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CONTRIBUTIONS TO THE KNOWLEDGE OF SOME KALLIAPSEUDIDAE (CRUSTACEA, TANAIDACEA) FROM THE NW OF THE INDIAN OCEAN

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A partir du matériel dragué par lui-même lors de sa participation à la campagne de 1977 du navire «Thalassa» (dans la mer d'Arabie), l'auteur décrit deux espèces nouvelles de *Kalliapseudes*, *K. macrothrixoides* et *K. borceai*, ainsi qu'un genre nouveau, *Cristapseudes*. Dans ce dernier, il encadre l'espèce décrite par Larwood comme *Kalliapseudes omercooperi* et complète sa description, l'écologie et la répartition de cette espèce. Des données écologiques et éthologiques sur les espèces trouvées, surtout de celles du Golfe d'Aden, sont également présentées.

INTRODUCTION

During my participation in the campaign of the French oceanographic research vessel "Thalassa" in the NW Indian Ocean — February-March 1977 — I had the opportunity to dredge at depths of 15—300 m for collecting Peracarida. Some of the Tanaids captured on that occasion have been already described by me (1978). The rest of the Monokonophora make the object of the present paper.

Here are below the stations where I found Tanaidacea and which I noted for each species indicating only their number from the ship's log.

— St. D 070, 22.II.1977; 23 m; 25°03'0" N; 63°30'6" E; bottom of *Ampelisca*, grey calcareous silt, Charcot dredge.
— St. D 072, 23.II.1977; 19 m; 24°52'9"N; 61°34'0" E, in front of Ras Jady; white calcareous silt with *Sternaspis*, red Mysids
— St. D 076, 23.II.1977; 67 m; 26°31'7"N; 56°42'5"E, Ormuz Strait, grey-whitish silt, bottom of *Ampelisca*, Charcot dredge
— St. D 087, 3.III.1977, 110 m; 25°54'5" N; 57°14'8"E (in the white silt brought by the trawl), Oman Gulf
— St. D 090, 6.III.1977; 61 m; 26°39'9"N; 56°40'1"E, Charcot-Dredge,
— St. 102, 13.III.1977; 51 m; 12°18'2"N; 43°28'8"E; in front of the Strait of Bab-el-Mandeb, on clean sandy bottom
— St. 103, 13.III.1977; 24 m; 12°18'0"N; 43°23'2"E, on blackish sand bottom, Charcot dredge.

To this material are added more than one hundred specimens of 3,5—4 mm (♂♀) collected by Prof. Francis Dow Por, on the Israeli coast of the Mediterranean.

DESCRIPTIONS, OBSERVATIONS

We begin this note by demonstrating that the Apseudid described by Larwood as *Kalliapseudes omercooperi* Larwood, 1932 is characterized by important morphological features singling it out within the family of Kalliapseudidae and obliging us to place it in a new genus, *Cristapseudes*.

Cristapseudes gen. n.

Diagnosis. Facies typical of *Kalliapseudes*, but showing the following differences: a strong crest-like epignathus with two lateral ramifications; the sensory organs from the basis of the dactyloclaws of peracopods II and III are lacking; peraeopod I (♂ ♀) has a prominent coxal plate; the middle of flagellum of antenna in ♂ bears special sensory organs; chelipeds and first peracopod have not exopodites; hyposphenia are absent in both sexes; the dorsal-terminal margin of propus and carpus of peracopod II shows tubercles instead of spines.

Generotype : K. omercooperi.

The species *Kalliapseudes omercooperi* was described by L a r w o o d after some specimens from the Canal of Suez (1954) and cited then — with several additional details — by B ă c e s c u (1961) from the Mediterranean waters of Israel. L a n g, as one who attempted a revision of genus *Kalliapseudes* l.s. (1956), could examine the type specimens of almost all the species he knew, with the exception of *K. omercooperi* which we are concerned with.

That is why, in spite of the description given by L a r w o o d (l.c.) for both sexes, detailed enough and sufficient for recognizing this species among the other *Kalliapseudes* known by that time, an important number of external morphological details remained unknown, as there are no other descriptions but those made by the above mentioned authors.

As I could study meanwhile a rich population of this species from the Levantine Mediterranean waters (more than 100 ♂ ♀ specimens from Prof. F. D. Por's collection), as well as another richer one, dredged by myself on 19—24 m bottoms of the Gulf of Aden (March 1977), I shall give some additional information about this interesting Kalliapseudid.

First, I shall complete the description of the type; then, I shall lay stress on the differences existing even between the two populations from the vicinity of the extremities of the Red Sea, i.e. especially age differences, but also a beginning of subspecific differentiation.

Mention should be made that the small population from the Gulf of Aden (3,5—5 mm) — the most numerous in that area — corresponds better to the Mediterranean type, despite some differences, either biological (an almost half reduced prolificity of the latter) or morphological; as far as morphological differences are concerned, we mention that only the population from the Gulf of Aden shows more segments on the flagella of antennula and particularly more aesthetascae.

