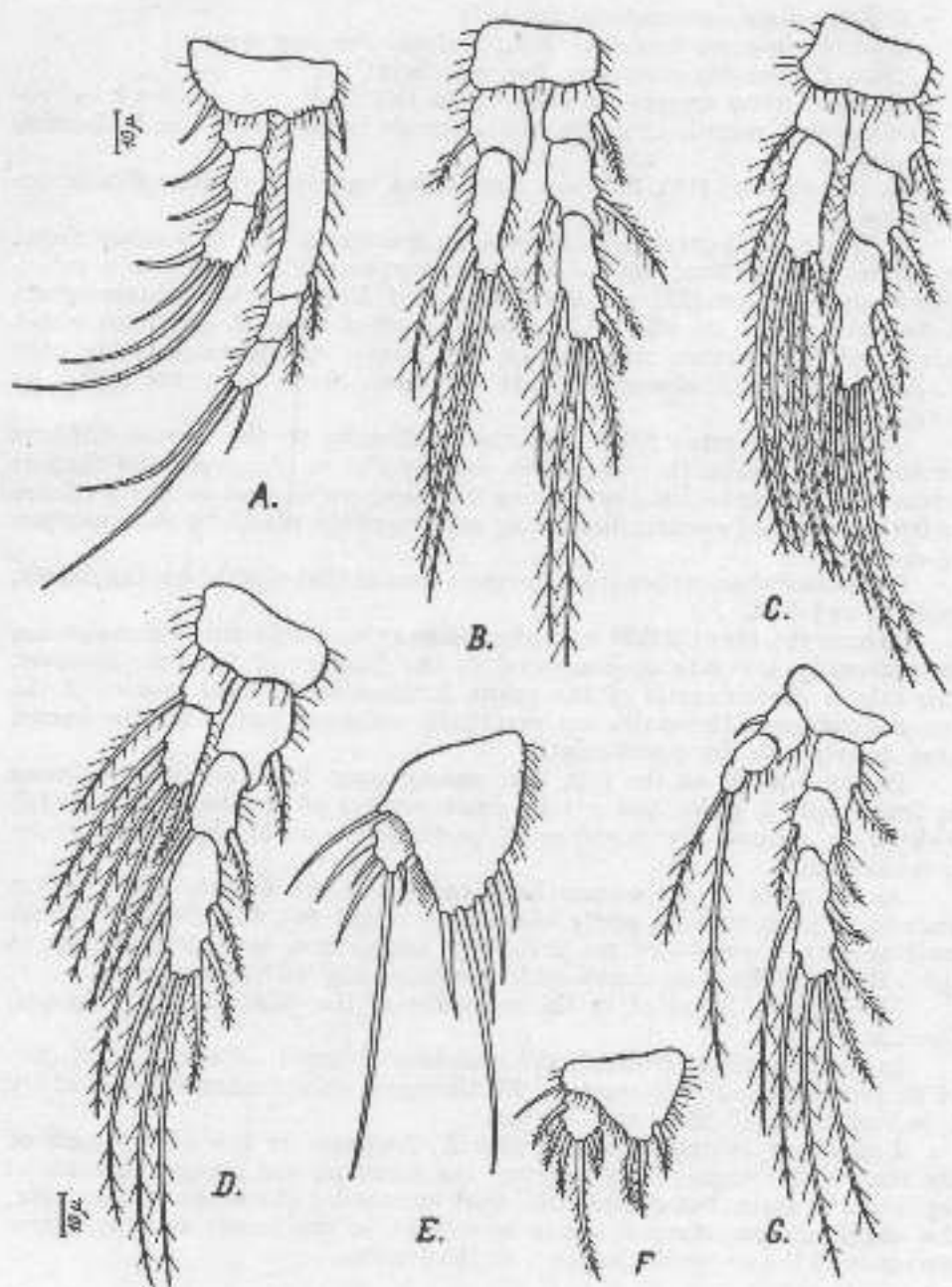


Fig. 2. *Mesochra pontica* sp. n. ♀ and ♂
A-E: P 1-6 ♀; F: P 5 ♂; G: P 3 ♂

2. *Ectinosoma intermedium*, sp. n.¹⁾

(Syn. *Ectinosoma herdmanni* Jak., Şerban, Por, nec Scott.)

