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INDIAN OCEAN KINORHYNCHA
2. NEOCENTROPHYIDAE, A NEW HOMALORHAGID FAMILY

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Perhaps the most criticized of Zelinka's kinorhynch species are *Pycnophyes quadridentatus* Zelinka, 1928, and *P. flagellatus* Zelinka, 1928, each described from a single specimen. Both specimens were dredged from the Gulf of Baja (Naples) along with "several" *P. communis* Zelinka, 1928, *Echinoderes dujardini* Claparède, 1863, and several juvenile stages.

The aberrant morphology of *P. quadridentatus* and *P. flagellatus* combined with the problem of a single specimen of each species must have caused Zelinka considerable concern. Superficially the specimens were homalorhagid, but close inspection revealed an undeniable resemblance to the cyclorhagid taxa.

Possibly because of justification of these new species Zelinka (1928, p. 136) reversed his prior opinion that "paedogenesis" occurred in the homalorhagids. Nonetheless, paedogenic characters were manifest in the morphology of these strange new species which remained unchallenged for nearly 20 years.

In 1947, Nyholm (p. 36) reported: "that paedogenetic *Hyalophyes* forms, when moulting, discharge eggs in the old integuments" and (p. 35) "that *Hyalophyes* forms—can become sexually mature but they continue to grow and not reach the imago until they change to *Pycnophyes* forms." I concur with Nyholm in that it does appear that the last juvenile stage of *Pycnophyes* may become sexually mature, but in such cases there is not a marked degree of morphological difference between this form and the normally developed adult. In cases

where the last molt is omitted the total length seems to be the most striking difference between the matured juvenile and the adult which has undergone the final molt, and the length characteristics of the two forms overlap in their normal curves.

Soon after Nyholm began and finished his work on kinorhynchs, Lang (1949), in addition to describing new kinorhynchs from the Swedish Antarctic Expedition, 1901–1903, critically examined the status of kinorhynch phylogeny and taxonomic characters and, upon reviewing the homalorhagids (p. 12) stated: "The isolated position of *quadridentatus, flagellatus* and *echinoderoides* in the groups of Zelinka as well as of Remane makes one extremely skeptical about them. And a study of Zelinka's reports on them—the three species have all been established by him—leads to the conviction that they lack any right of existence."

The report which follows is the third (Higgins, 1968a, b) in a series on the extensive collections of kinorhynchs I made along the coasts of India, Kenya, and the island of Nosy Bé, Malagasy Republic in 1964. The methods are identical with those outlined in the second paper of the series (Higgins, 1968b) which discusses the cyclorhagid families Semnoderidae and Centroderidae.

In this paper I shall resurrect the Lang-Zelinka dispute which has been mentioned above because I share Zelinka's experience of finding too few specimens—specimens which, as did the Zelinka collection from the Gulf of Baja, clearly reveal morphology intermediate, in several characteristics, between the cyclorhagid and homalorhagid taxa.

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The following key is amended from the prior pages in this series (Higgins, 1968b) to include the new genus and family whose descriptions will follow.

KEY TO THE ADULTS OF THE KINORHYNCH GENERA

1. First trunk segment entire, bivalvate with or without midventral and middorsal plates; round or oval in cross section; lateral, dorsal and terminal spines usually well developed; with 14–16 placids (neck plates) when present ..... order Cyclorhagida
   First trunk segment with single, strongly arched dorsal plate, single midventral plate and two lateroventral plates, or with ventral plates partially or entirely fused to form single, broad ventral plate; articulated (movable) trunk spines, if present, restricted to laterotermínal spines, occasionally with distinct spinose extensions of middorsal and lateral tergal borders, with 6–8 placids ..... order Homalorhagida 2

2(1). With midterminal spine and distinct spinose extensions of middorsal and lateral tergal borders; with 7 placids ..... Neocentrophyidae, n. f., *Neocentrophyes*, n. g.
   Without midterminal spine, with 6 or 8 placids 3

3(2). With laterotermínal spines ..... *Pycnophyes*
   Without laterotermínal spines ..... *Trachydemus*