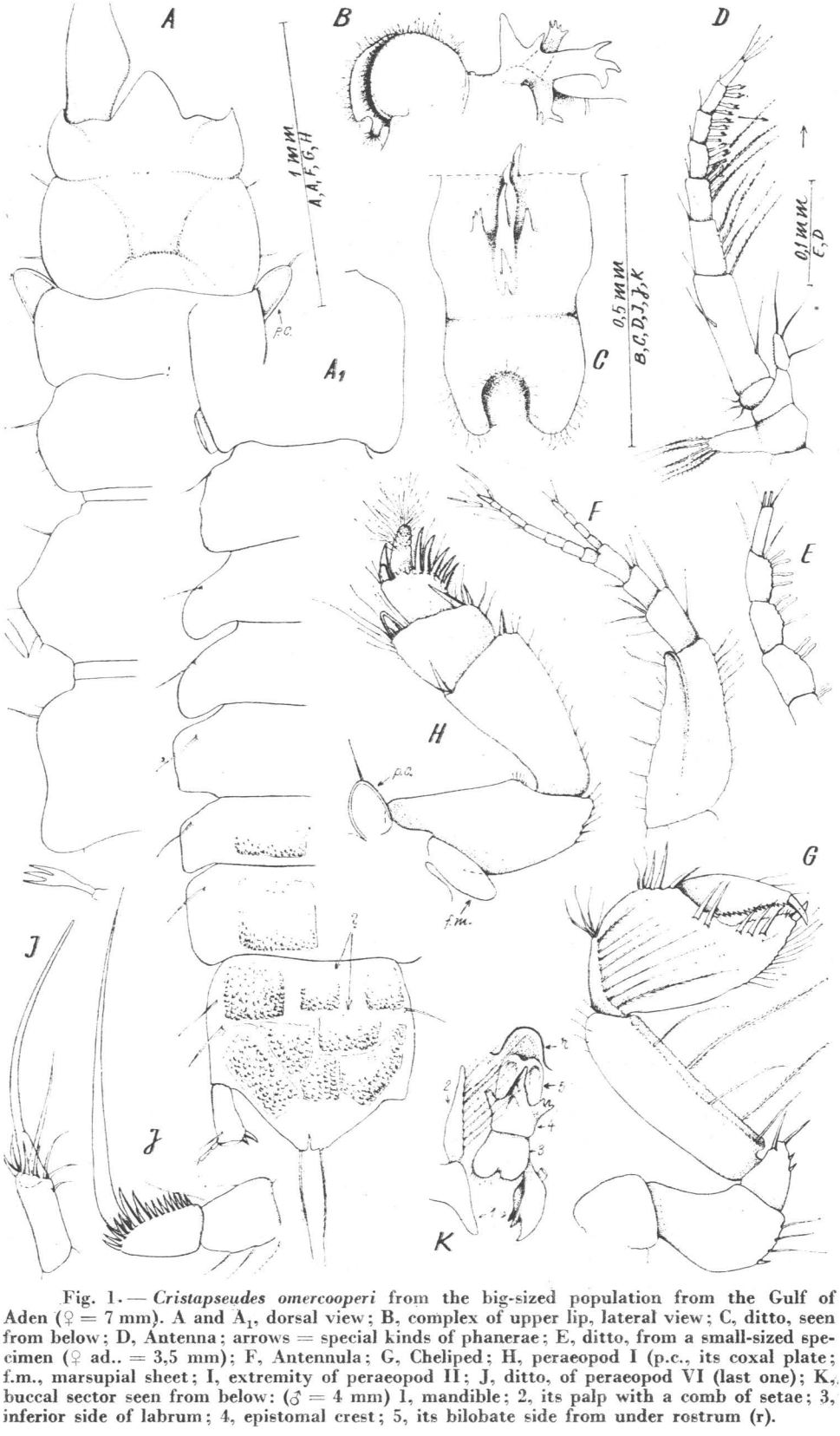

Fig. 1. — *Cristapseudes omercooperi* from the big-sized population from the Gulf of Aden (♀ = 7 mm). A and A_1, dorsal view; B, complex of upper lip, lateral view; C, ditto, seen from below; D, Antenna; arrows = special kinds of phanerae; E, ditto, from a small-sized specimen (♀ ad.. = 3,5 mm); F, Antennula; G, Cheliped; H, peraeopod I (p.c., its coxal plate; f.m., marsupial sheet; I, extremity of peraeopod II; J, ditto, of peraeopod VI (last one); K, buccal sector seen from below: (♂ = 4 mm) 1, mandible; 2, its palp with a comb of setae; 3, inferior side of labrum; 4, epistomal crest; 5, its bilobate side from under rostrum (r).

It is worth mentioning that the other possible disagreements between Larwood's figures and our present ones are either anomalies (e.g. the enormous claw from the mobile dactylus of chela, see its Fig. 1 J), or drawing errors, corrected below; among them, we quote the followings: the presence of common penate setae on flagellum A_2 (its Fig. 1 C), small coxal plates at the basis of peraeopod I (Fig. 1 A); common spines at the end of the external edge of propod and of carpus of the same peraeopod I, instead of tubercles, as well as the lack of spines on the internal-distal side of the basis of uropod.

The big-sized population from the Gulf of Aden — which coexists with the small-sized one in some stations — differs from both above mentioned small-sized populations not only by size (5,5—7 mm) and light colour, but also by a more important prolificity, going up to 50—60 juveniles, as well as by a large number of articles in the flagella of antennula (8+4) and longer setae on cheliped (especially on propod).

1. *Cristapseudes omercooperi* (Larwood)
(Syn. *Kalliapseudes omercooperi* Larwood, 1954)
(Figs 1 and 2, A-L)

Material. St. D 070: 43 specimens in which ♀♀ are dominant, but also the manca stage; D 076: 428 specimens (taken at random from thousands of them, among which ♀♀ are massively prevailing 6% ovigerous); only 6—7% are ♂♂ and 9 % juveniles. Exclusively the population of 3,5—4 mm.

— St. D 087: 2 specimens = 6 mm.

— St. 102: 3 specimens (2 ♀♀ = 5,3—5,5 mm; 1 ♂ = 5,5 mm).

— St. 103: 15 specimens and 20 manca: small and mixed population and respectively big-sized population.

Size of the big-sized population: 5,4—7 mm, most of them 6—6,2 mm; the small-sized Adenaic population: 3—4,5 mm; the eastern Mediterranean one: 3—4,5 mm.

Supplimentary data added to the original description.

In the small-sized population from the Gulf of Aden, tegument of specimens in fresh state or recently captured is brown-blackish. Thoracic segments straight, practically glabrous (Fig. 1 A and A_1). Some specimens of the big-sized population show on their abdomen a kind of somewhat geometrical formations (particularly square) full of granulations (surely a parasite?) (Fig. 1 A_1). Telson of *K. tomiokaensis* type, i.e. suddenly pressed in a triangle between the rami of uropods and ending by two penate setae (Fig. 1, A_1 and J, Fig. 2), which make it easily distinguishable among the other *Kalliapseudes* with a round or largely triungular tip of telson, provided with numerous setae. Dorsally, telson has only one or two lateral hair-spines.

Hyposphenia, present in almost all species known for the large genus *Kalliapseudes*, are absent or reduced as far as number and size are concerned. Indeed, in ♂ we find only several needle-shaped caudally-directed little spines on the free sternites II and III; for the rest of the body, we notice at the most some longitudinal median prominences both on peraeon and pleon. The last peraeonite has a penial prominence like a high cone, whose tip is

provided with a spine. They lack completely in ♀♀, traces of them subsisting only in juveniles; but it is curious that in ♀♀ too, the sternite of the last thoracomer has a weak prominence with a tiny spine on its posterior side. On terminal and inner side of the basis of uropod, 2—3 spines transversally juxtaposed.

In *C. omercooperi* — with a hollow labrum and very hairy lobes (Figs 1 B, C, K and 2 D, E, F, G), after the common depression — let's call it "saddle" — we notice a middle segment like a cock crest (4 Fig. 1 K and 2 D) which ends by a somewhat heart-shaped plate (5, Fig. 2 K). The cock-like crest is easily seen above rostrum, if we press a little between the first two thoracic segments (crustacean being kept in natural position), so that the frontal side of carapace be lifted (Figs 1 K and 2 D), like an acute-angled triangle with two lateral tubercles or even like a trident. Ventrally, it appears as shown in Figs 1 C, K and 2 D; i.e. a longitudinal prominence with a curved crest provided with 4—7 irregular tubercles, succeeding each other in a semicircle, on the median line and flanked by other two usually bi- or trifid tubercles (Fig. 1 K). Laterally, it is more difficult to see the crest, because of the comb of penate setae of the mandibular palp closely glued together on labrum complex (1—2 Fig. 1 K); in this species, the crest appears to be a feature as constant as varied considering form, size or tubercles arrangement (Fig. 2 D-G). This special epistome emerges in the species *C. omercooperi* since the manca stage; at first, it is simple, the crest having only three tubercles and unicuspidate lateral rami. In the specimens of the big-sized population, the crest is provided with 6—8 tubercles and multifid lateral prominences. The Mediterranean population shows a less, obvious crest — usually, a swelling with many short tips (Fig. 2 G).

Mandible has nothing uncommon: it shows in the population from the Indian Ocean too the usual dimorphism (without and with mobile lacinia), with a one-segmented palp on the right hand (1—2 Fig. 1 K); the rest of the masticatory pieces like in the type.

Antennula differs from Larwood's figure 1 b by its short and wide basal article (Fig. 1 F) which, even together with flagellum is much shorter than the rest of the segments.

In the big-sized population the little flagellum fixed on the IV-th segment of basis is 4-segmented, its edges having only 4 external setae-spines and several internal simple setae; they dilate so strongly on the proximal side that they touch each other in front of rostrum (Fig. 1 A).

Antenna ♂ adult shows a characteristic unique within the family, at least according to the descriptions and figures known so far, i.e. the presence of special phanerae — undoubtedly, special sensory organs — like little spoons (Fig. 1 E): 2, 2, 3 and 4 for each middle segment — in the Aden population or like little pitchforks with 3—4 unequal teeth (Fig. 1 D, arrow) — the inner lobe of antenna has 4—6 thick pennate setae. Scale of antenna (Figs 1 D and 2 C) is small, oval, armed only with 3 hairs even in specimens of 7 mm (Fig. 1 D). Between the segment supporting the scale and the long segment of flagellum there is a short segment with 3—4 setae, but with smooth articulations, not notched like in *K. crassus* Menzies (1953). The long basal

segment is provided with about 14 enormously long pennate setae (as long as A_2) in the big-sized population.