(Syn. *Ectinosoma elongatum* Por, nec Sars)

Six *Ectinosoma* species are known from the Black Sea. Jakubisiak (5) as the first records from Mamaia a female he determines as *Ectinosoma herdmanni*.

M. Şerban (16) lists six *Ectinosoma* species, including *Ectinosoma herdmanni*.

F. Por (12) records 5 *Ectinosoma* species of the Rumanian shore, including *E. elongatum*, but he does not mention *E. herdmanni*. In a subsequent paper, Por (13) gives a new list of *Harpacticoida* containing six *Ectinosoma* species, in which *E. herdmanni* is cited while *E. elongatum* is not mentioned. The author stresses that the Pontic specimens resemble both *E. herdmanni* and *E. elongatum*; (13) the same observation was made by Şerban (16).

On studying some 2,000 specimens belonging to the species cited as *herdmanni* by Jakubisiak and Şerban, and by Por as *elongatum* and then as *herdmanni*, I conclude that they belong to a new species that is closely related to both mentioned species, illustrating once more the plasticity and evolution of species.

Our material was taken from the same area as that studied by Jakubisiak, Şerban, and Por.

Among the about 2,000 studied specimens we found only six males, i.e. an extremely low rate as compared to the number of females; however, this rate is characteristic of the genus *Ectinosoma*. In most species of the genus *Ectinosoma* the males are practically unknown, while for the known ones descriptions are insufficient.

Basing himself on the fact that among some 1,500 studied specimens he found only 2 males and a very great number of females, Por (12) felt inclined to assume the existence of parthenogenesis in the species under consideration.

As the male of *Ectinosoma herdmanni* is not yet known, while in the male of *E. elongatum* the joints of leg 5 are fused (6), the study of our six male specimens persuaded me that they belong in a new species which in the 5th leg of the male shows evident relationship with *E. herdmanni*.

The type is deposited in the collection of the "Gr. Antipa" Museum, No. 52.

In *Ectinosoma intermedium* the armature of legs 1-4 is similar to that of *E. herdmanni* and *E. elongatum*. Furthermore, the number of setae of leg 5 is similar in all the three species.

Ectinosoma intermedium resembles *E. herdmanni* in the body length of the female, the shape of the rostrum, the structure and number of setae of leg 5 in the male, but differs from that species by the shape of the furca, the length and structure of the setae of leg 5 in the female and the micro-structure of the exopodite of leg 5 in the female.

¹⁾ I name this species *E. intermedium* because its characters are intermediate between *E. herdmanni* and *E. elongatum*.

Similarities with *E. elongatum* consist in the shape of the furca, the structure of the setae of leg 5 in the female, the microstructure of the exopodite of leg 5 in the female; dissimilarities consist in the shape of the rostrum, the number of setae of leg 5 in the female, and leg 5 in the male with separate endopodite and exopodite.

♀ Length: 0.60 mm. In this respect *Ectinosoma intermedium* rather resembles *E. herdmanni* whose length (0.60–0.80 mm) is shorter than that of *E. elongatum* (0.70–0.88 mm).

The body is cylindrical (fig. 3 A), slightly flattened laterally, ending in a broadened prominent rostrum identical to that of *E. herdmanni*, but differing from the rostrum of *E. elongatum*, which is less elongate.

The furca (fig. 3 D) longer than broad, slightly conical like in *E. elongatum*, but differing from the rectangular furca of *E. herdmanni*, where it is broader than long.

Antennula (fig. 3 C) very short, six jointed.

Antenna, longer than antennula, has well developed endopodite and exopodite.

Maxilliped 2 ending in a claw to beyond middle of basipodite.