4(1). First trunk segment entire, without midventral plate ..... suborder Cyclorhagae 5
   First trunk segment bivalvate, and/or with midventral plate; if not bivalvate, midventral plates on segments 3–8 8

5(4). First and second trunk segments entire; midterminal spine absent ..... family Echinoderidae, *Echinoderes*
   First trunk segment entire, second trunk segment with two lateroventral plates; midterminal spine present ..... family Centroderidae 6

6(5). Elongate spines extending from posterolateral margins of first trunk segment; laterotermínal accessory spines present in addition to laterotermínal spines 7

Elongate spines not present on posterolateral margins of first segment; lateroterminal accesory spines absent ..... *Condyloderes*

7(6). Lateral spines on most trunk segments; few lateral accessory spines present ..... *Campyloderes*
Lateral spines on few trunk segments, without lateral accessory spines ..... *Centroderes*

8(4). Midventral plate on segments 3–8, tapering in posterior progression; lateroventral articulation zone weakly developed; middorsal spine absent on segments 3, 7, 9, and 12 ..... suborder Cryptorhagae, family Cateriidae, *Cateria*
Midventral plate, if present, restricted to first trunk segment, first trunk segment with bilateral plates; lateroventral articulation zone obvious; middorsal spines on all trunk segments ..... suborder Conchorhagae, family Semnoderidae 9

9(8). Midventral and middorsal plate present on first trunk segment; with well-developed placids ..... *Sphenoderes*
Midventral and middorsal plate absent; without distinct placids ..... *Semnoderes*

Order Homalorhagida (Zelinka, 1896) Chitwood, 1958

Homalorhagae Zelinka, 1896, p. 198.
Homalorhaga Gerlach, 1956, p. 129.
Homalorhagea Chitwood, 1958, p. 942.

Definition: Kinorhyncha with second segment (neck) consisting of 6, 7, or 8 well-formed placids (neck plates); trunk segments flattened ventrally, vaulted dorsally, triangular in cross section; protonephridia without ligaments; gonopores ventrolateral on segment 13 or lateral between segments 12–13; pharynx musculature tripartite; oblique muscles absent; armor joints, if present, consisting of dorsal acetabulum and ventral condyle; with intersegmental processes along middorsal ridge or non articulate spinous processes both middorsally and laterally on tergal plates, if the latter, then with well-developed perispinal setae on either side of spinous processes; occasionally with midterminal spine in early postembryonic stages or adult; surface of trunk segments with minute pores or denticulate, hair like processes.

Neocentrophyidae new family

Definition: Homalorhagida with second segment (neck) consisting of seven well-formed placids (four dorsal and three ventral); mouth cone with four short, thin, unjointed styles and five longer, two-jointed styles, all with pectinate basal area; six(?) rows of scalids present, first row with single elongate seta centered on basal plate, bordered by pectinate fringe; 14 trichoscalids present in posterior scalid row; first trunk segment not divided into three ventral plates, or with plate formation evidenced only at anterior margin; middorsal and lateral, non articulate spinous processes on all tergal plates; with well-developed perispinal setae on either side of most spinous processes; midterminal spine pres-

ent, short, located between median terminal extensions of segment 13 so as to appear at the base of a notch in the terminal segment; armor joints absent or weakly developed; surface of trunk segments with denticulate hairlike processes; gonopores lateral between segments 12–13.

Neocentrophyes new genus

Type species: *Neocentrophyes intermedius* new species.
Definition: As in family.

Neocentrophyes intermedius new species
Figures 1–3

Diagnosis: *Neocentrophyes* with nonsetate trichoscalids; with ventral perispinal seta of lateral spinous process missing on segments 4, 6, 8, and 12; with middorsal flagelloid spinous process extending from posterior margin of segments 12 and 13, other middorsal spinous processes reaching maximum length of 30μ at segment 7.

Holotype: Adult male, TL 650μ; Ambatozavavy Bay, Nosy Bé, Malagasy Republic (13° 21.5′ S, 48° 19.5′ E); 1–2 m; gray-brown sandy mud; 15 April 1964; col. R. P. Higgins (RH44.81); USNM 37993.