Chela ♀ never has a prolonged claw of dactylopodite as figured by Larwood (l.c., Fig. 1 J); I checked this up on 70 Mediterranean specimens and more than 100 Adenaic ones. It seems that the author met an anomaly.

Cheliped has the form and armature as shown in fig. 1 G, with longer setae on the inner face of propod. Combs of pennate setae are longer in ♀; its anterior-inferior side is covered by more hairs than in ♂. Cheliped ♂ with dactylus and distal third completely rugous (Fig. 2 A) (less rugous than in the Aden small-sized population Fig. 2 L); dactylus, hollow all along the inner face, is bent in a right angle over the wide distal surface of propod, between the inner tubercle, as long as the fixed dactylus and a slight outer prominence on the margin of palma. All these rather form a subchela like in amphipods (Fig. 2 A).

Ischium with a sharp, hard and rugous tip slightly bent inwards and close to its homologous, like two teeth when chelipeds glue together in normal position.

Peraeopod I (Fig. 1 H) with dactylus transformed into the whisk of sensitive hairs common to the genus, which cannot be called aesthetasks as Lang considers (l.c., p. 215). On the inferior-anterior edge of propod there are 5 spines finely serrated in the proximal half; on its corner, 2 blunt spines rather like apophyses, and a blunt spine in the same position on carpus (Fig. 2 K, arrows) which are not clearly figured in type (compare Larwood's Fig. 2 a and our Fig. 2 K, arrows), but are present in the Mediterranean population. This kind of blunt phanerae also characterizes the species *C. omercooperi*. The coxal plates of this peraeopod show themselves like oval plates ending by a thick seta, strongly jutting out (p.c. Fig. 1 A) and practically coming in contact with the respective epimeres, as they do not bend at any movement of peraeopod I.

In all three examined populations, dactylus is provided with a common claw hardly exceeding the claw of the fixed dactylus when chela is closed (Fig. 1 G and H and J Fig. 2).

Peraeopods II and III like in type. Their dactyloclaws have common tips, not differentiated in tongs and without tiny subterminal setae (Fig. 1 I); in both sexes of the three populations, they are longer than the dactyloclaw of last peraeopod, whose propodite is provided with only 2 large outer spines and with the usual inner comb (Fig. 1 J); only rarely it has a single spine of that kind in the population from the Indian Ocean.

The dactyloclaw of last peraeopod is as long as four segments of the latter taken together; its end is laminate (Fig. 1 J and 2 B). Only 2 long spines, subterminally curved on the inner edge of the propodal disc (4—8 in the other species from the NW Indian Ocean).

Peraeopods IV and V show in juveniles 4 short spines around the dactyloclaw, as figured by Larwood, but in the big-sized population, their number goes up to 10 and their length exceeds the sensory organ.

Pleopods like in type. Uropods have a basis slightly longer than the tip of telson and are provided with one or 2—3 spines at the distal and inner

ends, which are not figured in type; a common spine and a little one are present in all the specimens of the Israeli waters population; the big-sized population always has 3 little spines (Fig. 1 A_1 and 2 J). Its rami are 18—19 and respectively 3-segmented.

Manca stage differs from adult only by the large exopodites of the last two peraeopods as well as by the smaller number of phanerae and segments.

Colour of alive specimens. The small-sized population from the Gulf of Aden had a rich brown pigmentation on dorsal side, more marked on the anterior halves of carapace and of telson (2 Fig. 2 J). The colour persists under the form of double networks of brown pigment even four years from the fixing in formalin, ♀♀ preserving it better. Brown are especially the anterior lateral sides of thoracomers. Pleonites, antennae, peraeopods and pleopods are perfectly transparent; they become opaque, marmorean in specimens ready to shed their coat. Chela ♂ is intensely pink and the colour is imprinted to the whole preserved animal. Chela ♀ is hyaline. In other specimens, on the chalk-like background of tegument appear two dorsolateral brown spots (more often triangular) on thoracomers and pleomeres alternating with a double chain of white spots.

Eyes like chalk bordered in brown.

Even if brown colour is obvious in alive specimens so that one could immediately distinguish the little crustacean crawling along the whitish detritus of the dredge, it often disappears even a few hours from fixing remaining only white-flat spots on the transparent background of tegument.

The big-sized population is light-coloured.

Ecology, ethology. C. omercooperi is a tubicolous species; as a consequence of its way of life, chelipeds closely glue together (the inner face of propus bearing setae is straight, the outer one is curved). Pulled out of its refuge, it always agitates its appendices with combs of long pennate setae drawing detritus towards its masticatory pieces.

The species is extremely abundant both in Eastern Mediterranean waters and in the Gulf of Aden, reminding of the concentrations of the most abundant known *Kalliapseudes: K. crassus* with 140 000 specimens/m^2 in the Californian waters (B a r n a r d, 1970).

Most of the ovigerous ♀♀ from the Levantine Mediterranean had 10—16 eggs; those belonging to the small-sized population from the NW Indian Ocean, even if of the same size (4,5—5,5 mm), had 24—28 eggs. In both cases, eggs are slightly oval, ivory coloured, transparent during the first stages, yellowish later. The big-sized population had over 30 eggs (35 to 60).

Taking into account the number of the females ovigerous or with marsupial lamellae, the Adenaic population multiplies well in February and March; that of Israeli, in July. The four pairs of marsupial lamellae form a single pouch stretching between peraeopods I and V on which the first are fixed.

This species occurs in such a great number on the white silty, calcareous bottoms (less on blackish silts) that, when I poured the sifted content of dredges in the crystallizer, *C. omercooperi* was really teeming in the de-