The armature of legs 1–4 as follows:

	Exopodite	Endopodite
P 1	0.1.123	1.1.221
P 2	1.1.223	1.1.221
P 3	1.1.323	1.1.324
P 4	1.1.323	1.1.221

The 5th pair of legs (fig. 4 A) consists of well developed exopodite and basiendopodite. The two external setae of the exopodite are rather of equal length, to beyond $2/3$ length of inner seta. Towards external edge of exopodite a row of slender setae and a longer seta, a similar microstructure being met with in *E. elongatum*.

The basiendopodite is provided with two setae about the same length, and of equal length with the external setae of the exopodite.

The structure of the long plumose setae of leg 5 is identical with that in *E. elongatum* (15). The length ratio of the setae differs from that in the latter species, in which the external setae of the exopodite are twice as long as the inner seta of the same joint, while the external seta of the basiendopodite exceeds by $2/3$ the inner seta of the same joint.

In *E. intermedium*, four of the five setae of leg 5 are of rather equal length while the inner seta of exopodite is only by $1/3$ shorter than the remaining ones.

The structure of the setae of leg 5 differs from that of *E. herdmanni* (15), where they are shorter, thicker, rigid and provided with spinules. However, the length ratio approaches that of *E. herdmanni*, where all five setae of leg 5 are of about the same length.

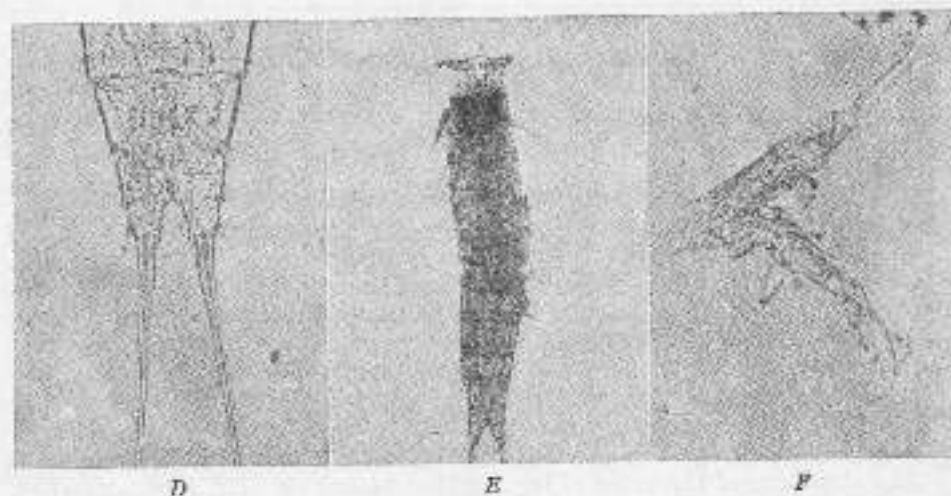
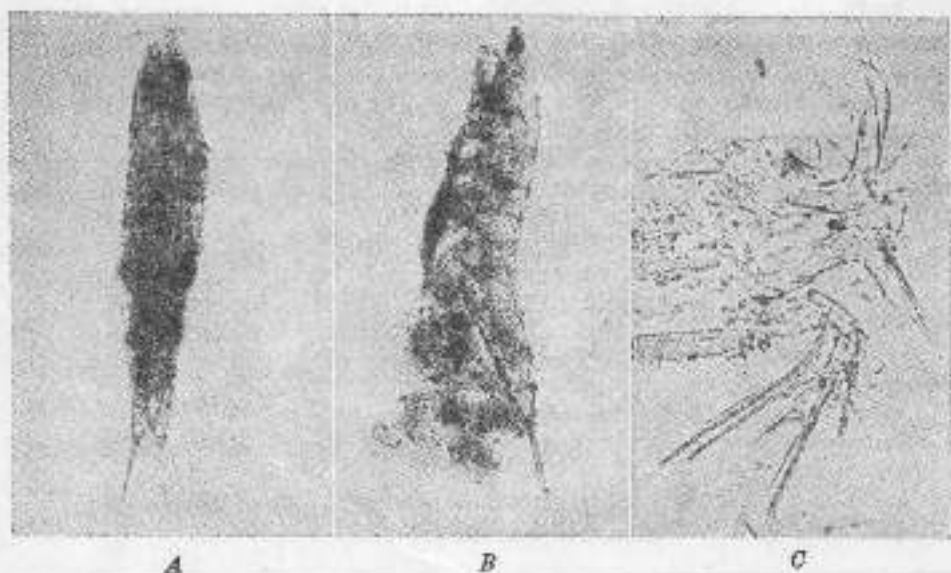


