STUDIES ON THE FAUNA OF CURAÇAO AND OTHER CARIBBEAN ISLANDS: No. 56.

COPEPODA ASSOCIATED WITH WEST INDIAN INVERTEBRATES - I

The genus Nanaspis (Siphonostoma, Nanaspidae)

by

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In the present series of papers the results of two different field trips to the West Indies are coordinated. Each paper, dealing with a convenient taxonomic group, will be numbered separately. The sequence of the taxonomic units is arbitrary.

Part of the material on which the results are based was collected by J.H.S. during a five months' stay (October 1958–February 1959) in the Dutch West Indies (or Netherlands Antilles, as they are more officially called), which was made possible by a grant from the Netherlands Foundation for the Advancement of Research in Surinam and the Netherlands Antilles (WOSUNA), Amsterdam. The greater part of the time was spent at the Caribbean Marine Biological Institute, Piscadera Bay, Curaçao, although short visits to the other islands of the Netherlands Antilles, *viz.* Aruba, Bonaire, St. Martin, St. Eustatius and Saba, have to a certain degree supplemented the results obtained in Curaçao.

The rest of the material was obtained by the other two authors during the course of a field trip of three and one-half months' duration (May–September 1959) which included collecting in the Bahamas, Barbados, Puerto Rico and Jamaica.

It is a pleasant duty to acknowledge the hospitality and help received on the West Indian islands.

Special thanks of J.H.S. are due to the Director of the Caribbean

Marine Biological Institute, Curaçao (at that time Dr. J. S. ZANEVELD); its staff members Miss HERTHA CAPRILES and Mr. H. VERBRUGGE; and its Board of Trustees; to the Natural Science Study Group of the Netherlands Antilles, Curaçao, and its members H. E. COOMANS, M.Sc., B. DE JONG, M.Sc., J. G. DE JONG, H. J. KOELERS, P. A. VAN DER WERF and W. BROK; to the Direction of Shell Curaçao (at that time Curaçaosche Petroleum Industrie Maatschappij); and to the Director of the Government Veterinary Service, Aruba, E. VAN DER KUIP, vet. surg. Acknowledgement should also be made of many favors received from the Government, and assistance of the Lt. Governors of Bonaire, Aruba, and the Windward Islands, and of the Administrators of St. Eustatius and Saba.

Grants from the National Science Foundation of the United States made possible the collecting trip of A.G.H. and R.U.G. and also supported the subsequent laboratory study of their material. The directors and staff of the following institutions provided greatly appreciated assistance: the Lerner Marine Laboratory, Bimini, Bahamas (Dr. HENRY KRITZLER, Resident Naturalist); the Bellairs Research Institute of McGill University, St. James, Barbados (Dr. JOHN B. LEWIS, Director); the Institute of Marine Biology, University of Puerto Rico, Mayagüez, Puerto Rico (Dr. JUAN A. RIVERO, Director); and the Marine Laboratory of the University College of the West Indies, Port Royal, Jamaica (Professor D. M. STEVEN, Director).

The material covered in this paper comprises:
Nanaspis pollens n. sp., from Jamaica, Puerto Rico, and Bimini (figs. 1–25);
Nanaspis exigua n. sp., from Jamaica (figs. 26–31);
Nanaspis media n. sp., from Puerto Rico (figs. 32–35);
Nanaspis truncata n. sp., from Puerto Rico (figs. 36–45);
Nanaspis tonsa Humes & Cressey, from Madagascar (figs. 46–47).

The siphonostome family Nanaspidae was erected by HUMES & CRESSEY (1959) to include their new genus *Nanaspis*, with a single species, *N. tonsa* H. & C., from the body surface of the holothurian *Stichopus chloronotus* Brandt in Madagascar. Another species has since been found on a *Stichopus* from the Swedish West Coast (J. BRESCIANI, *in litt.*). During the summer of 1959 A. G. HUMES and

R. U. GOODING collected four new species of *Nanaspis* from West Indian holothurians. The descriptions of these follow, together with a modification of the generic concept made necessary by additional information afforded by the abundance of new material. All type material deposited in museums is in alcohol.

We are indebted to Dr. ELISABETH DEICHMANN of the Museum of Comparative Zoölogy, Harvard University, for the identifications of the echinoderm hosts, and to Mr. ROGER F. CRESSEY for aid with the dissections and drawings.

Nanaspis pollens n. sp.

(Figs. 1–25)

Type material. — JAMAICA: 154 females and 137 males washed from the body surface of 7 *Isostichopus badionotus* (Selenka) in 2–4 meters at Drunkenman's Cay, off Kingston, September 7, 1959. Holotype female, allotype male and 70 paratypes deposited in the United States National Museum, Washington; 70 paratypes in the Zoölogisch Museum, Amsterdam; 70 paratypes in the British Museum (Natural History), London; and the remaining paratypes in the collection of A. G. Humes.