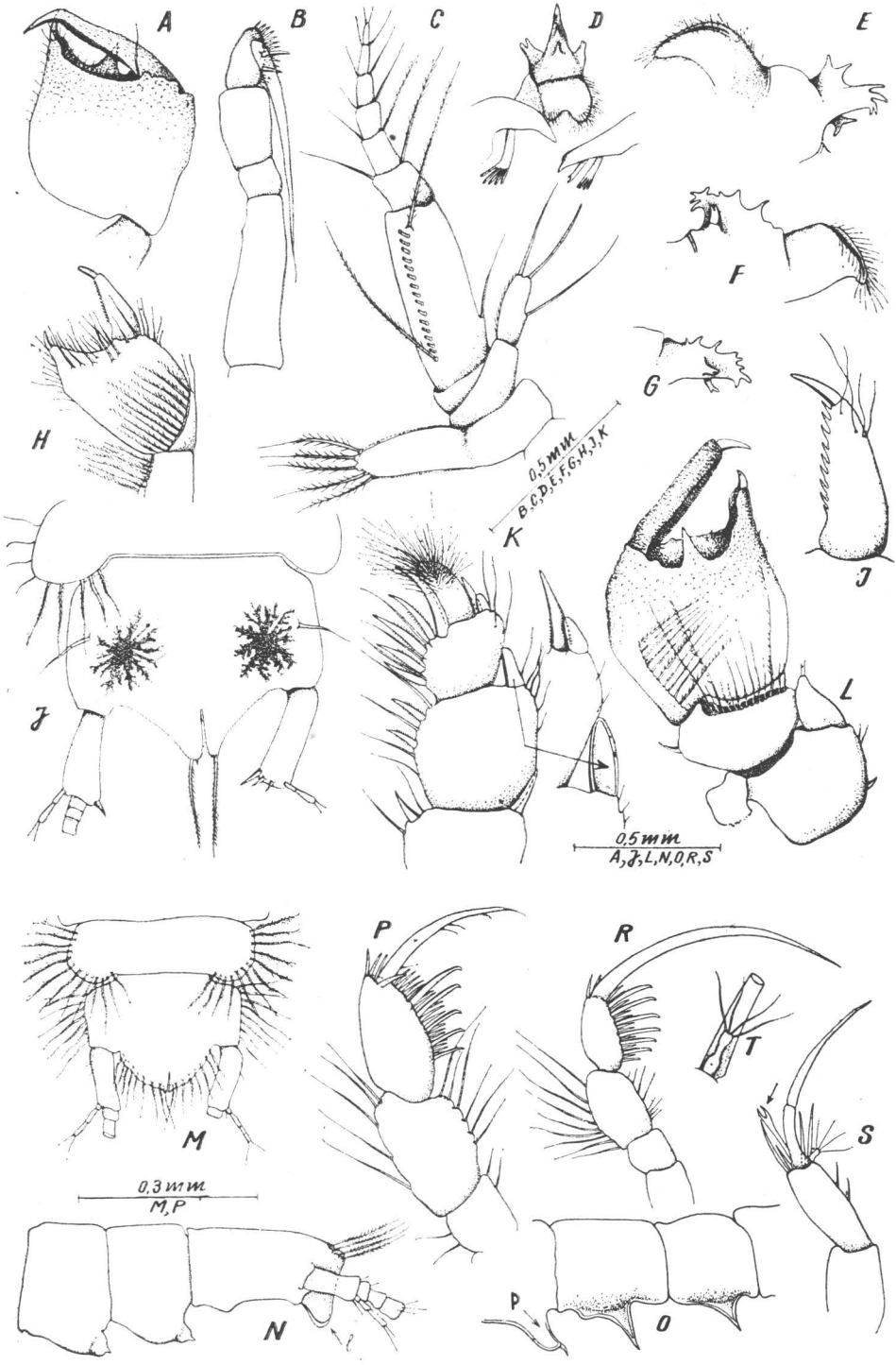

Fig. 2. — A-L *Cristapseudes omercooperi*. Small — sized population (3—3,5 mm): A, B, D from the Israeli Mediterranean waters; the rest from the Gulf of Aden (3,5—4,5 mm). A, Subchela ♂ seen from outside; B, last peraeopod ♀; C, Antenna; D, Complex of labrum seen from below; E, ditto (♂) in profile; F, ditto (♀); G, crest of rostrum (♂); H, Chela ♀ seen from inside; I, a magnified ♀ dactylus from another specimen; J, Telson with brown arborescences; K, Peraeopod I; arrow indicates magnified spines-tubercles; L, Cheliped of a ♂ of 3,5 mm, seen from the inside. M-T, *Kalliapseudes macrothrixoides*, sp. n. small-sized population ♂♀ (6—7 mm) — St. D5; M., telson and last pleonite (from above); N, idem, lateral view; O, hyposphenia and penial organ of the last thoracomers, p; P, dactyloclaw of peraeopod VI (♀ = 6 mm); R, id (♂); S, dactyloclaw of peraeopod III ♂, arrow points to the "fork" phanera typical of propus; T, sensory organ, magnified in order to make visible its clear articulation.

tritus from which they could be readily distinguished by their brown colour and by their sudden movements aiming at hiding.

The species was captured especially on whitish calcareous oozy bottoms, now and then on blackish sands (St. 103). It was accompanied by *Tanapseudes ormuzana* Băc. and *Pagurapseudopsis iranica* Bac.

2. Kalliapseudes (Kalliapseudes) macrothrixoides sp. n.

(Fig. 2, M-T and Fig. 3, A-L)

Diagnosis. Big-sized (7—10,3 mm) with bilobate labrum and prominent epistome, but without spine or crest; prominence hard bifurcate forming the subrostral third of labrum, under which it gets curved. Telson rounded, larger than longer, 1/2 of the length of uropods basis exceeding its apical side.

Antennula *with 4 segments in internal flagellum* and 9 in the external one. Antenna with sharp scale provided with 7—8 simple hairs. Propus of the last peraeopod (VI) ± lamellar, with 7—10 spines, subapically curved. Chela with a large oval area on terminal side of propus.

Material, origin : 2 ♂♂ from a big -sized population (10—10,3 mm) and 2 ♂♂ +1 ♀ = small-sized population (7—8 mm); St. D 087; 1 ♂ and 1 ♀ also small population (6—7 mm), St. D 072.

Description of ♂♂. Tegument shiny, calcareous and breakable (pressed under lamellae, the palm of a chela breaks; in dozens of pieces). Thoracomers ± rectangular, well distanced; they gradually grow longer up to thoracomer V (the longest) and become nearly half shorter on thoracomer VI). Body almost glabrous, provided only on antero-lateral edges of thoracomers with a fine hair (h, Fig. 3 B); pleonites show anteriorly above epimeres a fine hair somewhat masked by the rich group of pennate setae from their sides (h, Fig. 3 C).

Carapace areolate, with a deep X (Fig. 3 B); peraeonites smooth — only the first is provided with slight lateral areolations. No trace of coxal plate visible from above on the first thoracic free segment (in profile, the narrow ring-like coxa of peraeopod I can also be seen).

Telson wider than longer, with more than 30 double-pennate setae on the round terminal margin, some of them fixed above the apical excavation (Figs. 2 M and 3 C); below, it has 2 para-anal lobes placed like a parenthesis (ventrally seen) delimiting a funnel-like space; in profile (1, Fig. 2 N) it resembles a prominent spur.

Laterally, telson shows about 10 not pennate hairs. Strong median prominences all along the sternal length of peraeonites and pleonites ending with long acerate (very sharp) hyposphenia directed caudally, even in ♀. Hyposphenia begin on the sternite of segment supporting maxillipeds III and grow longer up to the penial segment (0), the only one which is swollen (p, Fig. 2 O).

Ventral side of pleon also shows hyposphenia — not long but globulous, short, with a sharp tip directed caudally (Fig. 2 N).

Labrum bilobate; close to its lips there is the incisive side of mandibles: epignathus with a median prominence of hard tissue which bifurcates upwards strengthening the subrostral heart-like side which disappears under rostrum