Fig. 3. *Netinosoma intermedius* sp. n. ♀ and ♂
 A: dorsal view of female; B: female with embryos, lateral view; C: A_1 ♀; D:
 furca ♀; E: dorsal view of male; F: A_1 ♂

♂ Length: 0.55 mm. Body shape similar to that of female (fig. 3E), antennula short; oral parts, and legs 1-4 similar to those in the female.

Leg 5 (fig. 4 B) provided with five setae of rather equal length. Four of the setae provided with spinules, like setae of leg 5 in the female of *E. herdmani*, internal seta of exopodite plumose.

Although *E. intermedium* approaches *E. elongatum* by the shape and structure of the setae of leg 5 in the female, it is also approaching *E. herdmani* by the structure and length ratio of the setae of leg 5 in the male.

Discussion.

Based on the fact that *E. intermedium* shows evident systematic similarities with and intermediate characters between *E. elongatum* and *E. herdmani* I consider it phylogenetically as an intermediate species between the two above mentioned ones.

This species once more stresses the plasticity and evolution of the species.

Among the studied examples we found numerous ovigerous females that were carrying nauplii.

Although the scarcity of the males is a very known fact, and the 0.3 per cent rate of the male occurrence is conclusive in this respect, the hypothesis of parthenogenesis is put under discussion, without, however, excluding it, by the fact of their existence.

Ectinosoma intermedium was found only in the sandy substrate, its elongate, cylindrical, pointed anteriorly body being a perfect adaptation to this biotope.

E. intermedium is frequent in the samples from the sandy facies in association with the specific components of the environment, viz., *Canuella perplexa*, *C. fuscigera*, *Ameira parvula*, *Harpacticus flexus*, etc.

3. *Ascomyzon băcescui*, sp. n.¹⁾

(Syn. *Asterocheres* sp. Marcus 1964 (1))

The only *Ascomyzontid* known from the Black Sea, *Ascomyzon carausi* Marcus et Por (7) was found in the rocky biotope of Yalta and off the Rumanian shore at Eforie Sud (= Vasile Roaită).

In the characteristic biotope of the muddy silt with algae and diatoms that covers immersed rocks I have found numerous specimens (females and males) belonging to a new *Ascomyzon* species which I name *A. băcescui*.

The type is deposited in the collection of the "Gr. Antipa" Museum, No. 53.

♀ Length: 0.55 mm. The body (fig. 5 A) is very much broadened anteriorly, cyclopoid-shaped, and flattened dorso-ventrally. Abdomen (fig. 5 D) four-segmented; genital segment laterally broadened results from coalescence of segments one and two.

The furca (fig. 5 C) 1.5 times longer than wide.

Antennula (fig. 5 E) 21-jointed; the first ten joints short and broadened; the remaining eleven more elongate, cylindrical.

¹⁾ I name this species in honour of Dr. M. Băcescu in token of gratitude for guiding my scientific activity.

Antenna 2 consists of triarticulated endopodite provided with claw terminally, and very short unarticulated exopodite bearing simple seta apically.

Oral syphon (fig. 6B) pear-like shaped, short, not exceeding basis of maxilliped.