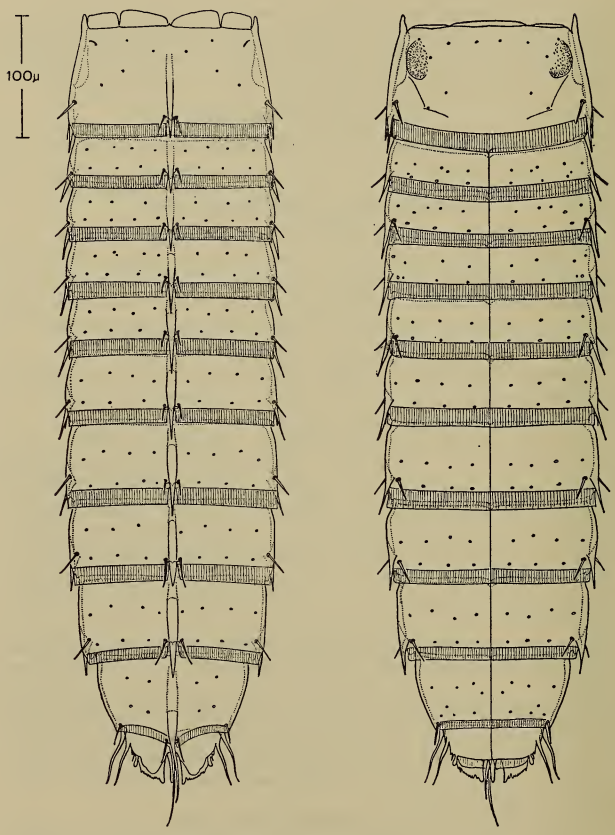
Paratypes: 4 adult males, TL 490–608μ, 1 juvenile, TL 352μ; as holotype (RH44 series); 1 adult male, TL 554μ; Anse des Antalaotra, Nosy Bé, Malagasy Republic; 1–2 m; muddy sand; 16 April 1964; col. R. P. Higgins (RH45 series); 2 adult males, TL 570–577μ; Ampasindava Bay, Nosy Bé, Malagasy Republic; 18 m; gray mud; 23 April 1964; col. R. P. Higgins (RH51 series); RH44, RH45, and RH51 series retained in author's collection.

Description: Holotypic male, TL 650μ; MSW-5 170μ; SW 120μ; SW/TL 0.19.

First segment (head) retracted. The following description of the head is based on a paratypic male, TL 608μ, RH44.78 (Fig. 3): Mouth cone with five two-jointed styles, 80μ, and four non jointed styles, 45μ, all with pectinate basal plate; six(?) rows of scalids, 10 spinoscalids of first row blunt-tipped, ca. 105μ, with pectinate basal plate and single elongate seta, ca. 40μ; second through fifth rows with pointed spinoscalids, ca. 75μ, 73μ, 57μ, and 52μ; posteriormost row with 14 nonsetate trichoscalids, 45μ.

Second segment (neck) with four dorsal placids (Fig. 1), medial placids 40μ wide, lateral placids 25μ wide; with three ventral placids (Fig. 2), midventral placid 64μ wide, lateral placids ca. 30μ wide.

Third segment (first trunk segment) with anterolateral margins projecting slightly as horn-like processes; anterior margin of dorsal and ventral plates even; muscle scars barely evidenced posterolaterally on dorsal plate and anterolateral on ventral plate; surface of plates with scattered openings, probably sensory pores; lateral tergal margin extended posteriorly as spinous process, ca. 27μ, with prominent perispinal setae, ca. 20μ, adjacent to base, one on ventral plate, one dorsal to lateral spinous process; middorsal ridge extending posteriorly to form short



FIGURES 1–2. *Neocentrophyes intermedius* n. sp., adult male, holotype, TL 650μ, neck and trunk segments: 1, dorsal view; 2, ventral view.

spinous process, ca. 13μ, also with perispinal setae, ca. 20μ, adjacent to base; posterior margins of dorsal and ventral plates thin, finely striate.

