CONTRIBUTION TO THE KNOWLEDGE OF *MONOKONOPHORA* (CRUSTACEA: *TANAIDACEA*) FROM THE NW OF THE INDIAN OCEAN

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On décrit une famille, deux genres et sept espèces d'Apseudiens, à savoir : *Tanapseudidae* n. fam. ; *Pakistanapseudes leptochelatus* n.g.n.sp., *P. shiinoi*, n.sp. ; *Apseudes adenaicus* n. sp. ; *A. babelmandebensis* n. sp. ; *Tanapseudes ormuzana* n.g.n.sp. et *A. gallardoi djiboutiensis*.

Le matériel a été dragué par l'auteur pendant qu'il a participé à la campagne du bateau français "Thalassa" dans les golfes d'Oman et d'Aden (février—mars, 1977).

Des données écologiques et zoogéographiques concernant ces nouveaux *Tanaidacea* sont présentées dans l'article.

Availing myself of an invitation to participate in the campaign of "Thalassa", a ship of the Technical Institute of French Marine Fishing in Nantes, for which I am very grateful to Prof. Claude Maurin, Director of this prestigious institution, I took part in the operations carried out by this ship in the Pakistani and Iranian waters, and then in the Gulf of Aden. I am much indebted to my oceanologist colleagues, to the scientific leader of the campaign, Dr. Abbes, and to the ship's crew headed by comm. M. Jamet, who have facilitated certain dredges in the areas where trawlings have been made. I used the dredges "Charcot", "Rallier" and "Băcescu" which required difficult sorting work, due to the great quantities of sediment dredged and taken on board.

In this paper we present 10 new taxa from the Arabian Sea, namely :

1. *PAKISTANAPSEUDES* N. GEN.

Diagnosis. Tanaid elongate, larvoid, with soft, noncalcified integument perfectly transparent ; at least one of the antennae has a rigid — even though multisegmented — thickened flagellum, bearing numerous series of aesthetascae, chelipeds very fine ; peraepod II rather swimming than digging ; both peraeopods with exopodites ; 5 pairs of well-developed pleopods ♂♂, biramous, foliaceous with biarticulated inner ramus.

2. *PAKISTANAPSEUDES LEPTOCHELATUS* N. SP.

(Fig. 1)

Description (♂, ♀). Body elongate, thin, slightly flattened dorsoventrally ; width of carapace enters 7—7.5 times in its length without appendages (Fig. 1 A). Integument perfectly transparent, glabrous, soft and smooth totally non-calcified ; no folds, no bristles and no apophyses. The digestive tube being full with white mud, its entire tract — occupying more than 1/2 of the animal's width — is opaque, distinctly in con-

trast with the transparence of the edges. Even the ventral spines are lacking on the sternites. The only prominences on the body are the short epistome and the penial tubercle in the male.

Carapace perfectly square; ocular lobes distinctly delimited, bright red, without visible omatidia; as a matter of fact, in this Tanaid the eyes are the only pigmented elements.

Thoracomers elongate, only the first one is rather wider than long (fig. 1. A). ♂ shows pleonites also long, trapezoidal. Pleotelson short, equal in length with the last pleonite, rather wider than long.

Antennule, not twice as long as the thorax, has a 7—8 segmented small flagellum and a 9—10 segmented big one, depending on the size, and does not present aesthetascae in ♂. *Antenna* (♀) as long as carapace, 7—8 segmented with a biarticulated squama (Fig. 1C) and with 1—2 aesthetascae. In exchange, in the ♂ the antenna is a very peculiar organ (fig. 1D); not only longer and thicker than A_1 ♂, but the 14 segments it consists of are in their proximal half even thicker than the basis of A_1, then they get gradually thinner, forming a long and somewhat stiff cone. That is why these antennae appear like two hornlets in front of the eyes. On 9 of these segments there are series of 5—6 long aesthetascae (only 1—2 on the last ones and on the third basal segment).

Labrum with a short epistomal projection, soft, blunt (♂) (Fig. 1B) or acute (♀) (fig. 1 E). *Mandible* (Fig. 1F) with 3-segmented palp, the second segment being very mobile as against the basal one. Labial lobes with 2—3 minute distal bristles among the long marginal cilia. *Maxillula* common, with bi-segmented palp, terminating in three simple setae. *Maxilla* does not show any peculiar features. *Maxilliped* without spines on the outer margin of carpus and meros, with 2 pairs of thick retinacula and exognathus ± rectangular without projection (fig. 1G).

Chelipeds minute (fig. 1H) without any trace of dimorphism; in normal position, chela is particularly fine being the only portion which exceeds the level of rostrum; it has a huge carpal segment, as long as half of the extended chela, thicker than the propodite.

Peraeopod II (fig. 1 I) shorter than the cheliped has no epimeral spine, its segments are wide, nearly foliaceous, the propodite being hardly longer than wide and the carpus as wide as long, nearly discoidal. All spines on the inner edges of propo-and carpopodite brusquely taper towards the tip, without being laminated. Both peraeopods show small but readily visible exopodites, consisting of 2 segments, the distal one being minute and bearing 1—2 small hairs.

Peraeopods III—VII have a similar morphology (fig. 1 J) only their size decreases especially at the basis level. For example, the basis of peraeopod III is almost twice less inflated and shorter than that of pair IV or V. Being fixed on the posterior portion of the long thoracomers, the basipodites of peraeopods are striking.

Fig. 1. — *Pakistanapseudes leptochelatus* n.sp. (D,B,L = ♂; the rest = ♀)

A, ♀ ad. seen from above; B, antennae and frontal portion seen from below; C, A_2♀; D, A_2 ♂, from specimens of rather same size; E, epistome ♀; F, mandible; G, maxilliped; H, chela ♂; I, peraeopod II; J, peraeopod III; K, pleopod II; ↓, its typical phanera, magnified; L, genital segment (VI) with genital protuberance ♂.


C
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B
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0.1mm
F
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A1
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C, G
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A, K
j
1mm
i
K
0.2mm
L
H
0.05mm

The ensemble of 5 pairs of pleopods with huge foliaceous rami, edges by long pennate setae gives a peculiarly wide and hairy appearance to the whole abdomen. Their basis is short, the 2-segmented endopodite has long inner phanera (fig. 1K), ciliated and bifurcated at its end, with a serrate ramus (fig. K, arrow), larger at the first two pleopods.

Uropods with a short basal segment, subterminally attached, a 3-jointed exopodite and a 19-jointed endopodite (fig. 1A).

Material, origin, size: 5 specimens : 1 ♂ = 4 mm, 3 ♀♀ (4.3—4.6 mm), 1 j, from St. So87 Thalassa, 25°54′5N ; 57°14′8″ E greymod, 110 m, 3.III.77, dredged near Ras al Kuh : 1 ♀ and 1 ♀ j in the Gulf of Oman 24°17′30″ N/66°05′7″E, at 102 m depth, on muddy bottom, with a Băcescu-type crotcheted dredge, 21.II.77 ; 1 ♂ and 2 ♀♀ ovigerous, 5 ♀♀j Indian Ocean-Pakistani waters, St D070—8 specimens captured by a Charcot dredge on calcareous soft bottom, massively populated with tubes of *Ampelisca*, Ras Jady : 25°03′0″ N ; 63°30′6″ E, 23 m, 22.II.77.

In the Crustacean coenosis dredged at the same time with this species the Amphipods massively dominate, followed by Cumacea and Anthuridea ; among Tanaidacea, *Leptognathia* sp. dominates ; less numerous are the *Kalliapseudes* sp and one *Apseudes* sp.

Holotype ♂ in the Crustacean collection of the "Gr. Antipa" Museum, no. 377 ; allotype ♀, ditto, no 378 ; 2 Paratypes ♀, ditto, no 378a.

Remarks. By the elongate segments of its body, *P. tenuichelatus* is reminiscent of abyssal Monokonophora ; only the latter are longer e.g. *Fageapseudes bicornis* (Kudinova-Pasternak, 1975— is 11 times as long as the maximal width of carapace. By the stiff antenna of the ♂, the minute cheliped, the fine thin non-dimorphic chela and the peculiar penial tubercle, the new genus is readily distinguished in the group of Monokonophora.

3. *PAKISTANAPSEUDES SHIINOI* N. SP.