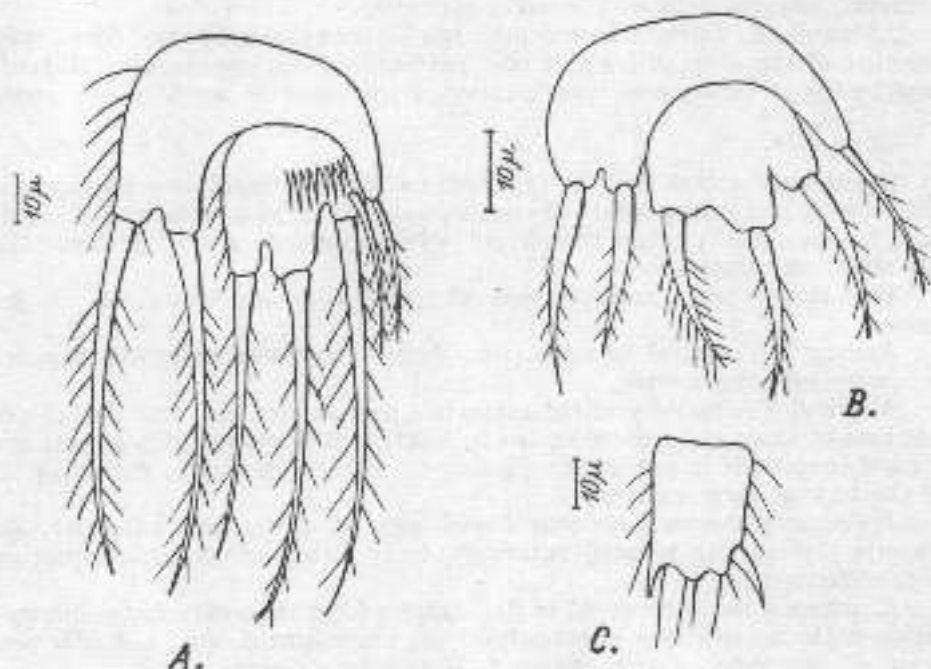


Fig. 4. *Fetinosoma intermedium* sp. n. ♀ and ♂
A: P5 ♀; B: P5 ♂; C: furca ♀

Mandible (fig. 6 C) consists of much elongate, slender, pointed coxopodite, and unarticulated palpus, slightly curved, with two unequal plumose setae apically.

Endopodite of maxilla 1 (fig. 6 D) unarticulated, with three plumose setae of equal length apically and a shorter simple seta laterally. The median plumose seta ending in two unequal branches. Palpus unarticulated, shorter than endopodite, with four plumose setae, three of equal length, one shorter.

Maxilla 2 (fig. 5 B) massive, provided with long terminal claw.

Maxillipede (fig. 5 C) with three long joints, three short ones and a prehensile claw.

The armature of setae of legs 1—4 as follows:

	Exopodite	Endopodite
P 1	1.1.1	1.2.6
P 2	1.1.4	1.2.6
P 3	1.1.1	1.2.5
P 4	1.1.1	1.2.1

The armature of spines of legs 1-4 as follows:

	Exopodite	Endopodite
P 1	1.1.3	0.0.0
P 2	1.1.4	0.0.0
P 3	1.1.4	0.0.1
P 4	1.1.4	0.0.1

The median joints of endopodites of legs 1-4 provided with two short pointed spines at inner angle.

Leg 5 (fig. 6 E) formed of one cylindrical joint attached to an individualized basillar plate, probably resulting from the fusing of the two basien-dopodites.

The basillar plate is provided with two long plumose setae of equal length apically, and with short plumose seta on inner side reaching about 1/3 length of the remaining two. Leg 5 entirely covered with groups of slender irregular setae.

Hereafter are the comparative data of females of *Ascomyzon bæcescui* and *A. carausi*. As the male of the latter species is not known, we can compare only the females of the two species.