Fourth segment with lateroventral plates, indistinctly articulating laterally with dorsal plate, typical homalorhagid armor joints absent or poorly developed; dorsal perispinal seta present near base of lateral

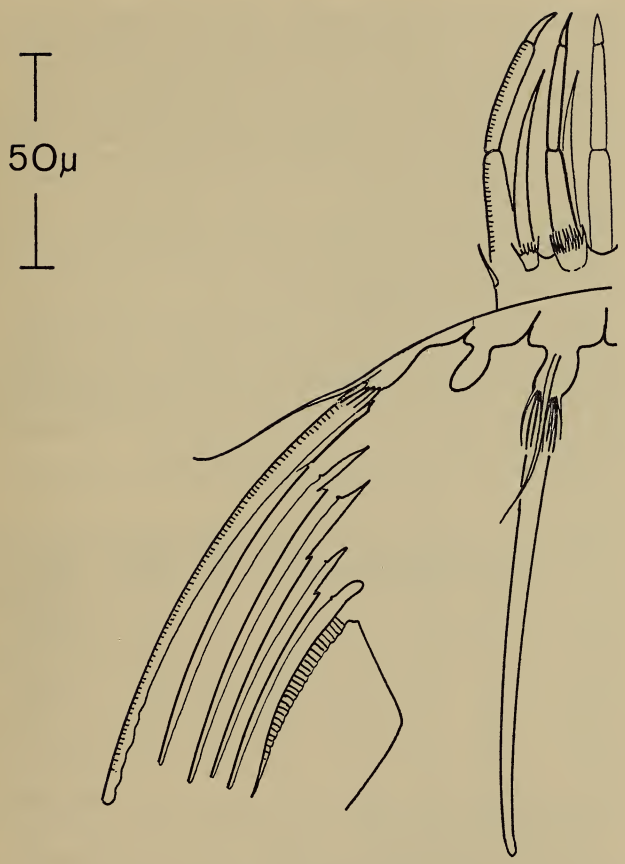


FIGURE 3. *Neocentrophyes intermedius* n. sp., adult male, paratype, TL 608μ, diagrammatic perspective, lateral half of head segment showing portion of mouth cone and spinoscalid-trichoscalid series.

spinous process, ventral perispinal seta absent; four sensory pits near anterior margin and three near posterior margin of each ventral plate and left and right halves of dorsal plate; otherwise similar to third segment.

Segments 5–11 similar to fourth, middorsal spinous processes reaching maximum length at segment 7, D-5 19μ, D-6 28μ, D-7 30μ, D-8 24μ, D-9 27μ, D-10 20μ, D-11 28μ; lateral spinous processes slightly longer, L-5 31μ, L-6 32μ, L-7 35μ, L-8 33μ, L-9 28μ, L-10 26μ, L-11 26μ; ventral perispinal seta of lateral spinous process absent on segments 6 and 8.

Segment 12 tapering posteriorly; with fewer sensory pits dorsally; lateral spinous process not extending beyond striate border of segment, ventral perispinal seta of lateral spinous process absent; middorsal spinous process thin, flagelloid, 50μ.

Segment 13 bifurcate, similar to *Echinoderes*; deeply incised along midline to accommodate short, midterminal spine, 29μ, nearly extending to margin of segment; with thin, flagelloid middorsal spinous process, 60μ; penis spine present anterolaterally, 48μ, second penis spine slightly posterior on lateral margin, 38μ; terminal margin of dorsal plate not extending to terminal margin of ventral plate; bulbose protrusion at laterotermINAL junction of dorsal and ventral plates, 8μ.