(Fig. 2)

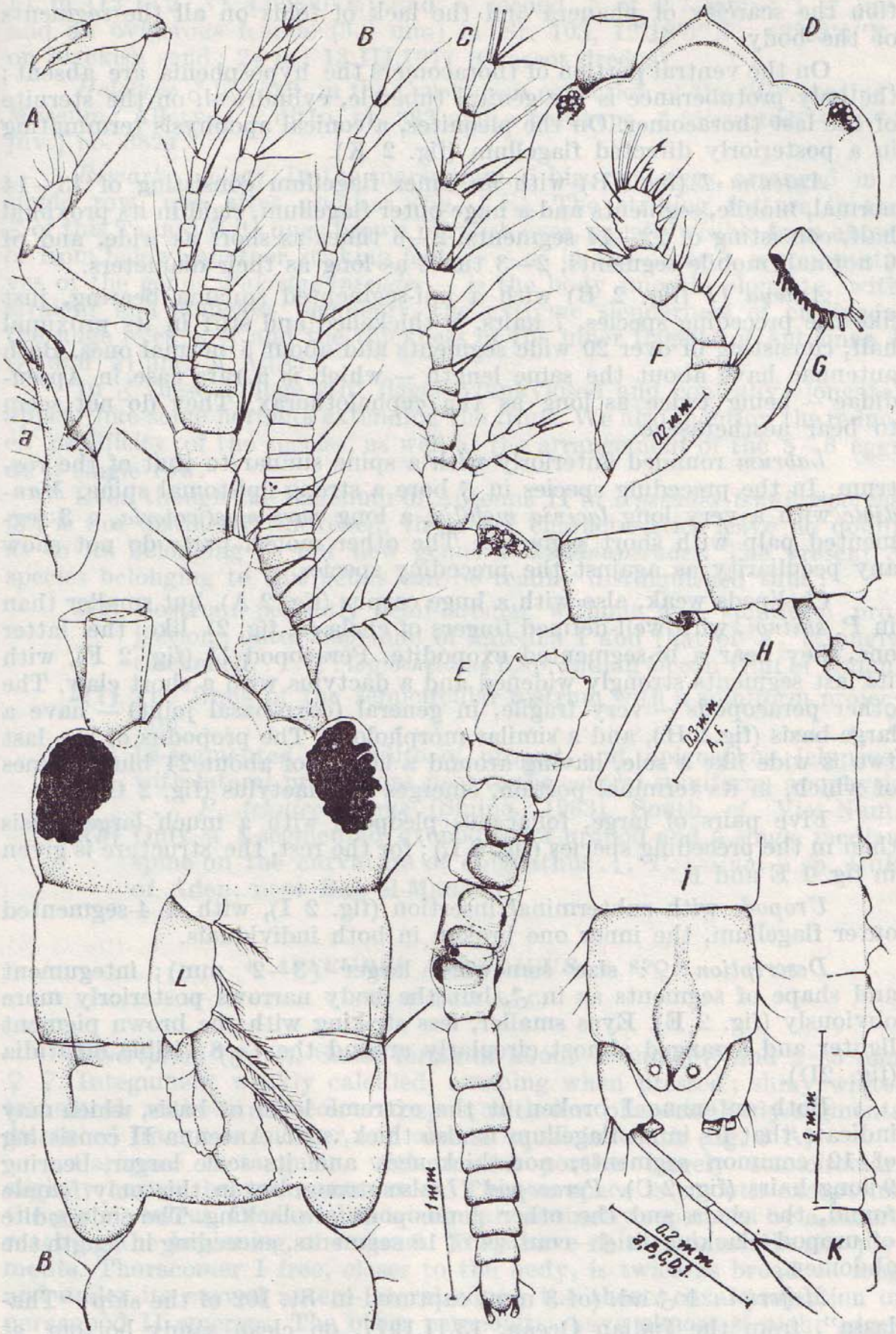
Description ♂. Body sinuous ; long and soft (resembling the type species (fig. 1A), 7 times as long as the width of carapace, slightly flattened dorsoventrally (fig. 2E).

Free thoracomer I twice as wide as long, with large, rounded postero-lateral folds ; second one, somewhat trapezoidal (fig. 2 B), the third one square, the others increasing in length, the last ones being distinctly rather longer than wide. Pleomers rectangular.

Frons with a semicircular rostrum bearing an anterior, bristle-like projection. Huge eyes with some visible omatidia, but not distinctly defined in the brown-purplish pigmentary mass (fig. 2 B). Pleotelson (fig. 2 I) also with straight edges, not longer than wide. It is interesting to men-

Fig. 2. — *Pakistanapseudes shiinoi* n.sp.

A, cheliped ♂ ; *a*, its chela, magnified ; B, anterior portion of a mating ♂ ; C, Antenna II ♀ ; D, frontal portion of carapace ♀ ; E, ♀ ovigerous, seen from above ; F, peraeopod II ♂ ; J, peraeopod II ; G, terminal portion of prp. VI ; H, last peraeonite and first 2 pleonites ♂ ; I, pleotelson ; K, penial and pleonal tubercles, in lateral view ; L, pleopod V ; (C, D, E = ♀ ; the rest, ♂).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tion the scarcity of phanera and the lack of folds on all the segments of the body.

On the ventral portion of thoracomers the hyposphenia are absent; the only protuberance is the genital tubercle, cylindrical, on the sternite of the last thoracomer. On the pleonites, a conical apophysis terminating in a posteriorly directed flagellum (fig. 2 K).

Antenna 1 (fig. 2 B) with an inner flagellum consisting of 13—14 normal, mobile, segments and a huge outer flagellum, rigid in its proximal half, consisting of 12—14 segments, 2—6 times as short as wide, and of 6 normal, mobile segments, 2—3 times as long as their diameters.

Antena II (fig. 2 B) with a uni-segmented squama bearing, just like the preceding species, 7 hairs, is thickened and stiff in its proximal half, consisting of over 20 wide segments and about 5 normal ones. Both antennae have about the same length — which is a rare case in Apseudidae — being twice as long as the cephalothorax. They do not seem to bear aesthetascae.

Labrum rounded anteriorly with a spine similar to that of the rostrum. In the preceding species in ♂ bore a strong epistomal spine. *Mandible* with a very long *lacinia mobilis*, a long *pars masticatoria*, a 3-segmented palp with short segments. The other mouth parts do not show any peculiarity as against the preceding species.

Chelipeds weak, also with a huge carpus (fig. 2 A), but smaller than in *P. shiinoi*, with well-defined fingers of chela (a, fig. 2) like the latter one, they bear a bi-segmented exopodite. Peraeopod II (fig. 2 F), with its last segments strongly widened and a dactylus with a short claw. The other peraeopods — very fragile, in general (coxo-basal joint) — have a large basis (fig. 2 H), and a similar morphology. The propodus of the last two is wide like a sole, having around a lattice of about 24 blunt spines of which, in its terminal portion, emerges the dactylus (fig. 2 G).

Five pairs of large, foliaceous pleopods with a much larger basis than in the preceding species (fig. 2 L); for the rest, the structure is given in fig. 1 E and F.

Uropods with subterminal insertion (fig. 2 I), with a 4-segmented outer flagellum, the inner one broken in both individuals.

Description ♀: size somewhat larger (3—2 mm); integument and shape of segments as in ♂, but the body narrows posteriorly more obviously (fig. 2 E). Eyes smaller, less striking with the brown pigment lighter and arranged almost circularly around the 7—8 visible omatidia (fig. 2D).

Both antennae I broken at the extreme level of basis, which may indicate that its inner flagellum is also thick, stiff. Antenna II consisting of 12 common segments, non-thickened, and its scale larger, bearing 9 long hairs (fig. 2 C). *Peraeopod II* also strong, but in this only female found, the chela and the other peraeopods are lacking. The endopodite of uropod—lacking in ♂—consists of 18 segments, exceeding in length the abdomen.

Material: 1 ♂ ad. (of 3 mm) captured in St. I02 of the ship "Thalassa", from the Indian Ocean, 13.II.1977, on clean sandy bottom, at

51 m (12°18′2″N) 43°28′0″E) and a second ♂ of 2.7 mm + 1 ♂ juv. and an ovigerous female (3.2 mm) in St. 103, 12°18′0″N ; 43°23′2″E ; on blackish sand ; 24 m ; 13.III.1977 (Charcot dredge).

Holotype ♂ no. 382, in the Crustacean collection of the "Gr. Antipa" Museum ; Allotype ♀ ditto, nr. 383 and a paratype ♂ (dissected) + 4 ♂♂ juv.) no. 382a.

Remarks ecology. In the marsupium, 5 big, oval eggs, arranged in a single row, one after another (fig. 2 E). The striking feature in the ♂ of this Tanaid is its huge brown purplish eyes, equally visible from above or from below ; another striking feature — as in the other 3 representatives of the genus *Pakistanapseudes* — is the body smooth, elongate, with straight and spineless segments, the extreme slenderness of chelipeds, the huge eyes of ♂ and the thickness of the inner flagella of antennae I (♂ and ♀) and of A_2(♂).

In ♂ these 4 huge stiff flagella (ankylosed and conically elongate) appear like some hornlets extending the frons. We also mention the reduced prolificity of the species, as well as the arrangement of the 5—6 eggs on a single row.

Even though the flagellum of Antenna II in *Apseudes tenuicorporeus* [7] is not distinctly thickened, the other characteristics leave no doubt as to its belonging to our new genus *Pakistanapseudes*. The present 3 species belonging to this genus can be readily distinguished thus :

1(2) Rostrum perfectly semi-circular without any spiniform projection ; outer flagellum of antenna I and that of A_2 strongly thickened. . . . *P. leptochelatus* n.sp. Indian Ocean Gulf of Oman.

2(1) The frons of the semicircular rostrum with a spiniform projection **3**

3(4) 12-segmented exopodite of uropod and epignathus (clypeus) with lateral projections near to the central spiniform apophysis . . . *P. tenuicorporeus* (Shiino, 1963) South of Viet-Nam.

4(3) Only a 4-segmented exopodite of uropod and a single median spine on the curvature of epignathus . . . *P. shiinoi* n.sp. Gulf of Aden, near Bab-el-Mandeb.