<i>Ascomyzon bæcescui</i> ♀		<i>Ascomyzon carausi</i> ♀
Length	0.75 mm	0.85 mm
A. 1	Identical in both species	
A. 2	Identical in both species	
Syphon	Identical in both species	
Mandible	Endopodite without setae Palpus uniaarticulated Plumose setae on palpus	Endopodite with group of slender setae on inner side Palpus biarticulated Simple setae on palpus
Maxilla I	Endopodite with 3 long plumose setae of equal length and a shorter one apically. Palpus with 4 plumose setae apically of which 3 of equal length, one shorter.	Endopodite with 4 simple setae apically, the median ones long, of equal length, the lateral ones shorter, unequal. Palpus with 3 long simple setae of equal length apically.
Maxilla II	Identical in both species	
Maxillipede	Identical in both species	
Formula of setae of exopodite of P 1	1.1.4	0.1.4
Formula of setae and spines of P 2-4	Identical in both species	
P 5	P 5 with 3 plumose setae Seta of basillar plate plumose	P 5 with 2 plumose setae Seta of basillar plate simple

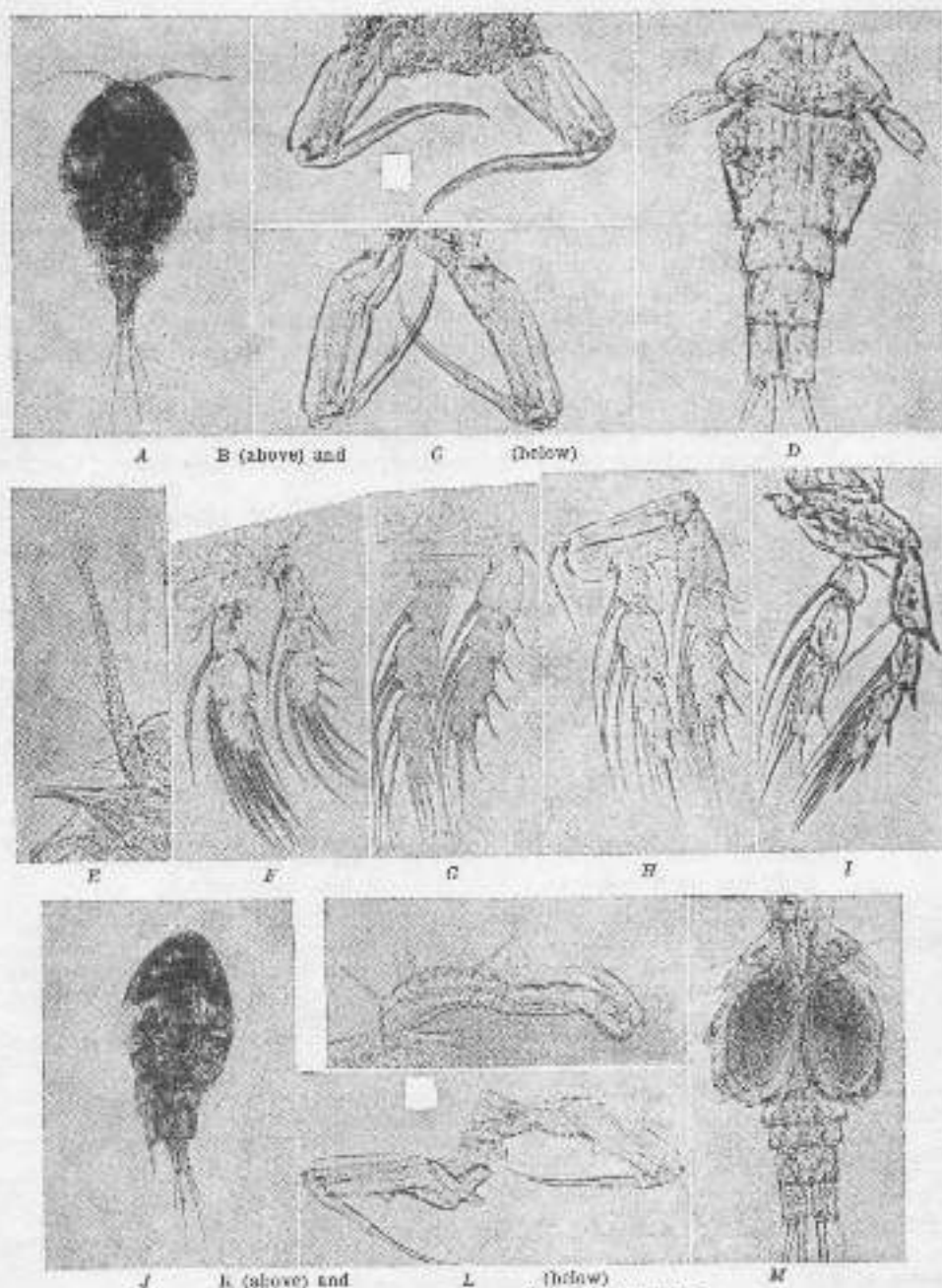


Fig. 5. *Ascomyzon bacescui* sp. n. ♀ and ♂