Measurements (μ) and indices for selected specimens of *Neocentrophyes intermedius* n. sp. are as follows:

	Juvenile RH44.80	Adult ♂ RH44.82	Adult ♂ RH44.76	Adult ♂ RH51.9	Adult ♂ USNM 37994	Adult ♂ USNM Holotype	Adult Range
TL	352	490	527	577	608	650	490– 650
SW	96	114	112	120	120	120	112– 120
SW/TL	0.27	0.23	0.23	0.21	0.20	0.19	0.19–0.23
MSW-5	130	154	168	160	168	170	154– 170
MTS	14	16	14	14	19	20	14– 20
MTS/TL	0.040	0.033	0.027	0.024	0.031	0.031	0.024–0.033

Discussion: Neocentrophyes intermedius n. sp. resembles *Pycnophyes flagellatus* in size (TL 595μ for the latter species), in its spinous processes and perispinal setae, in the denticulate hair-like processes, in the presence of a midventral placid, and most acutely, in the presence of the middorsal flagelloid spinous process on the twelfth segment and similar process on the thirteenth segment. The new species differs from *P. flagellatus* by the former's lack of laterotermINAL spines, by its lack of a broadly rounded thirteenth tergal plate, and apparently thickened but not articulate midventral and lateral plates on the ventral surface of the first trunk segment. Additionally, *P. flagellatus* apparently lacks(?) a

midterminal spine and has some delineation of the typical homalorhagid plate formation on the ventral surface of segment 3.

The normal attention to detail in the majority of Zelinka's species descriptions and illustrations deteriorates with *P. flagellatus*. The character of the mouth cone, by itself, in *Neocentrophyes intermedius*, n. sp. is of sufficient magnitude to separate it generically from *Pycnophyes*. Nothing is known of the mouth cone structure in *P. flagellatus*.

In the case of *P. quadridentatus*, *N. intermedius*, n. sp. differs by its lack of laterotermínal spines, by its flagelloid thirteenth middorsal spinous process, and by its lack of marginal plate formation on the first trunk segment. In both *P. quadridentatus* and *P. flagellatus* the midventral placid is no wider than the lateral placids, but in *N. intermedius*, n. sp. this placid is twice the width of those adjacent to it.

Considering the morphology of the juvenile specimen of *N. intermedius*, n. sp., TL 352μ, which lacks the flagellar spinous processes of the adult, it seems possible that *P. quadridentatus* may be a juvenile stage of *P. flagellatus*. Only by intensive study of the kinorhynch populations where these presently discussed species occur can the matter be resolved.

Neocentrophyes satyai new species
Figures 4–5

Diagnosis: Neocentrophyes with setate trichoscalids, with both dorsal and ventral perispinal setae missing at base of lateral spinous process of segment 4; without middorsal flagelloid spinous process on terminal segments, other spinous processes reaching maximum length of 52μ at segment 6.

Holotype: Adult female, TL 537μ; ca. 10 km offshore E of Visakhapatnam (Bay of Bengal), India; 40 m; brown sandy mud; 26 March 1964; col. R. P. Higgins (RH37.87); USNM 37995.

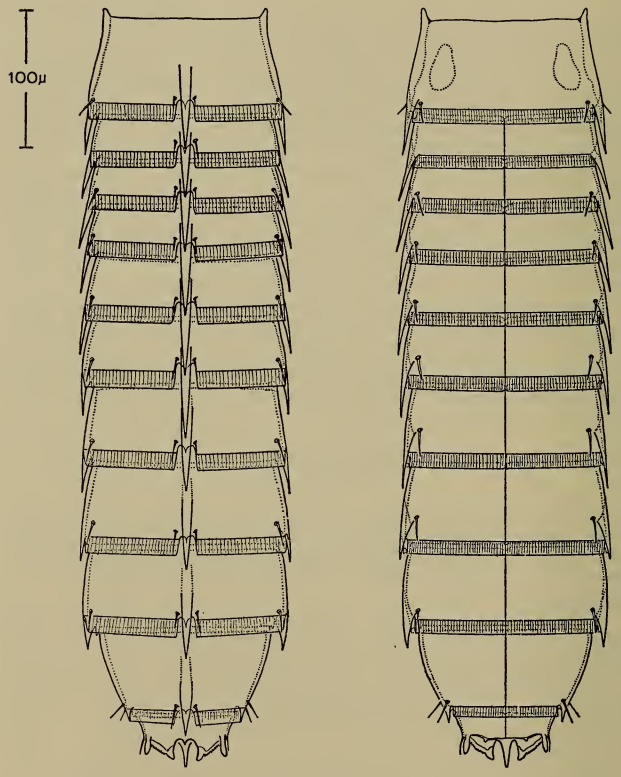
Paratypes: Adult female, TL 445μ and juvenile, TL 430μ; as holotype; (RH37 series, retained in author's collection).