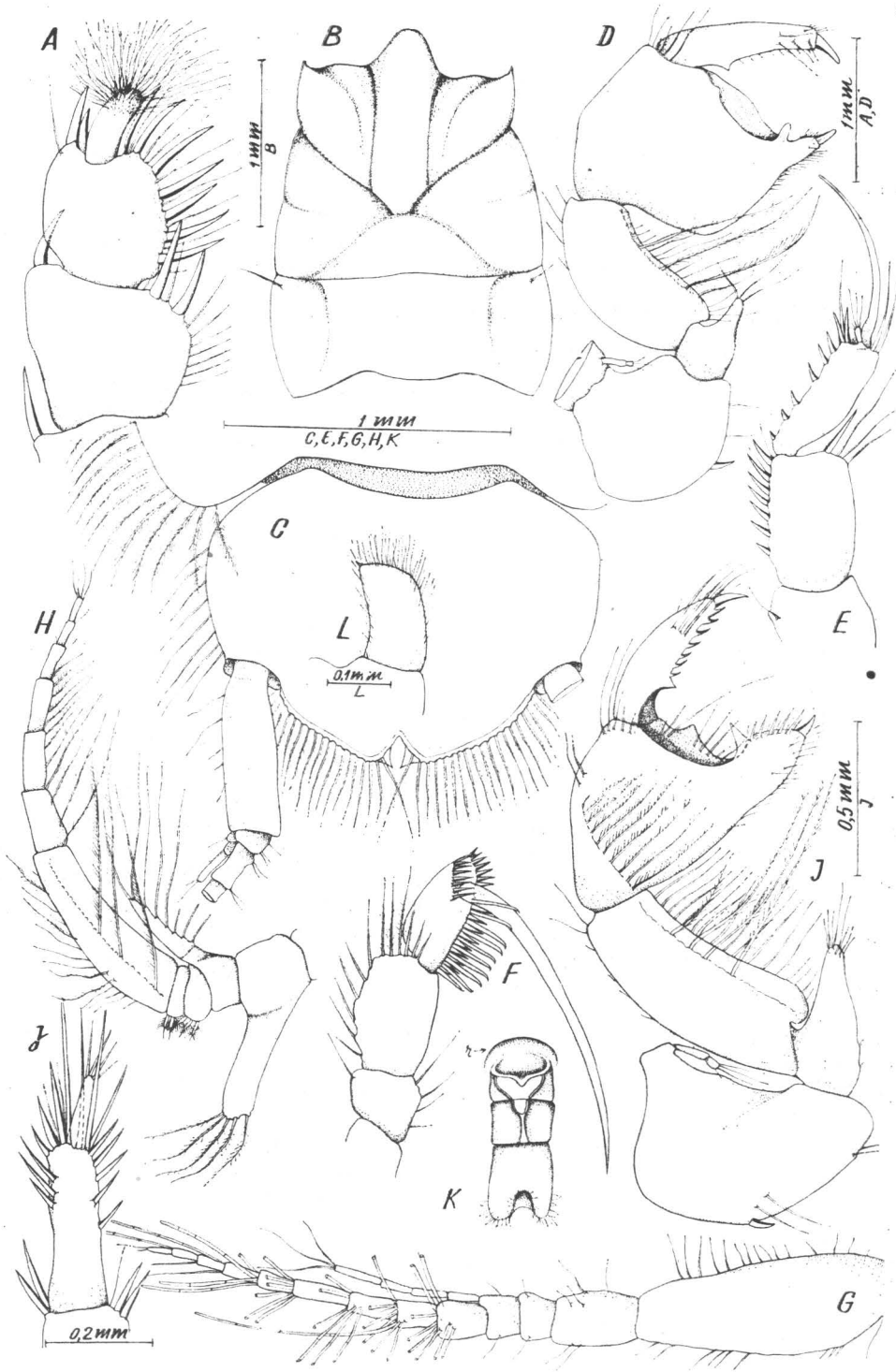

Fig. 3. — *Kalliapseudes macrothrixoides* sp.n., ♂♂ = 10,3 mm and 7,8 mm; A, Distal segments of peraeopod I; B, Carapace and first free thoracomer; C, Telson and adjacent pleonite; D, Cheliped seen from the outside; E, Extremity of peraeopod III; F, idem, of last peraeopod; G., Antennula; H, Antenna (♂ of 8 mm); I, Cheliped (♂ = 7 mm), seen from the inside; J, sole (flat propod) of peraeopod IV (♂ = 8 mm), ventral sight; K, labrum; r, tip of rostrum seen from below S; L, labium (♂ = 8 mm).

(r, Fig. 3 K). Labium (Fig. 3 L) with a tiny apical spine; the rest of masticatory pieces common to the genus. 2 short retinacles on Maxilliped II.

Antennula (Fig. 3 G) with proximal basal segment short; endopodite 4-segmented and exopodite 9—11-segmented, provided with rich verticils of long aesthetasks (much more numerous than those indicated in the mentioned figure and decreasing towards the tip: e.g. 30 on its first basal segment and only 3,2,1 on the subterminal ones). Flagellum with these aesthetasks becomes so thick that it resembles a brush for washing test tubes.

Antenna (Fig. 3 H) with first basal segment showing a long apophysis with 4—5 pennate setae visible from above which move between the bases of antennulae; the second segment bears a sharp scale with 8 simple hairs; follow two short segments with pennate internal short setae. The long segment with the usual comb of setae provided with fine and long cilia only on antero-dorsal side.

Chelipeds with 2-segmented exopodites. Propus not rugous, but smooth and shiny, marmorean marking by dozens of transparent ovals the insertion of the muscular fascicles of the adductor of dactylus. Terminal side of propus — like in *Cristapseudes omercooperi* — is largely oval, having the aspect of a masticatory surface of a molar tooth. It has an external tubercle and two sharp internal prominencies — one at the basis of dactylus, the other under the terminal spine of the fixed finger. The other details can be seen by comparing figures 3, D and I. Internal setae of propus are cilia only on their antero-dorsal side.

Peraeopod I (Fig. 3 A) with a morphology characteristic of genus *Kalliapseudes*, shows 7 spines finely toothed on the inferior edge of propus and 2 spines normally pointed above, near the sensory dactylus. Propus and carpus a bit longer than wider.

Peraeopods II and III with moderate cylindrical basipodites, and without any sensitive hair on propus; in exchange, they have a bifid phanera (like a fork) at the end of propus (Fig. 2 S, arrow); those of peraeopods IV and V are very thickened; the ones of peraeopod VI are frail, laterally flat and partly transparent. Dactyloclaw of this peraeopod distinctly longer and more vigorous than that of peraeopods II or III, its finely laminated tip reaching basipodite (compare E with F, Fig. 3). Propodal disc of last peraeopod with 7—10 spines on the inner margin and a usual comb of short laminae on the outer margin. Sensory organs of the dactyloclaws of peraeopods II and III are well developed, showing 5—8 sensory hairs (Fig. 2 T) in the small-sized population (Figs 3 E and 2 S) and 7—9 in the big-sized one.

Sensory organ of peraeopod IV is strong, as long as half the length of propus, wide (like a sole seen ventrally) strongly armed with spines (Fig. 3 J).

Pleopods foliaceous with much smaller exopodites. Bases of uropods much longer than telson (Fig. 3 C), without a trace of spines (as a in *C. omercooperi)* or spur (as in *Monokalliapseudes gianucai* (B ă c e s c u, 1961). Exopodite 3-segmented (Fig. 3 C); endopodite 31—33-segmented, as long as pleon plus the last three thoracal segments.

Small-sized population (Fig. 4, A—D and H, J) from St. 103 (3 ♂♂, 3 ♀♀ = 6—6,5 mm and 2 manca). ♂♂ with crest of epignathus less obvious; big flagellum of antennula 7-segmented while the little one is 4-segmented; short flagellum of antennula 2—4, more often 3-segmented in ♀ (sometimes, asymmetrical: 3 segments on the left side and 4 on the right side) and as long as pleon+last 2—3 pereonites.

Dactyloclaw of peraeopod VI more massive and shorter than on peraeopods II and III in the big-sized population; it is provided with a short hair and is not thread-like; its propus with 5, rarely 6 spines. Maxilliped III with 2 thick retinacles.

Endopod of uropod 27—29-segmented. Number of phanerae grows with age: from 5 to 7 on propus of peraeopod I; number of external spines on peraeopod II grows from 5 to 7; segments of endopodite from 2 to 4 and of exopodite of antennula from 9 to 11.

Hyposphenia ♂♂, keeping the proportion, are much longer, finer and sharper.

Description of ♀ (= 6 mm). Dactyloclaw of peraeopod VI as long as propus seems blunt as it has asymmetric tongs and two fine subterminal hairs; it is provided with 5 external spines on propus. Dactyloclaw of peraeopod II apically not laminated, with a tiny hair; sensory organ clearly articulated. Chela shows a weak dimorphism (Fig. 5 C — arrow, compare with 4 D).

Peraeopods IV and V provided with a strong sensory organ on dorsal postero-upper side of propus that lacks on peraeopods II and III which show, in exchange, a fork-like phanera (Fig. 2, S, arrow) on the exterior of the terminal side of propus.

In little ♀, dactyloclaw of peraeopod VI with 5—6 little hairs; it is as long as propus, while those of peraeopods II and III as long as the following two segments. In *K. macrothrix* the same claw provided with subterminal hairs and only 4 long spines (see peraeopod V in Fig. Pl 5 Stebbing). In youngs of about 3 mm dactyloclaw of peraeopods II and III much longer and finer than of last peraeopod; it is as long as the following three segments (nearly as in Fig. 5 K). Youngs too, have 7 segments on the long flagellum of antennula and only 2 on the short one; then, 6 segments on antenna and 4 hairs on its scale. Telson like in Fig. 5 H.