4. *APSEUDES ADENAICUS* N. SP.

Figs 3 and 4 A—C)

Description (♂, ♀). Small forms of about 2 mm ♂♂ and 2—3 mm ♀ ♀. Integument weakly calcified, crushing when pressed ; shiny white, translucid, without any coloured spot, with few phanera. Body segments distanced from one another and almost equal in width (fig. 3 A).

Carapace rectangular, with rostral portion largely semicircular, slightly curved between antennules. This carapace is smooth except for the gastric sulcus. Ocular lobes triangular, distinctly separated by a suture reaching the beginning of rostrum. They have neither omatidia nor pigments. Thoracomer I free, closer to the body, is twice as broad as long and under its curved antero-lateral edges, the short, coxal projection of peraeopod II emerges. The other peraeonites have almost straight edges

(see proportions in fig. 3 A); pleomers also distinctly delimited, with rounded epimers bearing few lateral setae. Pleotelson trapezoidal with 6 distal simple setae (fig. 3 A and 4 A); only in mating ♂♂ there is an additional rich ciliation, not only among the terminal setae but also on the edges of pleotelson (fig. 3 L). The ventral portion of the body shows a short semicircular epistome doubling the rostral semicircles; and is translucid with no sternal projection on the anterior thoracomers; only the last peraeonite bears an acute tubercle between peraeopods VII posteriorly directed (fig. 3 J). In ♂♂ this thoracal tubercle is of a still acuter shape, the terminal bristle being doubled by another anterior, smaller one (fig. 3 K).

Antennule short with 2 segmented short flagellum (3 segments with the basal common one) and 5—6 segmented long flagellum (+ 1 common one); only 2 aesthetascae, the fixation site of which is readily seen because their supporting segments are larger than the following ones (fig. 3 B). *Antenna* with a basal segment strongly widened and serrated in the inner portion has a squama with 3 long setae and a 7-segmented endopodite (fig. 3 C). *Labrum* semicircular, hyaline with 2 groups of lateral setae but without anterior projection. *Mandible* (fig. 3 D) common, only the long palp hyaline, thin with a huge proximal segment is readily distinguished from other *Apseudes*. A strong pars incisiva and a bunch of bifid phanera from a lacina mobilis. *Labium* as in fig. 3 F, strongly ciliated, terminating in 3 fine bristles. *Maxillule* with bisegmented palp, terminating in 3 long setae; maxilla common; maxilliped weakly armed as against the endites bearing terminal bacilliform phanera and 3 strong median crotchets (fig. 3 0).

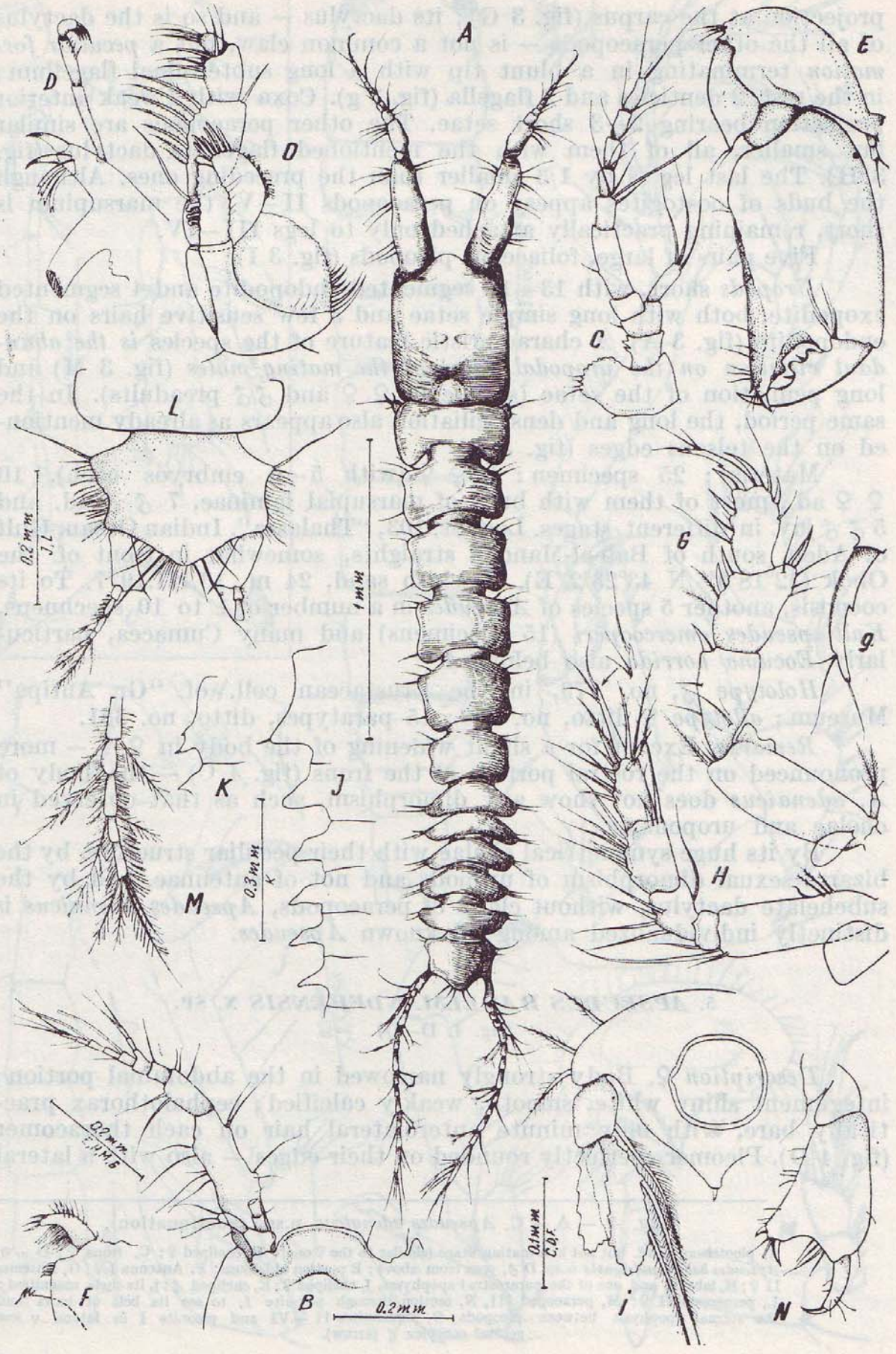
Chelipeds. The males of this species are characterized by a huge chela, in which the laterally widened propodite is three times as large as the rest of segments (fig. 3 E); its shape is ± rectangular, with a short dactylus, bearing 3 tubercles and the finger fixed with a weak terminal claw and a smaller, subterminal, inferior bristle; the other segments are minute as against the propodus — especially the carapopodite — and overlaps one another; exopodite hardly visible. In all 9 ♂♂ examined the chelae were not extended, both being nearly close, their basis looking like heels, which is not the case with females.

In ♀♀ the chela is distinctly differing from the ♂ one (fig. 3 N) by the size ratio of segments (propodus equal in length and volume with basis) as well as by the lack of tubercles on the strong dactylus or by a more developed spine on the fixed finger. Almost in all the females examined the cheliped was distinct and the chela excessively open (fig. 4 B).

Peraeopod II of the digging type with bi-segmented exopodite fixed on the opposite side of oostegites and with an important lateral

Fig. 3. — *Apseudes adenaicus* n.sp. A,E,K,L and N = ♂ mating stage; B, C,D, G,g, H,I,J,M and 0 = ♀.

A, body seen from above; B, frons and antennule, seen from below; C, antenna; D, mandible; E, chela ♂; F, left side of labium; G, peraeopod II; g, its dactylic claw ciliated, magnified; H, peraeopod III; I, hyposphenium of last peraeopod (and pleopod I seen from the front), J, ditto. in lateral view and tubercles on the sternal face of pleonites; K, genital tubercle ♂ with 2 spinules; L, pleotelson of a mating male, ciliated; M, end of its endopodite also ciliated; N, chela ♀; O, maxilliped.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projection at the carpus (fig. 3 G); its dactylus — and so is the dactylus of all the other peraeopods — is not a common claw, but a *peculiar formation* terminating in a blunt tip with a long subterminal flagellum; in the rest, 2 denticles and 2 flagella (fig. 3 g). Coxa with a weak anterior projection bearing 2—3 short setae. The other peraeopods are similar but smaller, all of them with the mentioned flagellate dactylus (fig. 3 H). The last leg is by 1/3 smaller than the preceding ones. Although the buds of oostogites appear on peraeopods II—V, the marsupium is short, remaining practically attached only to legs III—IV.

Five pairs of large, foliaceous pleopods (fig. 3 I).

Uropods short, with 13—16 segmented endopodite and 4 segmented exopodite, both with long simple setae and a few sensitive hairs on the endopodite (fig. 3 A). A characteristic feature of the species *is the abundant ciliation on the uropodal rami of the mating males* (fig. 3 M) and long pennation of the setae (simple in ♀ ♀ and ♂♂ preadults). In the same period, the long and dense ciliation also appears as already mentioned on the telsons edges (fig. 3 L).