Description: Holotypic female, TL 537μ; MSW-8 146μ; SW 124μ; SW/TL 0.23.

First segment (head) retracted. Second segment not visible except for retracted outline which shows seven placids as in generic definition.

Third segment (first trunk segment) with anterolateral margins projecting slightly as horn-like processes; anterior margin of dorsal and ventral plates even; large muscle scars discernible only on ventral plate, centered midway between anterior and posterior margins; sensory pores not well-evidenced; lateroventral margin of dorsal plate extended into spinous process, ca. 37μ, with prominent perispinal setae, ca. 20μ, adjacent to base, one on ventral plate, one dorsal to lateral spinous process; middorsal ridge extending posteriorly to form spinous process, 35μ, with perispinal setae, ca. 18μ, adjacent to base; with posterior margins of dorsal and ventral plates thin, finely striate.

Fourth segment with lateroventral plates indistinctly articulating



FIGURES 4–5. *Neocentrophyes satyai* n. sp., adult female, holotype, TL 537μ, trunk segments: 4, dorsal view; 5, ventral view.

laterally with dorsal plate, typical homalorhagid armor joints absent or poorly developed; without lateral perispinal setae; no sensory pits noted (possibly obscured by condition of specimen).

Segments 5–11 similar to fourth but with lateral perispinal setae; middorsal spinous processes reaching maximum length at segment 6, D-5 40μ, D-6 52μ, D-7 52μ, D-8 52μ, D-9 33μ, D-10 28μ, D-11 30μ;

lateral spinous processes slightly shorter, L-5 42μ, L-6 37μ, L-7 40μ, L-8 41μ, L-9 41μ, L-10 31μ, L-11 25μ.

Segment 13 bifurcated as in *Neocentrophyes intermedius* n. sp.; deeply incised along midline to accommodate short midterminal spine, ca. 20μ, middorsal spinous process barely suggested; margin of dorsal plate not extending to terminal margin of ventral plates; bulbose protrusion at laterotermínal junction of dorsal and ventral plates, 15μ.

Measurements (μ) and indices for specimens of *Neocentrophyes satyai* n. sp. are as follows:

	Juvenile RH37.27	Adult ♀ RH37.88	Adult ♀ USNM 37995 Holotype
TL	430	445	537
SW	102	104	124
SW/TL	0.24	0.23	0.23
MSW-8	124	140	146
MTS	18	18	20
MTS/TL	0.043	0.040	0.037

Etymology: This species is named in honor of the Liaison Officer for the U. S. Program in Biology, IIOE, Dr. T. S. Satyanarayna Rao—respectfully and affectionately called "Satya" by his many friends.

Discussion: Neocentrophyes satyai n. sp. differs from *N. intermedius* by the former's lack of the flagelloid middorsal spinous process on segments 12 and 13, lack of lateral perispinal setae on segment 4 and presence of both dorsal and ventral perispinal setae on the remainder of the lateral spinous processes of the trunk segments, by its significantly shorter (13μ) middorsal spinous process on segment 3 and much longer processes on segments 4–8 in particular. Characteristics such as the more posterior position of the lateral perispinal setae of segment 3 (Figs. 4–5), the presence of a small seta near each laterotermínal protuberance, the outline of the terminal border of both dorsal and ventral plates, and the MTS/TL index may be of taxonomic importance.

The presence of a laterotermínal spine in both *Pycnophyes flagellatus* and *P. quadridentatus* readily separates these two species from *N. satyai* n. sp.

Neocentrophyes satyai n. sp. is known only from two adult females just as *N. intermedius* n. sp. is known only from several adult males. Although nothing can be stated about the sexual dimorphism of either of the new species, based upon my experience, I would not expect to find sexual dimorphism accounting for the differences between *N. intermedius* n. sp. of the West Coast of Madagascar and *N. satyai* n. sp. from the East Coast of India.