Other specimens. — JAMAICA: 172 specimens from the same host (11 individuals) at the same locality, August 29, 1959. — Two males from washings of 5 echinoids, *Meoma ventricosa* (Lamarck), in 1–2 meters at Rackham's Cay, off Kingston, August 31. — One female and 2 males from *Isostichopus badionotus* in 3 meters in Kingston Harbor, near Palisadoes Airport, September 5. — PUERTO RICO: 6 females and 2 males from 75 *Brandtothuria arenicola* (Semper) and *Semperothuria surinamensis* (Ludwig) (mixed at the time of collection) in 0.5 meter under *Porites* at Corona del Diablo Reef, near Magüeyes Island, off La Parguera, southwestern Puerto Rico, August 23, 1959. — BAHAMAS: 1 female from *Isostichopus badionotus* in 2 meters, west of Pigeon Cay, Bimini Lagoon, June 9, 1959.

Female. — The body form (fig. 1) and the positions of the appendages are similar to those of *N. tonsa*. The size, not including the setae on the caudal rami, is 571 μ (560–593 μ) × 457 μ (448–470 μ), based on 10 specimens. The dorsal surface of the shieldlike prosome bears many minute hairs. The segmentation is like that of *N. tonsa*, with the appendages hidden in dorsal view.

The segment bearing leg 5 is about as long as the genital segment (figs. 2–3), but is somewhat longer ventrally than dorsally. It bears transverse ventral rows of spinules as indicated. The genital segment, which clearly represents a complex of 2 somites, is rounded posteriorly and has a few small spinules on its dorsal surface. There is a single segment posterior to the genital segment. It inserts under

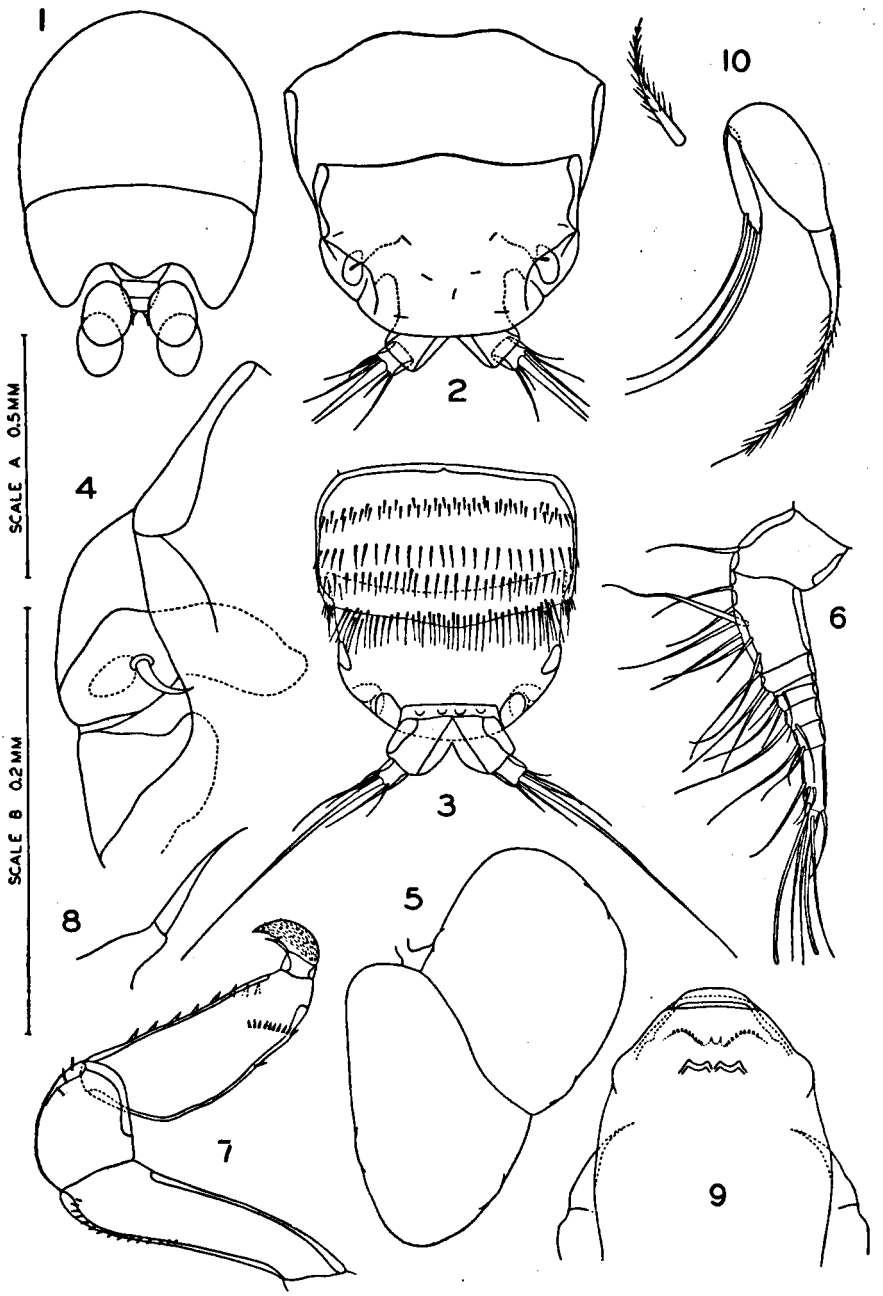

Fig. 1–10. *Nanaspis pollens* n. sp., female. — 1. Dorsal (A). — 2. Urosome, dorsal (B). — 3. Same, ventral (B). — 4. Egg sac attachment, dorsal (E). — 5. Egg sac, lateral (B). — 6. First antenna (C). — 7. Second antenna (C). — 8. Mandible (D). — 9. Oral cone, posterior aspect (D). — 10. First maxilla (C).
All figures were drawn with the aid of a camera lucida. The letter after each figure refers to the scale at which the figure was drawn.