Material: 25 specimen: 3 ♀ ♀ (with 5—6 embryos each), 10 ♀ ♀ ad., most of them with buds of marsupial laminae, 7 ♂ ♂ ad. and 5 ♂ ♂ juv. in different stages. Loc. St. 103, "Thalassa", Indian Ocean, Gulf of Aden, south of Bab-el-Mandeb straights, somewhat in front of the Obok (12°18′0″ N 43°23′2″E). Blackish sand, 24 m, 13.III.1977. To its coenosis, another 5 species of *Apseudes* in a number of 1 to 10 specimens, *Kalliapseudes omercooperi* (15 specimens) and many Cumacea, particularly *Eocuma horrida* also belonged.

Holotype ♂, no. 379, in the Crustacean coll. of "Gr. Antipa" Museum; *allotype* ♀ ditto, no. 380; 15 paratypes, ditto, no. 381.

Remarks. Except for a slight widening of the body in ♀ ♀ — more pronounced on the rostral portion of the frons (fig. 4 C) — the body of *A. adenaicus* does not show any dimorphism, such as that observed in chelae and uropods.

By its huge symmetrical chelae with their peculiar structure, by the bizarre sexual dimorphism of uropods and not of antennae, and by the subchelate dactylus, without claws of peraeopods, *Apseudes adenaicus* is distinctly individualized among all known *Apseudes*.

5. *APSEUDES BABELMANDEBENSIS* N. SP.
(fig. 4, D—O)

Description ♀. Body strongly narrowed in the abdominal portion; integument shiny white, smooth, weakly calcified; cephalothorax practically bare, with only minute anterolateral hair on each thoracomer (fig. 4 D). Pleomers perfectly rounded on their edges — also with a lateral

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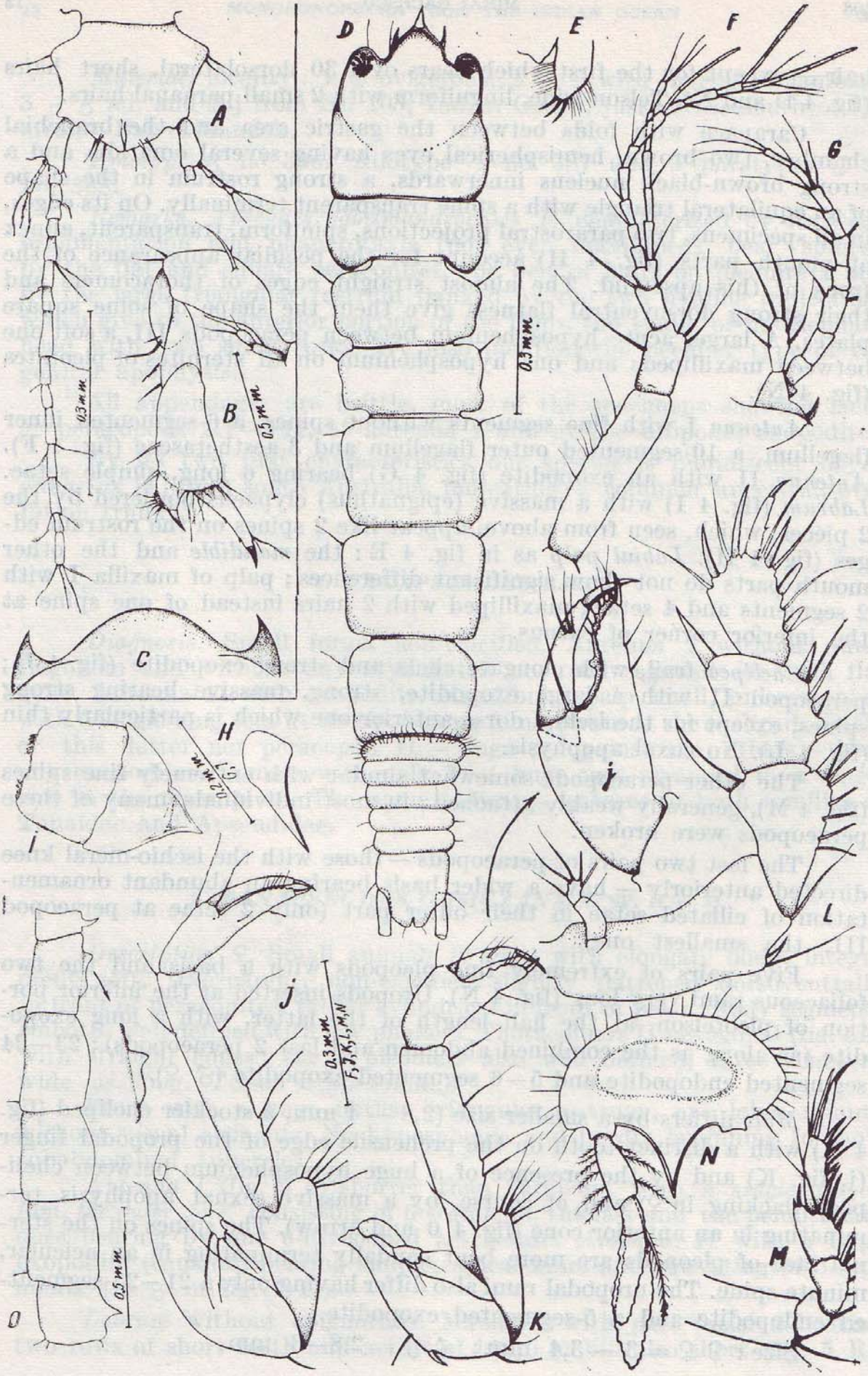
Fig. 4. — A — C, *Apseudes adenaicus* n.sp. (continuation).

A, pleotelson ♂ ad. but not in a mating stage (similar to the ♀ one); B, cheliped ♀; C, frons ♀; D — O, *Apseudes babelmandebensis* n.sp. D ♂, seen from above; E portion of labium; F, Antenna I ♀; G, Antenna II ♀; H, labrum and one of the pararostral apophyses, J, cheliped ♀; K, cheliped ♂; j, its chela magnified; L, peraeopod II ♀; M, peraeopod III, N, section through pleonite I, to see its belt of hairs and the sternal apophysis between pleopods; O, peraeonites II — VI and pleonite I in lateral view genital complex ♂ (arrow).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F, J, K, L, M, N

hair — except for the first which bears over 30 dorsolateral, short hairs (fig. 4 D and N). Telson wide, linguiform with 2 small paraanal hairs.

Carapace with folds between the gastric area and the branchial chamber, two brown, hemispherical eyes having several omatidia and a strong brown-black nucleus innerwards, a strong rostrum in the shape of an equilateral triangle with a spine transparent terminally. On its edges, in all specimens, two pararostral projections, spiniform, transparent, annex of mouth parts (fig. 4 H) account for the peculiar appearance of the frons of this apseudid. The almost straight edges of thoracomers and their strong dorsoventral flatness give them the shape of some square plates. A large, acute hyposphenium between peraeopods III, a soft one between maxillipeds and one hyposphenium on all sternites of pleonites (fig. 4 N).

Antenna I with fine segments without spines, a 6-segmented inner flagellum, a 10-segmented outer flagellum and 3-aesthetascae (fig. 4 F). *Antenna* II with an exopodite (fig. 4 G) bearing 6 long, simple setae. *Labrum* (fig. 4 I) with a massive (epignathus) clypaeus bordered by the 2 pieces, which, seen from above, appear like 2 spines on the rostrum edges (fig. 4 H). *Labial palp* as in fig. 4 E : the *mandible* and the other mouth parts do not show significant differences ; palp of maxilla I with 2 segments and 4 setae ; maxilliped with 2 hairs instead of one spine at the inferior corner of carpus.

Cheliped frail, with elongate chela and strong exopodite (fig. 4 J) ; peraeopod II with a large exopodite, strong, massive bearing strong spines, except for the ischial dorso-anterior one which is particularly thin (fig. 4 L). No coxal apophysis.

The other peraeopods somewhat similar with extremely fine spines (fig. 4 M), generally weakly attached ; in most individuals, many of these peraeopods were broken.

The last two pairs of peraeopods — those with the ischio-meral knee directed anteriorly — have a wider basis bearing an abundant ornamentation of ciliated setae in their outer part (only 2 setae at peraeopod III, the smallest one).

Five pairs of extremely fine pleopods with a basis and the two foliaceous rami very long (fig. 4 N). Uropods inserted at the inferior portion of pleotelson, at the half length of the latter, with a long exopodite (as along as the combined abdomen and last 2 peraeopods) ; 23—24 segmented endopodite and 5—6 segmented exopodite (♂ ♀).

Male differs by a smaller size (2,8 — 4 mm, a stockier cheliped (fig. 4 K) with a distinct tooth on the prehensile edge of the propodal finger (j, fig. K) and by the presence of a huge hyposphenium between chelipeds (lacking in ♀) and, of course, by a massive sexual apophysis terminating in an anterior cone (fig. 4 O and arrow). The spines on the sternal face of pleopods are more bent caudally terminating in an acicular, minute spine. The uropodal rami also differ having only a 21—23-segmented endopodite and a 5-segmented exopodite.

Size : ♀ ♀ = 3 — 3,4 mm ; ♂ ♂ = 2.8—3 mm.