The Evolutionary Significance of the Neocentrophyidae

Zelinka's aberrant species, *Pycnophyes flagellatus*, *P. quadridentatus* and *P. echinoderoides*, each based on a single specimen, have been banished from existence by Lang, 1949 as noted in the introduction of this paper. Although I, too, would exclude *P. echinoderoides* at this time, and have serious doubts as to the taxonomic validity of both *P. flagellatus* and *P. quadridentatus* (the latter possibly a juvenile stage of the former), I shall renew the Lang-Zelinka dispute.

Indeed, I shall take up the argument for the existence of Zelinka's disputed taxa not merely because of the present discovery of two additional species which, by Lang's reasoning, would be explained as deformations or retarded development, but because of the rapidly accumulating evidence that heterochrony (=paedogenesis) has been an important factor in the establishment of several uncommon kinorhynch taxa.

The notation by Nyholm (1947) in his studies of the Kinorhyncha, that "paedogenesis" may occur in *Pycnophyes* is certainly substantiated by my own studies (Higgins, 1962). Yet, Lang (1949) is correct in raising many questions basic to this feature of kinorhynch biology. Perhaps the only contribution that can be added to Nyholm's work is the observation that when the fifth of a normally six-instar series in *Pycnophyes* assumes adult characters without the final molt, this individual is not unrecognizable as conspecific with the more normally developed adult of the species in question. The recognition, however, of earlier stages is an entirely different matter.

Probably the most aberrant and obviously neotenic kinorhynch taxon to be described so far is *Cateria* (Gerlach, 1956). In my recent discussion (Higgins, 1968a) of this mesopsammic taxon I mentioned the following series of juvenile characters among the Kinorhyncha: 1) a poorly developed cuticle, usually hyaline rather than chitin "tanned"; 2) spinous to denticulate cuticular marking rather than hairs or pores which communicate with the underlying cells; 3) incomplete or poorly developed segmental or plate articulation, particularly lateroventrally; 4) presence of midterminal spine, laterotermi-nal and laterotermi-nal accessory spines, and extensive mid-

dorsal and lateral spines; 5) absence of sexually dimorphic characteristics, including various spines, certain adhesive tubes, and apparent absence of functional gonopores.

Recently described new genera such as *Condyloderes* Higgins, 1968b and *Sphenoderes* Higgins, 1968b reflect the growing evidence that the ontogeny of the better known taxa such as *Echinoderes* and *Pycnophyes* is reflected in the adults of less common taxa. Certainly the presence of the genus *Neocentrophyes* is well within the expected evolutionary limits of the phylum.

Assuming the validity of the two most common genera of Homalorhagida, ie. *Pycnophyes* and *Trachydemus*, the former differing from the latter by its possession of laterotermínal spines and recognizably distinct postembryonic stages, and assuming the heterochronic potential of the various taxa now known, it then follows certain juvenile characters might establish themselves in a taxon closely related to the more "adult" genus *Pycnophyes* and, similarly, the genus *Trachydemus*. Indeed, this is strongly evidenced by *Neocentrophyes* which, by its lack of laterotermínal spines, suggests a strong relationship to *Trachydemus*. A similar relationship exists between *Pycnophyes* and Zelinka's *P. flagellatus* and *P. quadridentatus* as suggested in their being assigned to this genus by Zelinka on the basis of their laterotermínal spines.

Following his declaration that *P. flagellatus, P. quadridentatus* and *P. echinoderoides* "lack any right of existence," Lang (1949, p. 12) continues: "Each of them has been obtained once only. They all have in common the weak cuticularization which may indicate their having moulted but recently. *Echinoderoides* was found also still lying in the *Hyalophyes* skin. And Zelinka (l.c., p. 218 et al.) has pointed out himself that the Echinoderida directly after their 'metamorphosis' look quite different from older imagines."

The unfortunate possibility that representatives of certain taxa may be collected "once only" either because of their normally low proportion within the community sampled or because they are not normally a component of the sampled area, or for any reason, does not justify their "non-existence."

Weak cuticularization is now a well-established character retained by such neotenic taxa as the Cryptorhagae. The present evidence does not allow for comment on the validity of all three of the species criticized by Lang to any further degree than has already been discussed.