Manca stage. Besides the usual enormous 3-segmented exopodites with immense pennate setae on the last two pairs of peraeopods (Fig. 5 L), manca specimens show 2 immense dorsal pennate setae dorsally-subterminally fixed on tip of pleotelson and as long as 2/3 of pleotelson, flanked by other 2—3 shorter ones and lack hairs on the sides of telson (Fig. 5 H).

Labrum with epignathus smooth, without particular formations (Fig. 5 E); tip of pleotelson not curved like a beak. Long propus of cheliped shows hairs since manca stage. Dactyloclaw of peraeopods II and III abruptly gets narrower on the fixing spot and that of peraeopod VI is laminated.

Observations: Our species resembles the most *K. macrothrix* Stebbing, which is also occurring in the NW Indian Ocean and in Gulf of Bengal, hence the name of the species. Unfortunately, we cannot make a valid comparison as long as we know but the type specimen; 1 ♀ = 5,25 mm, our specimens ♂♂ being twice larger. It would be interesting for us to know the structure

of labrum in *K. macrothrix*. *K. primitivus* too, seems to have a special labrum and this would facilitate its assignment within the context of the species known so far. It is a pity that L a n g, who could study the types of these species, does not describe them. On the photograph he made (Fig. A_1, p. 210 l.c.) we only observe that the tip of labrum in the last species is concave.

We signal out the double length of basis of uropod in our species, the long dactyloclaw of last peraeopod in ♂. Propus and carpus of peraeopod I clearly wider than longer, the first being provided with 7—8 spines on anterior edge, instead of 4—5 (compare Fig. gn 2, pl. 5 S t e b b i n g (1910). with our Fig. 3 A). Basis of uropods much longer than pleotelson; scale of antenna short, with 8 hairs, not 4 like in *K. macrothrix*.

The presence of 4 segments in adults at the exopodite of antennula makes it differ both from *K. macrothrix* (with 3 segments) and especially from *K. obtusifrons* or *K. primitivus* (from the Indo-West Pacific area), which have 6 segments. Although apparently not important in other genera, in Kalliapseudidae the number of segments of endopodite of A_1 has a particular constancy and significance. The lack of sensory organ on peraeopods II and III in *K. macrothrix* is certainly an error of drawing, partly corrected by Lang.

We mention the strong sexual dimorphism of the end of peraeopod VI, more constant and often more obvious within the family Kalliapseudidae than the dimorphism of chelipeds.

Holotype ♂ (= 10 mm); nr. 505 Col. Crustaceans of "Grigore Antipa" Museum.

Alotype ♀ (= 7 mm); nr. 506, ibid: Paratypes ♂ ♀ ibid.

Ecology. *K. macrothrixoides*, one of the largest *Kalliapseudes* known so far, occurs on silty white relatively deep bottoms (19—28 m). Among the species which we have recently described (1961, 1978), here are below some of its biotop mates: *Kalliapseudes borceai*, *Pagurapseudopsis iranica*, *Pakistanapseudes leptochelatus*, *P. shiinoi*, *Apseudes adenaicus*, *A. gallardoi djiboutiensis*. *A. babelmandebiensis*, *Dioptromysis djiboutiensis* and *Eocuma horrida*.

3. Kalliapseudes borceai sp. n.
(Figs 4 and 5)

Diagnosis. Tegument glabrous, shiny. Telson triangular, with sharp side longer than basis of uropods; provided with 6 long dorsal hairs followed by 5—6 pairs of hairs on margins. Labrum slightly bifid, relatively small, hairy; face of epignathus shows two granulated parallel swellings.

Sensory organ of peraeopod I with a group of short sense hairs besides the usual tuft of long sense hairs characteristic of the Family. Distinct dimorphism on dactyloclaw of the last peraeopod (VI) with bifid end in ♀. Hyposphenia strong in both sexes.

Material, origin. St. 103 Thalassa, Gulf of Aden near the strait of Bab-el-Mandeb. 3 ♀♀, 1 ♂; several juv. and 20 manca-stage.

Description of ♀. Length: 6 mm. Tegument shiny, glabrous, areolate; frontal side characteristic of the genus (Fig. 4 A) with sharp ocular lobes.

Pereonites rectangular gradually narrowing towards the posterior side; the first free is the widest, while the last is the narrowest, only a little wider than longer; all of them except the first one, with coxal plates visible from above; instead of phanerae, they show a long hair and 2—3 tiny antero-lateral ones (Fig. 4 B).

Pleomeres only slightly wider than peraeon but wider than telson, with epimeres round (the last one) or straight (the other ones), all of them with a simple hair, dorsally and anteriorly inserted, and with the usual crown of shorter pennate setae on the margin (Fig. 4 L).

Both peraeonites and pleonites show on their sternal side long and short hyposphenia (Fig. 4 K).

The telson of the species with the sides of proximal half (up to the insertion of uropods) convex and provided with 6 non-pennate hairs; distal half, with slightly excavated valves forms an acute-angled triangle visibly exceeding the basis of uropods. The apex of this triangle, slightly curved ventrally, is surpassed by the two mobile para-anal lobes which are suspended and appear like a beak seen in profile (Fig. 4 L and 4 N). The edges of the triangle bear hairs, two pairs of which are dorsally inserted just above the tip of telson. Telson also shows a medio-ventral swelling, certainly homologous to the hyposphenia of the other pleonites (s, Fig. 4 L).

Labrum is here too, characteristic of the species: sarcous, slightly bilobate, turned down a little; it continues with a depression — saddle of epignathus — and forms then two parallel swellings with granulations, separated by a longitudinal groove (Fig. 4 C).

Antennula of a type common to family Kalliapseudidae with 3-segmented endopodite and 7-segmented exopodite as well as with 2 subterminal aesthetascs in ♀ (Fig. 5 A).

Antenna also common, 6-segmented, with oval scale and 5 simple setae (Fig. 5 B). Mandible, maxilla and maxillipeds like in the other *Kalliapseudes*; palp of mandible one segmented, with a terminal little spine. Cheliped with exopodite and very long setae on the inner face of propodus and of carpus (Fig. 5 C); chela with two little swellings on finger of propodus (Fig. 4 D).

Peraeopod I (Fig. 5)D with a 3-segmented exopodite is armed as in Fig. 4 E; it has a special dactylar sensory organ as it is provided, besides the usual bunch of terminal sense filaments, with a thick brush of hairs half shorter, inserted on the inferior side of the dactylar lobe; the infero-terminal side of basipodite shows a spine. Peraeopods II (Fig. 4 F) and III (Fig. 4 H), with strong basipodites, end by a dactyloclaw longer than propodus and having on its basis the sensory organ inserted with 4—6 filaments (Fig. 4 J); around the dactyloclaw, a series of finely serrate spines (Fig. 4 H).

Peraeopods IV—V (Fig. 4 J) similar, with a sensory organ that replaces dactylus and with a rich series of toothed spines that on peraeopod V are longer than the sensory organ.

Peraeopod VI shows a strong dimorphism: a dactyloclaw as short as propus in ♀ (Fig. 5 G) and bifid on tip, resembling a tiny pair of pincers with unequal arms (Fig. 4 g); dactyloclaw is as long as the following three segments in ♂ (Fig. 4 G and arrow), also bifid and shows on propodite only two long spines, as well as the usual comb of little spines all around it.