Material, locality : 1 ♀ ovigerous, 2 ♀ ♀ with marsupial laminae, 3 ♂ ♂ ad. and 2 j from St. 103, Indian Ocean, just at the south of the straits Bab-el-Mandeb.

Holotype ♂ no 386. Allotype ♀ no. 387 and 5 paratypes ♂ ♀, no. 388.

Remarks. Apseudes babelmandebensis is characterized by its weak ornamentation and phanerotaxia (not even maxillipeds bear spines), by the flat and square peraeonites, the belt of hairs on pleonite I and by the large triangular rostrum flanked by the two hyaline projections which give to the anterior portion of the frons, the shape of an elephant head with two small tusks. We also mention the peculiar type of the genital apophysis.

All appendages are brittle, most of the specimens showing lacks at peraeopods III—VII, at antenna I and at the uropodal exopodites.

By its two first characteristics our species is reminiscent of *A. estuarius* [4] from south Australia, indicating a common ancestral, evolution trunk.

6. *TANAPSEUDES* N.G.

Diagnosis. Small forms non-calcified. Antenna I without outer flagellum and without any asymmetric common segment for both flagella. Antenna II with exopodite. Mandibular palp small, unisegmented with a single long seta at its tip. Strong dimorphism at the cheliped. Neither this latter nor peraeopod II — huge as against the others — bear any exopodites. Female with only 3—4 huge eggs arranged in a single row in the marsupium. The name indicates features of both families of Tanaidae and Apseudidae.

7. *TANAPSEUDES ORMUZANA* N. SP. (Fig. 5)

Description ♀. Small animals (2 mm) with elongate body, integument soft, transparent, non-calcified slightly flattened dorsoventrally in front of peraeonites, rather cylindrical in front of pleon. Body segments smooth, well defined with few phanera. Thoracomers II hexagonal (fig. 5A) with straight edges ; the 5 pleomers also well defined, three times as wide as long. Telson trapezoidal.

Frons with a huge obtuse triangular rostrum ; eye lobes minute without visual elements. No hyposphenia and hardly beginning to show subabdominal tubercles.

Antenna I (fig. 5 c) shorter than carapace, with a *single flagellum, the outer one*, consisting of 6 segments, the last and the penultimate ones bearing by one 6-divisioned aesthetasc. *Antenna.* II with a large exopodite (squama) bearing simple, apical hairs and consisting of 5 segments (as ♂ in fig. 5 D).

Labrum without epignathus. Mandible with pars incisiva bearing two rows of short teeth and a tuft of lacini mobili also short (fig. 5 E).

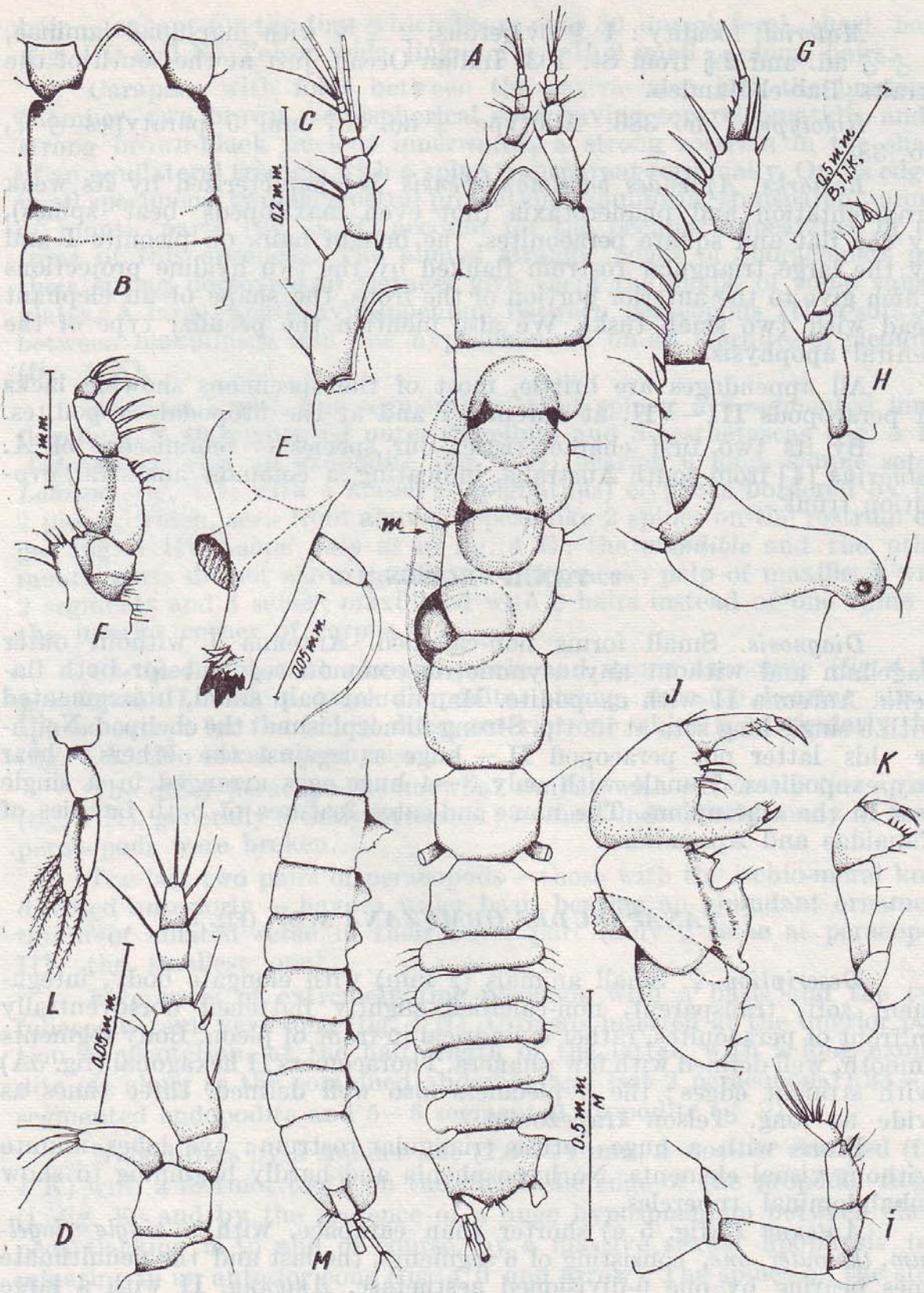

Fig. 5. — *Tanapseudes ormuzana* n.sp. A,C,D,E and K = ♀; the rest, ♂.
A, female ovigerous, seen from above; m, marsupium; B, anterior portion of a ♂; C, Antenna I; D, Antenna II; E, mandible; F, maxilliped; G, peraeopod II; H, last peraeopod; I, peraeopod III; (G–K, same magnification); J, cheliped ♂; K, cheliped ♀ (with same magnifier); L, pleopod V; M, last thoracomer and abdomen in lateral view.

Pars masticatoria with a minute peduncle; *palp reduced to a single narrow segment, bearing a long, terminal, non-ciliated seta.* *Maxillule* and maxilla have not been dissected. *Maxilliped* (fig. 5 F) of the common type, bearing 2 crotchets at their endites.

Chelipeds (fig. 5 K) with a wide propodus and a brusquely narrowed ischium; no exopodite. Peraeopod II stronger than the others, with a tubercle instead of exopodite (fig. 5 G). Marsupium (m, fig. 5 A) extends between this leg and peraeopod V and shelters 3—4 eggs, yellowish, huge, almost spherical, their diameter being a little shorter than the width of the relative thoracomers, hence arranged in a single row.

Pleopods foliaceous, biramous with bisegmented exopodites (fig. 5 L). Uropods, terminally attached, have a 3-segmented exopodite (the proximal segment very small, sometimes hardly visible) and a 11-segmented exopodite (fig. 5 M); the last ramus bears huge setae, perpendicularly inserted.

Male. Body appearance as in ♀, only a little narrower, which makes the rostrum appear as more pointed; the morphology of appendages also similar; only the cheliped (fig. 5 J) is totally different, with its segments strongly widened laterally, close together, the first ones almost overlapping each other and with almost ankylosed joints. Carpus with a large notch on its caudal edge. Peraeopod II (fig. 5 G) huge (to compare with the rest of peraeopods (fig. 5 J, I, with same magnifier) bearing a tubercle instead of exopodite, with few phanera and a dactylus with 3 spinules. Peraeopod VI is the shortest, with dactylus oval, not elongate as in Prp. III—VI (fig. 5 H). The dactylo-claw is pointed at prp. III and IV, blunt at V—VI. On the sternal face of pleonites (fig. 5 M) a penial, bidented tubercle and simple tubercles with a caudally directed bristle.

Material, locality: Sr. D076 Thalassa, Indian Ocean, 23.II.77, 67 m, Ormuz straits (26°31′7″N; 56°42′5″ E). 1 ♂ = 2.2 mm, 1 ♀ ovigerous = 2.2 mm.

Holotype ♀, no. 384 in the Crustacean coll. of "Gr. Antipa" Museum. *Allotype* ♂ (dissected) no. 385 ditto.