 A: ♀; B: Maxilla ♀; C: Maxillipede ♀; D: Abdomen ♀; E: A_1 ♀; F-I:
 $P1-P_4$ ♀; J: ♂; K: A_1 ♂; L: Maxillipede ♂; M: abdomen ♂

♂ Length: 0.50 mm. Body egg-shaped (fig. 5, J), less broadened anteriorly than in the female.

Abdomen (fig. 5 G) five-segmented, having one additional segment as compared to that of the female. Genital segment more developed than in

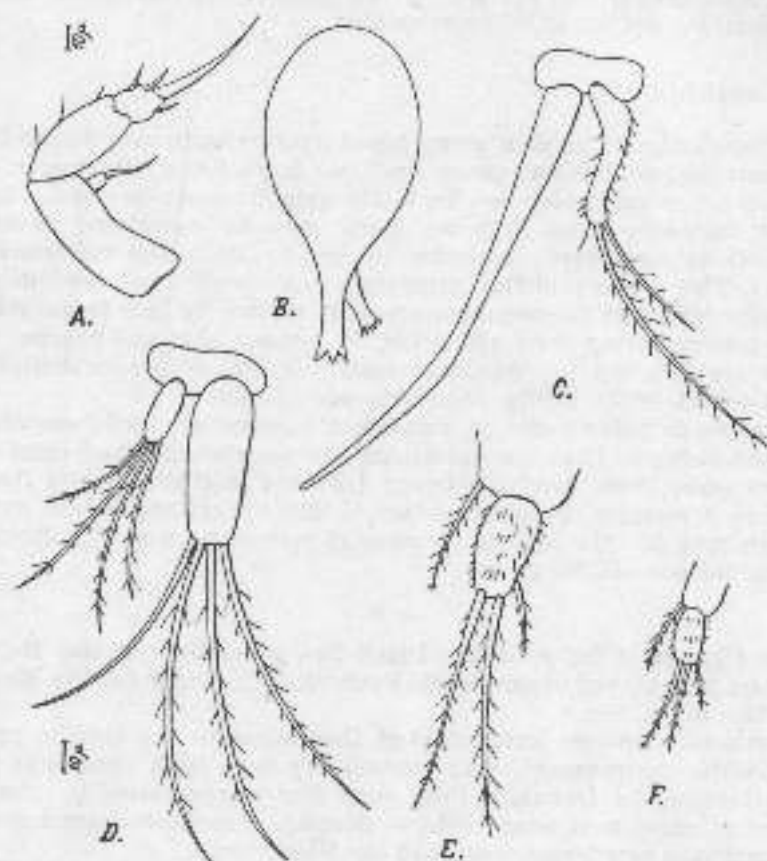


Fig. 6. *Ascomyzon băcescui* sp. n. ♀ and ♂

A: A₂ ♀; B: syphon ♀; C: Mandible ♀; D: Maxilla 1 ♀; E: P5 ♀; F: P5 ♂

the female, ending in triangular prolongation in lower angle. A simple seta above the prolongation. Two subsequent abdominal segments provided in lower angles with one pointed prolongation each.

Furca longer than broad is shorter than in the female.

Antennula (fig. 5 K) with 18 joints; the first ten joints very short and broader than remaining ones.

Antenna 2 and oral pieces with exception of maxillipedes similar to same parts in the female. 3rd joint of maxillipede (fig. 5 L) with pointed triangular

excrecence in first half of inner side. This alteration probably plays a part in mating.