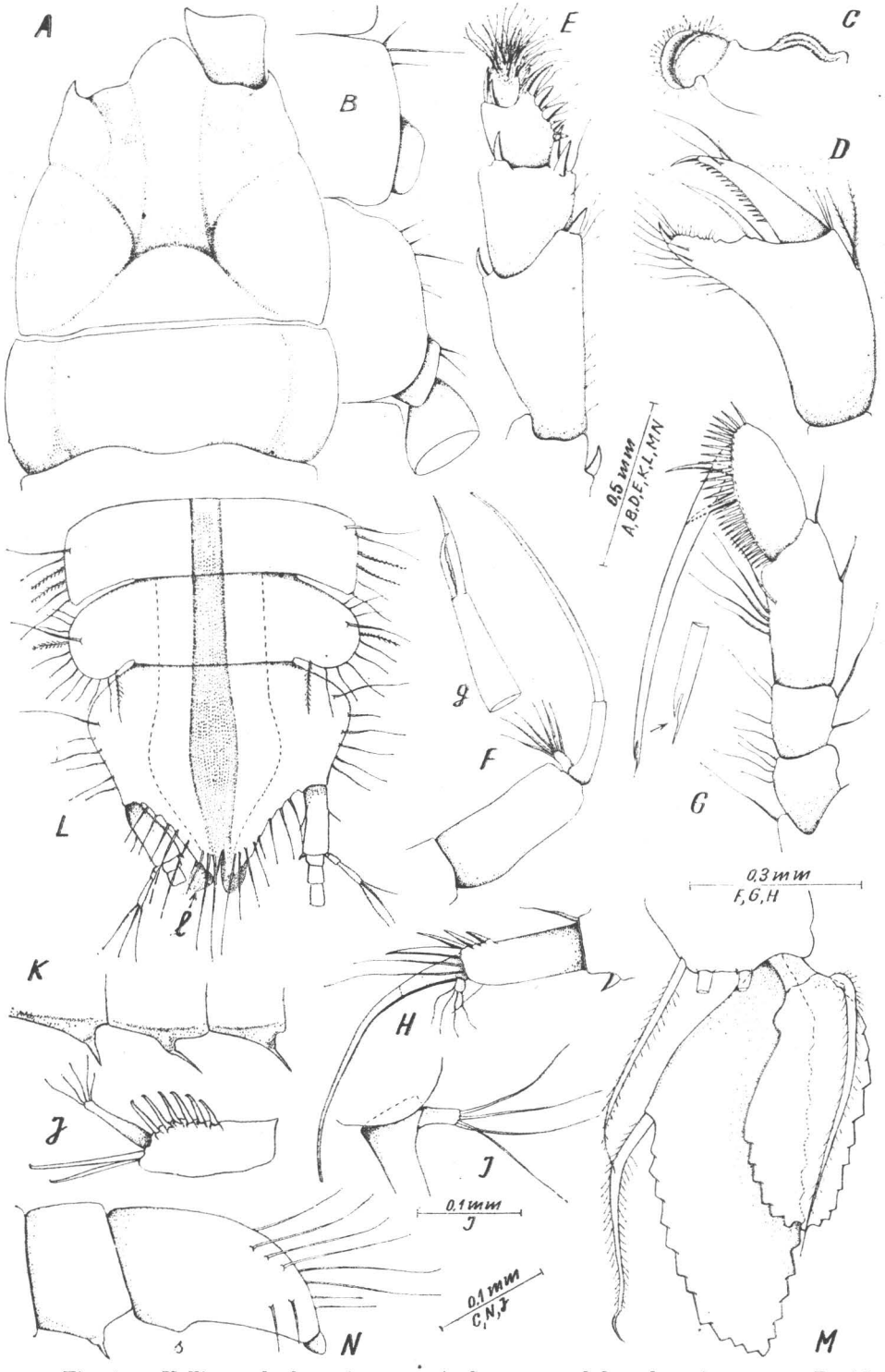

Fig. 4. — *Kalliapseudes borceai* sp.n. ♂. A, Carapace and first thoracic segment: B, sides of peraeonites 4 and 5; C, labrum, in profile; D, Chela ♀; E, Peraeopod I; F, extremity of peraeopod II; G, Peraeopod VI; arrow, magnified bifid tip of dactyloclaw; g, ditto, in ♀; H, extremity of peraeopod III ♂; I, its magnified sense organ; J, tip of peraeopod V; K, hyposphenia of the last peraeonites; L, last three segments of abdomen; l, para-anal lobes; M, pleopod I.

Pleopods with a 2-segmented exopodite, bearing a long external bipennate seta and with a twice longer endopodite and a strong inner seta ending by a curved tip (Fig. 4 M). Basis of uropod provided with 3 long pennate inner setae is clearly shorter than tip of telson and shows a tiny intero-terminal spine; its endopodite is as long as pleon and has about 24 segments in o and 29 in ♀, in 5 sectors. Exopodite 3-segmented.

Description of ♂. Length = about 6 mm. The absence of the anterior side does not allow us to know how antennae and chelae look like. Thoracomeres and pleon indicate no dimorphism; pleotelson slightly shorter, the tip of the basis of uropod exceeds the triangular tip of telson (Fig. 5 J). In exchange, the last peraeopod is dimorphic; dactyloclaw just as long as the following three segments together (propo-carpo-meropodite), is also bifid (Fig. 4 G); however, this dactyloclaw is not longer than the dactyloclaw of peraeopods II—III, nay, a little shorter; on the contrary, in ♀, the last dactyloclaw is merely as long as propodite, while that of peraeopod II is twice longer than propodite. Pleopods with exopodite twice shorter (Fig. 4 M).

Observations. By the curved edges of the proximal side of pleotelson (but not by the lack of little spines on the distal side of the basis of uropods) *K. borceai* slightly resembles *K. macrothrix* ; it differs from that by the sudden sharpening of its distal half and by the smaller and more differentiated number of hairs on the apex of pleotelson: about 8+8 in *K. borceai* against 11+11 in *K. macrothrix*, even in small-sized individuals. By the dactyloclaw with a bifid tip of peraeopod — and by the bifurcate tip of telson, *K. borceai* reminds of *K. magnus* Lang; the latter is however different by the tiny hairs on the tip of pleotelson and by another type of chela ♂. It differs from *K. obtusifrons* by the 3 segments of the endopod of antennula (not 6 like in *K.o.*)

Although in the original description of *K. macrothrix*, S t e b b i n g (1910) does not specify the presence of a sensory organ at the basis of dactyloclaw, this appears distinctly in all our specimens (e.g. Fig. 5 F).

K. borceai is not too abundant in comparison with the other Kalliapseudidae from the NW Indian Ocean, even if it was captured in Station 103, containing the largest number of varied Peracarida; indeed, except *Pakistanapseudes leptochelatus* and *Pagurapseudopsis iranica*, it is in this station that I captured all the species previously quoted in the coenosis of *K. macrothrixoides*.

I dedicated this species to the memory of my Master in oceanology, Prof. Ion Borcea, whose centenary was celebrated in 1979.

Holotype ♀, nr. 508, col. "Grigore Antipa" Museum; Paratypes ♀ and juv., nr. 509, ibid.

4. *K. macrothrix* Stebbing, 1919

Several young specimens in St. DO 70 and D 076. Except the larger number of articles of the flagelli of antennula (4 instead of 3) and the different number of uropodal segments, our specimens correspond to the type. As we did not capture adults, we could not make a comparison with the preceding species. The area of this species widens thus covering the north of

Indian Ocean (the coasts of Kenya and Gulf of Bengal, where it was signalled out in 1962 by Balasubrahmanian).

Palp of mandible one-segmented as in the other specimens of the genus, confirming thus Lang's opinion that S t e b b i n g's drawings (m+m, pl. 5) l.c. are the result of a wrong interpretation of the pieces of the original crushed specimen.