Ecology. The species was dredged on a grey-whitish muddy bottom, with many remains of Pteropods and microshells of gastropods. In association, the Polycheta — among which the large skinny tubes of *Diopatra cuprea* hamper the sorting — and the Amphipods dominate. Among Tanaidacea, in the same sample, we captured: *Kalliapseudes omer-cooperi* and *Pagurapseudes* n. sp. The species is not very abundant, which is understandable by their low number of eggs.

Remarks. The above-described genus *Tanapseudes* seems to have appeared just to demonstrate that the time has not yet come for an accurate classification, at least for a phylogenetic description of *Crustacean* belonging to the *Tanaidacea* order, as already pointed out by Lang,

who gave up his intention to make an overall description of this group, as shown in the following statement :

"We say it because we probably dont't know even 20 per cent of the existing species, we know but a few types of structures and, above all, we know very little about the ecology and ethology of *Tanaids*, hence we have no adequate arguments to establish the different evolution ways of the group's representatives."

To endorse this statement, we mention the fact that in a few samples taken in the Gulf of Oman and the Gulf of Aden, we were able to discover three new genera and ten new species.

I must confess that the discovery of this new type of antennae structure — an unusual combination of a type of antennae I with a single flagellum (as in the *Tanaidae* family), a mandibular palp with a single non-ciliated seta (as in *Psammokalliapseudes* among *Kalliapsendidae*) and a peculiar peraeopod II caused me great embarrassment.

That could not be assigned to Tanaids, because their habitus was that of Monokonophora ; nor could it be considered a Kalliapseudid, because it lacked the sensitive organs at the dactylus of all peraeopods and also the filter of ciliated setae, so characteristic of the appendages of those Crustaceans. But it could not be placed among orthodox Apseudidians either (1), just because of its uniflagellate A_1 and its uni-segmented mandibular palp.

The problem of its classification in a higher unit remains an open one. Among the forms we are acquainted with, only "Apseudidae n.sp.", summarily figured by Makkaveeva from the south of the Red Sea, is reminiscent of our genus, particularly by the shape of Antenna I and of peraeopod II [5] ; however, it differs by the 2-segmented palp of Mandible, with common phanera and by the lack of the dactylus at the Chela ♂ (broken ?).

8. *FAM. TANAPSEUDIDAE* N. FAM.

I think that the combination of these mixed features calls for the creation of a separate family for this Tanaid, namely Tanapseudidae n.fam., with the following diagnosis : apseudid with uniflagellate Antenna I and with uni-segmented palp of mandible.

9. *PAGURAPSEUDOPSIS IRANICA* N. SP . (Fig. 6)

Description ♂ ♀. Body flattened integument yellowish-white, rough, weakly calcified, but not friable, with many areolae and folds on the tergal portion, extremely hirsute ; pilosity of fine hairs on the smooth surfaces, pennate setae on the edges and appendages. Frontal portion of carapace with a strong lobe (fig. 6 A) medially spiniform, curved downwards

nearly at a right angle, bordered by two rectangular lobes, lateral and anterior portion of carapace with an acute lobe, just near the basis of A_1 forming a common body with the ocular swelling, which does not show any visual elements ; it follows a straight lobe as wide as the frontal ones.

Edges of thoracomers 0—3 lobated, the lobes bearing many pennate setae (fig. 6 C) ; only the free thoracomer I is without lobes, both anteriorly and on the edges (fig. 6 A) ; the second one has its right anterior edge terminating in a strong antero-lateral apophysis, whilst thoracomers III—V show by 3 hirsute lobes, without considering the prominences forming the articulation of peraeopods (fig. 6 C) ; thoracomer VI has only 2 such lobes.

Pleomers, in a number of 5, show large epimeral projections bearing pennate setae ; telson, wider than long, begins with two lobes similar to those of pleonite V and terminates tergally in a triangular apophysis with 3—4 setae on the edges, which partially cover the aperture of the anal valves (fig. 6 B) ; in front of the basal lobes, as well as at the insertion of uropods, depressions are observed in the integument.

In males, the sternite of the free thoracomers has no hyposphenium ; in exchange, sternite II bears a huge antero-median spine, as long as the thickness of the relative thoracomers, and sternites III and IV (fig. 6 C) bear each a complex of 3 antero-medial spines (two huge ones and a small one between them), as well as a medium-sized posterior spine (corresponding to the common hyposphenium) ; V, with a large anterior spine and a small posterior one, whilst VI bears a small sexual bifid, medio-posterior tubercle (very like those in fig. 1 K) ; the ventral face of pleonites shows a small tubercle (not spine). The mature female has no ventral spines.

No dimorphism in the body.

Appendages Antennule (fig. 6 E) with a 13—14 segmented long, outer flagellum and 4 segmented small flagellum (with the basal one common to both flagella) ; the long flagellum has only 4 aesthetascae situated at the every second segment. Each segment with 2—3 long phanera with the terminal half suddenly narrowed and curved.

Antenna (fig. 6 D) *without squama ;* inner projection of basis terminating in a strong apophysis. *Labrum* short truncate as circulary cut when seen from below (like a free cut), semicircular (fig. 6 F), very characteristic (♂ ♀). *Mandible* common with 3-jointed palp (as in *P. gymnophobia)* ; maxillae do not show any particular feature. *Maxilliped* (fig. 6 G) is readily distinguished by the disk of meros.

Chelipeds ♂ as in fig. 6 H ; those in the ♀ ♀ studied were broken ; they bear a minute exopodite and an elongate propodite, somewhat longer than the carpus.

Peraeopod II with a large exopodite, is not specialized, *with cylindrical segments* (not flattened) similar to the others (♂ ♀) (fig. 6 I). Only the details differ : at the basis of dactylus, 2 small serrated claws (*i*, fig. 6) which lack in III and IV, where 3—4 spines are to be found on the propodus.

In ♂, peraeopods 3—5 the meros shows a strong antero-posterior tubercle (see the arrow fig. 6 J), a good dimorphic character. The size of peraeopods gradually diminishes from IV to VIII, but their morphology

is similar. Only two pairs of pleopods (I and II), filiform, perfectly similar, elongate, with uniarticulated rami and the exopodite — 1/2 of the length of basis — much smaller than the endopodite (fig. 6 K).

Uropod with its basis shorter than the pleotelson is laterally, subterminally inserted; rami short, with 3-segmented exopodite and 17-segmented endopodite (fig. 6 L).

Colour in living animals: yellowish-white, tinged with brown due to the lateritic mud stuck in all the depressions of the integument, particularly on the dorsal portion, and difficult to be precluded. Movements clumsy.

Material examined; *sizes*: 1 ♂ = 6 mm; 2 ♀♀ = 6.5 and 5.8 mm, the latter with 17 embryos in the oval marsupium, situated between the basis of peraeopod II and peraeonite V. Station D 087 of the ship Thalassa during the "Indian Ocean Campaign" 1977, 110 m, Gulf of Aden, 3.III.77 : 1 ♀ = 5.5 mm, St. D 076, 67 mm and 1 ♀ j at the entrance of the Ormuz Strait (26°31′17″N; 56°42′5⁻″; 1 ♂ = 6.2 mm, Gulf of Oman 28 m, 3.VII.1973.

Holotype ♂ no 374 and allotype ♀ no. 375 in the Crustacean collections of the "Gr. Antipa" Museum. Two paratypes ♀ ♀, ditto no. 376.

Remarks. The animal shows a dense pilosity on all appendages, on epimers and on the tergal portion of the body. Only the sternal face is glabrous.

This genus ought to belong to the family of Pagurapseudidae Lang, according to the structure of prp. II, but from the number of pleopods it enters the Metapseudidae. The diagnoses and the content of these families should be revised.

Compared with the Apseudidae, the species *Pagurapseudopsis iranica* can be related only to *Apsendes gymnophobia* [2]. Generically, this latter perfectly belongs to this genus by its entire morphology, except for the pleopods which in *A. gymnophobia* are in number of five. As a matter of fact, even Barnard [2] wrote that the structure of peraeopod 2 in *A. gymnophobia* "might suggests a generic separation".

Aside from the small tubercle in males, the meropodal spurs of peraeopods 3 and 4 and the lack of the sternal spines in females, no dimorphism could be found (either in antennae, or in pleopods).

Anyhow, leaving aside the number of pleopods (a detail to be checked-up) our species readily differs from *Apseudes* (*Pagurapseudopsis*) *gymnophobia* by the lack of the anterior lobes of peraeonites III and IV, by the complex of sternal spines (only one spine on the free thoracomer 2 in Barnard) and by the unequal rami of pleopods.