No sexual dimorphism in legs 1—4. Leg 5 (fig. 6 F) identical in shape, pilosity, and setal structure with 5th leg in the female, differing from it only in size. Both length and breadth of the joint are twice smaller than those of the female. Apical setae even smaller.

Discussion

Although the *Ascomyzon* group has a semi parasitic way of life (thoracic pieces parasitic, abdominal pieces free), we have found *Ascomyzon băcescui* always as a free swimming species in the specific rocky biotope. The dorso-ventrally broadened and flattened body may be considered as an adaptation both to temporarily parasitic life and to life in the anfractuositities of the rocks. This group probably presents a non specific and random example of ectoparasitism, as its members are able to live as free forms for a long time and even during their whole life. It appears that the passing to ectoparasitic status is not a prerequisite condition, and occurs incidentally when a specific host or an easily accessible one is met.

I incline to believe this as *Ascomyzon băcescui* occurs frequently in the mentioned biotope. Thus, on examining the samples obtained from washing six rocks taken from depths between 1.20 and 4.50 m I found *Ascomyzon băcescui* in 5 samples. From a surface of 929 sq. cm the lowest number of specimens was 43; the highest number of specimens was 406, from a rock having a surface of 788 sq. cm.

★

The Copepodal fauna of the Black Sea generally contains Mediterranean species that moved to the Pontic basin after the linking of the Mediterranean to the Black Sea.

Eurybiontic species have adapted themselves to the specific conditions of the Pontic environment, viz., low salinity with high variations (7 to 18 per cent) owing to Danube's flow, very low temperatures in the winter, existence of azoic area, etc., without altering. Stenobiontic species were lost or changed into new forms specific of the Black Sea.

Owing to the characteristic of the Pontic environment, which is influencing species plasticity, the Copepodal fauna of the Black Sea is in a stage of transformation and differentiation.

COPEPODE NOI GĂSITE ÎN MAREA NEAGRĂ

REZUMAT

Pe baza studiului unui bogat material, de mii de exemplare de Copepode provenite de la faciessul nisipos și pietros al Mării Negre se descriu 3 specii noi pentru știință, două Harpacticoid, *Mesochra pontica* și *Ectinosoma intermedium* și un Cyclopoid, *Ascomyzon băcescui*.

Două dintre speciile citate, *Mesochra pontica* și *Ascomyzon băcescui* au fost găsite numai în biotopul caracteristic de mil amestecat cu alge care acoperă suprafața pietrelor submersae. *Ectinosoma intermedium* face parte dintre Copepodele caracteristice lacieiului nisipos.

În încheiere se arată că, datorită caracteristicilor mediului pontic: salinitate scăzută și variabilă, temperaturi foarte scăzute în timpul iernii, existența zonei azoice, care acționează asupra plasticității speciilor etc., fauna de Copepode a Mării Negre se află încă într-un stadiu de transformare și diferențiere.

НОВЫЕ ВЕСЛОНОГИЕ НАЙДЕННЫЕ В ЧЕРНОМ МОРЕ

Резюме

В результате обработки обильного материала, из нескольких тысяч экземпляров, взятых из песчано-каменистого дна Черного моря, описываются три новых для науки вида. Два вида, относящиеся к сем. Harpacticidae *Mesochra pontica* и *Ectinosoma intermedium* и один из сем. Cyclopoid, *Ascomyzon băcescui*.

Два из названных, *Mesochra pontica* и *Ascomyzon băcescui* были найдены только в характерных биотопах, состоящих из глы, смешанного с водорослями, покрывающего поверхность погруженных в воду камней *Ectinosoma intermedium* относится к веслоногим, характерным для поверхностного слоя песчаного дна.

В заключение указывается, что вследствие характерных свойств среды в Черном море, пониженного и непостоянного содержания соли, очень низких температур зимой и существования мертвой зоны, оказывающей влияние на пластичность видов, в фауне веслоногих Черного моря продолжают происходить изменения и дифференциации.

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