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* *

GENERAL REMARKS

Although unexpectedly varied as far as taxa are concerned, some o-them even superior (B ă c e s c u, 1978) — *Tanapseudes* Băc., *Pakistanapseuf des* Băc. etc. — and sometimes represented by a great number of specimens (we remind the hundreds of *Cristapseudes omercooperi* and even *Kalliapseudes borceai)*, our captures are of course far from conveying the really abundant fauna of Monokonophora of the northern Indian Ocean and so much the less their variety. That is because all the specimens we described in 1978 — and in the present paper — result, in spite of the 3000 km that we covered in the Arabian Sea, only from seven samples taken with unadequate dredges, as the purpose of the expedition was not the common dredging, but fishing with trawls in order to identify the fish stocks. This is confirmed by St. 103, better dredged, which, except Cumaceans, Isopods etc., contains at least 5 species of Monokonophora, besides some representatives of genera *Leptochelia*, *Leptognathia* etc.

I was impressed by the unusually great number of Kalliapseudidae in that sector in comparison with other areas of the World Ocean which I could explore. If we take for example St. 103, we notice that the number of *Cristapseudes* is very close to the records cut so far (e.g. 100 000/m^2) (B a r n a r d, 1970).

Consequently, *Cristapseudes omercooperi* a species till now considered as rare and strictly limited as far as space is concerned (Suez Canal), not only considerably extends its distribution both in the eastern Mediterranean and the area of contact between the Red Sea and the Gulf of Aden, but also proved to be extremely abundant in both sectors.

The fact that the population of this species is not only vigorous, but also abundant in the NW Indian Ocean, demonstrates that this is the area offering it most suitable conditions of life.

Until the present only one species of *Kalliapseudes*, i.e. *K. macrothrix* Stebbing, 1910, has been known from the Indian Ocean (Kenyan waters and Gulf of Bengal). Other three ones — *K. obtusifrons* (Haswel, 1881) (SE of Australia); *K. primitions* Nierstrasz, 1913 (according to some authors, a synonym of the preceding species) from Indonesia; *K. tomiokaensis* Shiino, 1966, from Japan — have been known from the Indo-West Pacific sector. The citation of *K. mauritanicus* Monod in the Red Sea (M a k k a v e e v a, 1971, p. 97) must still be verified.

To all these, we add other three species, one being assigned to a new genus, *Cristapseudes* mihi. The material that we captured during the expedi-

Fig. 5. — *Kalliapseudes borceai*. A-D, ♀ of the small-sized population (= 6 mm); I, ♀ = 7 mm; J, juv. = 4 mm. the rest of the pieces of manca stage; A, antennula; B, antenna; C, cheliped; D, peraeopod I; E, labrum ; F, end of peraeopod III; G, end of peraeopod VI; H, terminal side of pleon; I, tip of telson ♀ and.; J, ditto of a juv.; K, peraeopod III and L, peraeopod V in manca stage.

tion of R/V "Thalassa" in the NW Indian Ocean, contained a great number of *C. omercooperi* as well as a smaller number of *K. macrothrixoides* mihi and *K. borceai* mihi. Unfortunately, the descriptions too short, or made on the basis of a single sex, did not allow us to make a more complex comparative study as we did for *C. omercooperi*.

Concerning the geographic distribution and the relationship between our species, we mention the following:

Cristapseudes omercooperi is known only from the mouth of the Canal of Suez, the Israeli coast of the Mediterranean and now from the NW of the Gulf of Aden. If it is found in the Red Sea, there is no doubt that it recently penetrated in the Mediterranean, via Suez, adding one more species to the number of erythraeic immigrants settled in the Mediterranean (P o r., 1971). As a matter of fact, the very occurrence of *C. omercooperi* uniquely in the Eastern Mediterranean pleads for its recent penetration and its drawing eastwards by the strong current of the SE Mediterranean. The species is lacking on the Libyan coast, the closest sector on the West of the mouth of the Canal of Suez, as the numerous dredge and grab samples brought by Dr. Geza Müller, did not contain any specimen of it as I could notice personally.

Its more limited geographic distribution, the lack of exopodites on chelipeds and on peraeopod I, as well as the presence of a labrum complex and of particular sensory organs on flagellum of antenna, make genus *Cristapseudes* appear as more evolved and phylogenetically younger than *Kalliapseudes*.

K. macrothrixoides is obviously related to the species known from the Indian Ocean, i.e. *K. macrothrix*; and *K. borceai* is related to *C. magnus* Lang, 1976.

We are surprised that in her recent paper M a k k a v e e v a (1971) who studied a rich material of Tanaidacea from 42 stations in the Red Sea, including 233 specimens of Monokonophora (some of them in great quantities), captured there only one representative of the family Kalliapseudidae (*K. mauritanicus*); this is more surprising especially as several of his southern stations are very near to our stations from the NW Gulf of Aden. I wonder if the determination is correct, as figures are very approximate).

The narrow area covered today in the Mediterranean by one of the most frequent species of the NW Indian Ocean (whose occurrence in the Red Sea is to be checked up.), indicates a recent immigration (called by Fr. Por "lessepsian" considering the present connection between the tropical Red Sea and the temperate Mediterranean and not the ancient connections).

As regards the morphology of the group, we remind once again that the structure of antennas, of labrum and of last peraeopod, can offer good systematic criteria also valid for the phylogeny within the whole group of Monokonophora as we have already pointed it out when speaking about labrum in *Pagurapseudopsis iranica* Bac. (1978, p. 212). As for peraeopod VI, even if in L a n g's paper (l.c.) appear antitheses concerning the length of the respective dactyloclaw (key on page 216), one should not compare the long dactyloclaw of peraeopod VI (♂) of *K. primitivus* with short dactyloclaw (♀) of *K. macrothrix*, but ♂♂ with ♂♂ or ♀♀ with ♀♀, as there exists

a clear sexual dimorphism: dactyloclaws short in ♀, long in ♂, with or without apical bifurcation, lamination (thread-like) on tip, with or without several hairs all along the body or subterminal. All these as well as the structure of labrum or the number of segments of endopodite of antennula are microstructures which may be characteristic of some species.

A permanent attention should be paid to the number of segments of filiform appendages, especially as concerns the endopodite of antennula and even the form and the number of setae on the scale of antenna.

As long as the bottom of the ocean has been studied but in an isolate and sporadic way — naturalists having at their disposal for this study only rare samples, taken in conditions unproper for capturing animals smaller than 2 cm as most Peracarida are — it is not astonishing that within the majority of genera few species are known, described based on 1—2 specimens and often based on a single sex.

However, during the last decades, the extended study of the World Ocean, the deepening — we could even name it the beginning — of the ecologic-ethologic study of the benthic fauna, resulted in the fact that species which were known uniquely based on a single specimen, and a single sex — we think of Monokonophora — considered as very rare species, appear today as very common and often as dominant elements of the trophic components in some fishes *(K. mauritanicus* Monod, 1925), in certain migratory limicolous birds *(Discapseudes* Băcescu and Guțu 1972) etc.

A new fact which recently resulted is also the preference of many species (hundreds of thousands/m^2) for certain bottoms and types of ooze (e.g. calcareous, with pteropods etc.), for brackish waters, for estuaries (e.g. *K. crassus* in California, (see Barnard 1970) and of course *Cristapseudes omercooperi*, captured from the NW Indian Ocean).

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REZUMAT

Participînd la campania din 1977 a navei oceanografice franceze, « Thalassa», autorul a putut draga o sumă de Peracaride în apele litorale ale Iranului și în golful Aden. Printre Tanaidele colectate au fost și multe Kalliapseudidae, aparținînd la trei specii, dintre care *Kalliapseudes borceai* și *K. macrothrixoides* sînt noi pentru știință. Avînd la îndemînă un bogat material din specia *K. omercooperi*, autorul completează repartiția și descrierea acestei specii aflată și în Mediterană, creînd pentru dînsa un gen nou, *Cristapseudes* n.gen.

Se dau figuri şi multe date ecologice şi etologice noi pentru toate trei speciile.

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