Additional data to the diagnosis. Body dorsoventrally flattened, extremely hirsute; frons trilobate medium spiniform lobe downwardly

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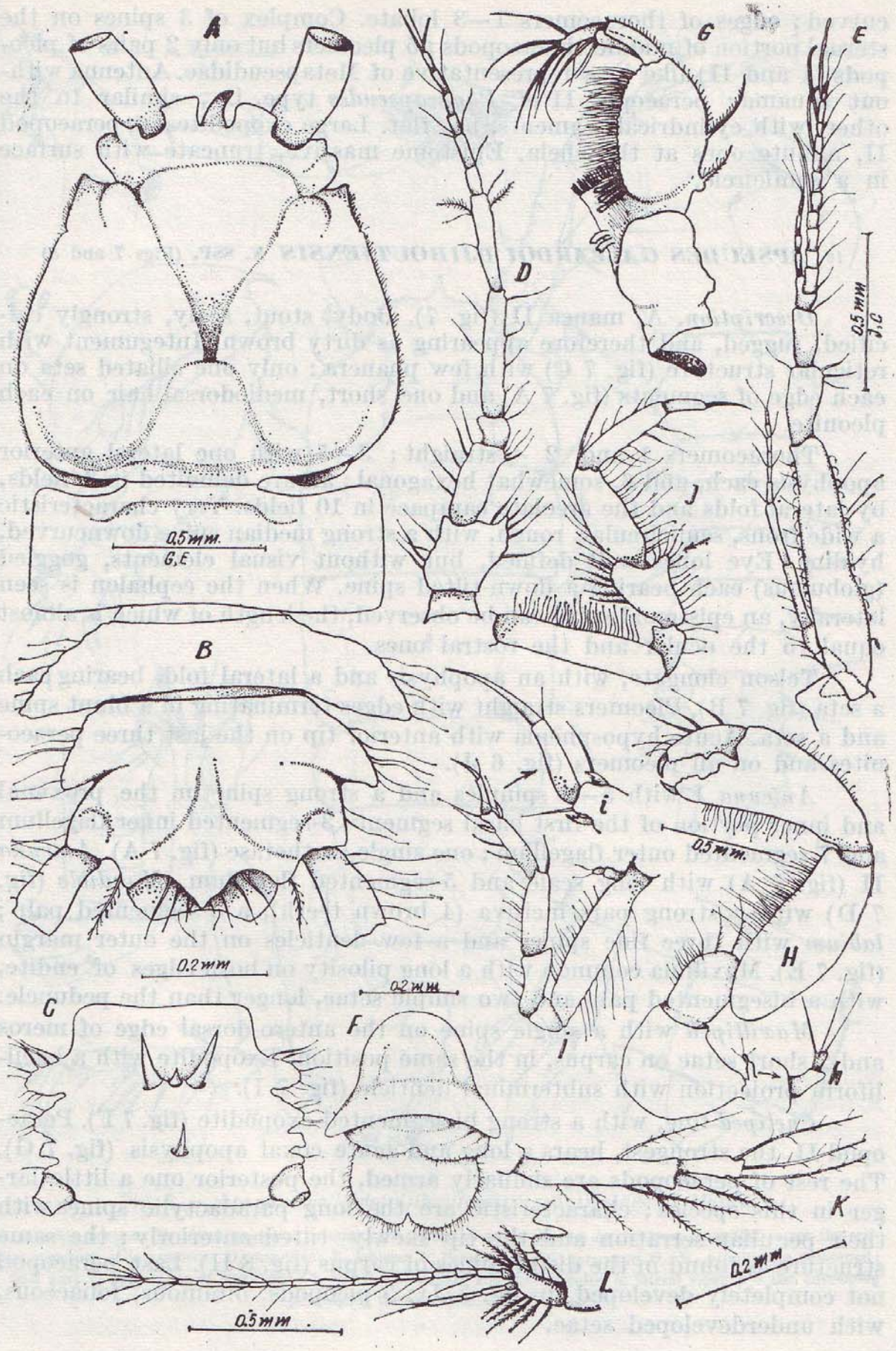
Fig. 6. — *Pagurapseudopsis iranica* n.sp. C,F,H,K,L = ♀; the rest = ♂.

A, cephalothorax and first free thoracomers; B, pleotelson and last pleonite (dorsal); C, thoracomer 4 in ventral view; D antenna; E, antennule; F, labrum with its epistome, in ventral view; G, maxilliped; H, chela; h, its exopodite; I, peraeopod 2; i, its distal portion magnified; J, peraeopod IV; K, pleopod I. L, uropod.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curved; edges of thoracomers 1—3 lobate. Complex of 3 spines on the sternal portion of middle thoracopods; 5 pleomers but only 2 pairs of pleopods (I and II) like in a representative of Metapseudidae. Antenna without squama; peraeopod II of *Pagurapseudes* type, i.e., similar to the other, with cylindrical segments, not flat. Large exopodites at peraeopod II, minute ones at the chela. Epistome massive, truncate with surface in a semicircle.

10. *APSEUDES GALLARDOI DJIBOUTIENSIS* N. SSP. (Figs 7 and 8)

Description. A, manca II (fig. 7). Body, stout, scaly, strongly calcified, rugged, and therefore appearing as dirty brown. Integument with reticular structure (fig. 7 C) with few phanera: only one ciliated seta on each edge of segments (fig. 7 A) and one short, mediodorsal hair on each pleonite.

Thoracomers 1 and 2 ± straight; 3—5 with one lateral anterior apophysis each, and 6, somewhat hexagonal; all are delimited in 3 fields, by lateral folds and the areolate carapace in 10 fields. Very characteristic a wide frons, semicircular, rough, with a strong median spine downcurved, hyaline. Eye lobes well defined, but without visual elements, goggled (globulous) each bearing a down-tilted spine. When the cephalon is seen laterally, an epistomal spine can be observed, the length of which is almost equal to the ocular and the rostral ones.

Telson elongate, with an apophysis and a lateral fold, bearing each a seta (fig. 7 B). Pleomers straight with edges terminating in a blunt spine and a seta. Acute hyposphenia with anterior tip on the last three peraeonites and on all pleomers (fig. 6 J).

Antenna I with 5—6 spinules and a strong spine on the proximal and inner portion of the first basal segment; 3-segmented inner flagellum and 7-segmented outer flagellum; one single aesthetasc (fig. 7 A). *Antenna* II (fig. 7 A) with long scale and 5-segmented flagellum. *Mandible* (fig. 7 D) with a strong pars incisiva (4 brown teeth), a 3-segmented palp; *labium* with three fine spines and a few denticles on the outer margin (fig. 7 E). Maxillula common with a long pilosity on both edges of endite, with a bisegmented palp and two simple setae, longer than the peduncle.

Maxilliped with a single spine on the antero-dorsal edge of meros and 2 short setae on carpus, in the same position. Exopodite with a baciliform projection with subterminal denticle (fig. 7 I).

Cheliped fine, with a strong bi-segmented exopodite (fig. 7 F). Peraeopod II, the strongest, bears a long and acute coxal apophysis (fig. 7 G). The rest of peraeopods are similarly armed, the posterior one a little larger in this species; characteristic are the long paradactylic spines with their peculiar serration and the tip skewly tilted anteriorly; the same structure is found in the distal spines of carpus (fig. 8 H). Last peraeopod not completely developed (p. fig. 7 J); 5 pleopods, biramous, foliaceous, with underdeveloped setae.