Lang continues: "The extraordinary structure of the 3rd zonite in *quadridentatus*, which, incidentally was already dead when secured, cannot be considered a normal phenomenon. The impression it makes of being a defective specimen, the development of which has been retarded, is increased not only by the above mentioned shape of the armour, but also by its having kept such 'larval' characters as the strong lateral and dorsal spines and especially the long dorsal spines situated almost terminally on the last zonite (cf. Nyholm 1947b, p. 9)."

The structure of the third segment (first trunk segment) of the taxa in question is neither unexplainable nor unexpected considering the morphology of this same segment in both *Cateria* and *Sphenoderes*, neither of which was known to Lang. In *Cateria*, an otherwise normal cyclorhagid morphology is contrasted with the distinct division of the first trunk segment's ventral surface into a midventral plate which, depending upon the species, may not be separated from the remaining portion of the segment for its entire length. In *Cateria*, this ventral plate formation proceeds to the eighth segment and is accompanied by weak development of the lateroventral articulation zone. In *Sphenoderes*, the otherwise *Semnoderes*-character of the genus is marked by the presence of both a middorsal and midventral plate between the bilateral clam-shell-like closing apparatus formed by the first trunk segment.

In each case, *Cateria* and *Sphenoderes*, two otherwise cyclorhagid forms (14 placids or their equivalent on segment 2, etc.) have exhibited homalorhagid morphology by the development of a midventral plate on segment 3. The "larval" characters such as the strong lateral and dorsal spines, etc. that Lang refers to, and which exist in *Neocentrophyes* as well as the Zelinka species to which Lang alludes, are extremely suggestive of the postembryonic stages of the homalorhagids just as is the poorly developed plate formation on the third segment.

On the other hand, several previously described genera such as *Semnoderes, Centroderes, Campyloderes,* and the more recently described *Sphenoderes* and *Condyloderes* retain the juvenile character for both middorsal and lateral spines to be extensively developed in the adult. *Neocentrophyes* follows this same pattern as do the Zelinka species, regardless of their arbitrary generic assignment.

Finally, let me comment on Lang's statement: "*Flagellatus* gives the same impression as *quadridentatus.* According to Zelinka it is a male, but that it does not represent a normally developed stage is indicated by its lack of penis spines, in contrast to all other Homalorhagae. The lack of penis spines, like the lack of genital openings, is characteristic for the 'larvae' (Zelinka, l.c., p. 136, Remane, l.c., p. 331)!"

Zelinka's illustration of *P. flagellatus* (Plate 14, Figures 4–5) clearly shows two lateral spines which he labels sb_1 and sb_2 or "Seitenstacheln" which are the equivalent of the penis spines of *Neocentrophyes intermedius* (Figs. 1–2). Certainly, if one looks for the normal homalorhagid genital apparatus in the intermediate-oriented *Neocentrophyes* one will not find it. Instead, *Neocentrophyes* penis spines and associated genital apparatus are located laterally as in the Cyclorhagida, one of the several characteristics which enhances the suggestion that this taxon is phylogenetically an intermediate through a neotenic evolutionary process not uncommon to many invertebrate taxa. The mature state of the gonads of the specimens described in this paper obviates the question of their adulthood.

Finally, we must consider the implication that if *Neocentrophyes* is to *Trachydemus* as *Pycnophyes flagellatus* is to *Pycnophyes,* then *P. flagellatus* may constitute a new generic category. A single specimen of homalorhagid kinorhynch taken from the continental slope off the coast of North Carolina by Dr. F. Grassle, Duke University Marine Laboratory, shows the essential family characteristics attributed to Neocentrophyidae. The specimen is well-sclerotized and possesses midterminal and laterolerminal spines and unfortunately these are broken off near their base. The middorsal and lateral spinous processes, ventral aspect of the first trunk segment, perispinal

setae, denticulate segment surface pattern, all correspond to the characteristics of the Neocentrophyidae. Extensive sampling may provide additional specimens of this unquestionably new taxon, meanwhile a ray of hope for kinorhynch *beta* and *gamma* taxonomy begins to appear.

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