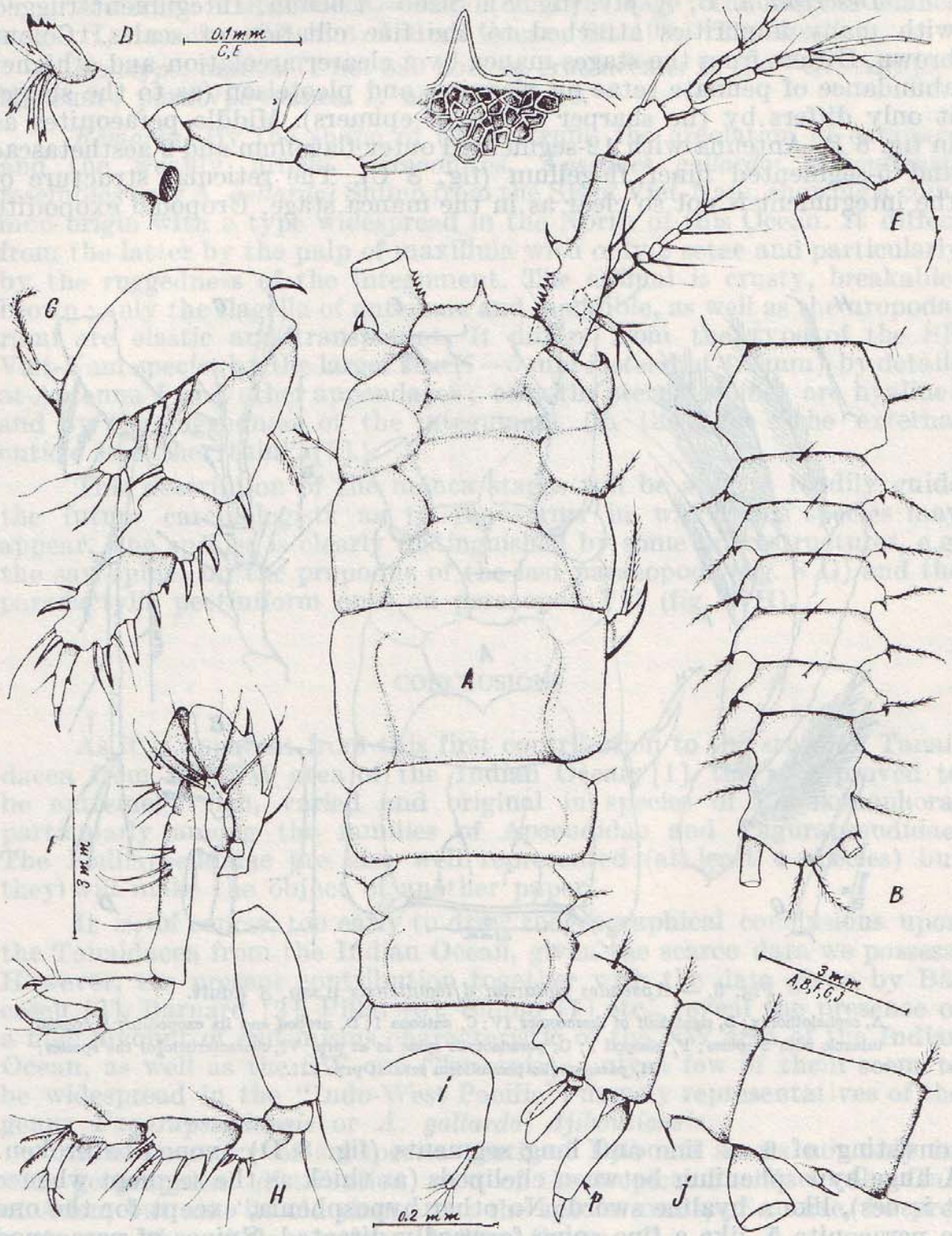

Fig. 7. — *Apseudes gallardoi djiboutiensis* n.ssp. in stage II Manca,

A, anterior portion; B, ditto, posterior extremity; C, rostrum and a portion of the frons magnified to see the reticular structure of integument; D, mandible; E, labium; F, Peraeopod I; G, peraeopod II; H, penultimate peraeopod; I, final part of epignathus of maxilliped; J, last 3 thoracomers and first pleonite, in lateral view; p = last developing peracopod; the hyposphenia can be seen.

Description. B, ♂ juv. (fig. 8). Size = 7.6 mm. Integument rugged with many impurities attached to the fine ciliation of scales. Colour brown. Differs from the stages manca by a clearer areolation and a higher abundance of pennate setae on pleonites and pleotelson (as to the shape, it only differs by the sharper spines of epimers). Middle peraeonites as in fig. 8 B. Antenna with 12-segmented outer flagellum and 2 aesthetascae and 5-segmented inner flagellum (fig. 8 C). The reticular structure of the integument is not so clear as in the manca stage. Uropodal exopodite

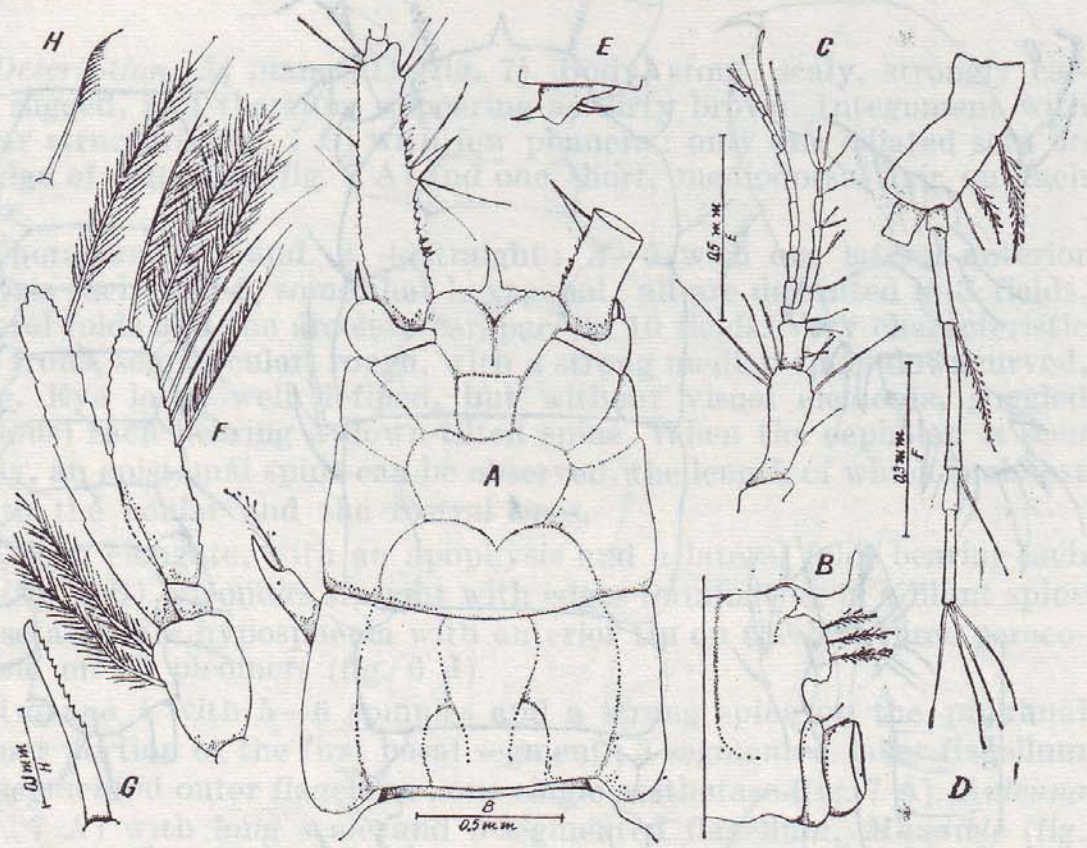

Fig. 8. — *Apseudes gallardoi djiboutiensis* n.ssp. ♂ adult.

A, cephalothorax; B, right half of thoracomer IV; C, antenna I; D, uropod and its exopodite; E, penial tubercle with 2 spines; F, pleopod I; G, paradactylic spine as at prp. VI, characteristic of the species; H, paradactylic pectiniform seta at prp. VII.

consisting of 6—7 fine and long segments (fig. 8 D) exopodite broken. A huge hyposphenium between chelipeds (as thick as the segment whence it issues), like a hyaline sword. No other hyposphenia, except for the one in peraeonite 5, like a fine spine forwardly directed. Spines of peraeopod II are brown in their terminal half. Between the last peraeopods, a peculiar genital complex with an anterior and a posterior spine (fig. 8 E).

The 5 pleopods have long rami and a characteristic ornamentation of long setae doubly ciliated; cilia very long and dense intercross, forming a solid swimming blade with silky iridescenses (fig. 8 F). We mention that in the 3 mm manca the pleopods had not yet any setae.

Material: 2 specimens, both in manca stage; the one, in manca stage II, measures 2.8 mm. Indian Ocean, St. 103, "Thalassa".

Holotype, manca II no. 389 coll. of crustaceans in the "Gr. Antipa" Museum; paratype-manca I, no. 390 ditto.

Remarks. By the shape of the rostrum, the areolation of carapace and the weakly armed peraeonites, *Apseudes gallardoi djiboutiensis* resembles only A. *gallardoi* Shiino from the SE of Viet-Nam, showing a common origin with a type widespread in the North of this Ocean. It differs from the latter by the palp of maxillula with only 2 setae and particularly by the ruggedness of the integument. The animal is crusty, breakable, brown; only the flagella of antennae and mandible, as well as the uropodal rami are elastic and transparent. It differs from the type of the SE Viet-Nam species by the larger size (7—5 mm instead of 4.9 mm), by details at Antenna I and other appendages; only the sternal spines are hyaline; and by the ruggedness of the integument (in the type "the external cuticle is rather thin" [7].)

This description of the manca stages will be able to readily guide the future carcinologists as to the forms in which this species may appear. The species is clearly distinguished by some microstructures, e.g. the saw-spines on the propodus of the last paraeopods (fig. 8 G) and the paradactylic pectiniform ones on peraeopod VII (fig. 8 H).

CONCLUSIONS

As it is apparent from this first contribution to the study of Tanaidacea from the NW area of the Indian Ocean [1], the area proved to be extremely rich, varied and original in species of Monokonophora, particularly among the families of Apseudidae and Pagurapseudidae. The Kalliapseudidae are also well represented (at least 4 species) but they will make the object of another paper.

It is, of course, too early to draw zoogeographical conclusions upon the Tanaidacea from the Indian Ocean, given the scarce data we possess. However, the present contribution together with the data given by Băcescu [3], Barnard [2], Pillai [6], Shiino [7] etc., reveal the presence of a high amount of endemisms characteristic of the NW area of the Indian Ocean, as well as the SW one (Tanzania); only a few of them seem to be widespread in the "Indo-West Pacific", namely representatives of the genus *Pagurapseudopsis* or *A. gallardoi djiboutiensis*.

The discovery of subspecies north of Djibouti shows not only its wide geographical distribution west of the tropical Pacific to the Gulf of Aden, but also its old character; the species must, of course, be present over the whole northern Indian Ocean.

Unfortunately, the huge international research campaign initiated by UNESCO in the Indian Ocean did not tackle the fauna of the small benthic animals, particularly in the vast space of its continental shelf.

Anyhow, the calcareous and glauconiticous muds seem to be the ideal medium for the development of Monokonophora; this is why the Monokonophora type is dominant: small, elongate, many of them blind,

with soft, smooth and ± glabrous integument : *Pakistanapseudes*, *Tanapseudes*, *Msangia* mihi.

Maybe due to them the Indian Ocean generated special types of such *Crustacea*, thus proving this Ocean to be an important speciation centre.

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