the posterior rim of the latter and is so deeply indented at the distal end by the anus as to be almost completely divided.

The paired openings from which the egg sacs arise are located dorsolaterally on the posterior third of the genital segment (see fig. 3). Near each is a single seta (fig. 4). The egg sac contains 2 eggs, the posterior one oriented somewhat obliquely as in fig. 5.

The rostral area is demarcated by thickenings in the exoskeleton but is not well developed. The first antenna (fig. 6) is clearly 8-segmented, with the suggestion of a ninth segment terminally bearing 2 setae and an aesthete. The lengths of the segments are 22, 28, 7, 3, 4.5, 8, 8 and 20 μ respectively. (Unless otherwise specified all such measurements refer to a single specimen.) The eighth segment is armed with 2 slender aesthetes about 45 μ long. A generalized setal armature is shown in the figure but there is some variation. The second antenna (fig. 7) is 4-segmented, with the fourth segment very short (only about 10 μ long) and bearing a short hairy claw and a small seta. The mouth is located in an oval raised area (oral cone) probably formed by the approximation of the labrum and the region immediately behind the mouth. The mandible (fig. 8) consists of a basal piece bearing a slender distal spine and is closely associated with the oral cone (fig. 9). The first maxilla (fig. 10) resembles that of *N. tonsa*, except that the 3 setae on the outer branch are more equal in length. As in the case of the first antenna, the appearance of a minute terminal segment is produced on this ramus by breaks in the sclerotization. As in *N. tonsa*, an isolated seta is situated near the bases of the first maxilla and the second antenna; it is represented in fig. 10 but the exact homologies are obscure. The second maxilla (fig. 11) is like that of *N. tonsa*. The maxilliped (fig. 12) resembles that of *N. tonsa*, but the articulation between the fourth and fifth segments is more distinct. The penultimate maxilliped segment is 58 μ in length; the terminal segment (including its fused hairy element) is 25 μ long. The area between and slightly posterior to the bases of the maxillipeds (postoral protuberance) is triangular and bears a patch of spinules (fig. 13).

Legs 1 and 2 are biramous, legs 3 and 4 uniramous, the endopods being absent, as in *N. tonsa*. Leg 2 is the only leg with a well differentiated coxa and intercoxal plate. The spine and setal formula of

the legs is as follows (Arabic numerals refer to setae, Roman numerals to spines; numbers to the left of the colons refer to the outer side):

	protopod	leg 1		leg 2		leg 3		leg 4	
		exp	end	exp	end	exp	end	exp	end
1st segment	0	4	1	I:0	0:1	I:0		I:0	
2nd segment	1			I:1	0:1	I:1		IV1	
3rd segment				III 3	4	III 3			

Leg 1 (fig. 14) has 1-segmented rami, the endopod (18 μ in length and bearing a long terminal naked seta 56 μ in length) being a little slenderer and shorter than the exopod (bearing 4 naked setae). The number of spinules on the outer margin of the endopod may vary from none to 3. The basis is well marked (with a naked seta) but the coxa is not clearly distinguishable. Leg 2 (fig. 15) has trimerous rami, the endopod being 3-segmented, instead of 2-segmented as in *N. tonsa*. The middle endopod segment has outer rows of both marginal and submarginal spinules. The 3 endopod segments measure 17, 19 and 31 μ in length respectively. The outer distal corners of the first 2 exopod segments are conspicuously produced. The proximal outer spine on the third segment is 21 μ long. The basis is elongated and naked except for a minute hair near the base of the exopod; the coxa is small but well marked; and there is a heavily sclerotized intercoxal lamella. Leg 3 (fig. 16) has a trimerous exopod with the outer distal corners of tne first 2 segments produced and with the last segment differing from that of *N. tonsa* in having 3 spines and 3 setae. The endopod is absent. The basis is greatly elongated and naked. Leg 4 (fig. 17) has a bimerous exopod with the outer distal corner of the first segment greatly produced. The endopod is absent. The basis is long, slender and unarmed.

Leg 5 (fig. 18) consists of a seta 13 μ long, surrounded by a group of slender spinules. Leg 6 may be represented by the seta near the genital aperture, but we do not think that present evidence is conclusive.

The caudal ramus (fig. 19) is minute, subquadrate, 12 × 13 μ, with the setation similar to that of *N. tonsa*. The large seta on the ramus is about 135 μ long.

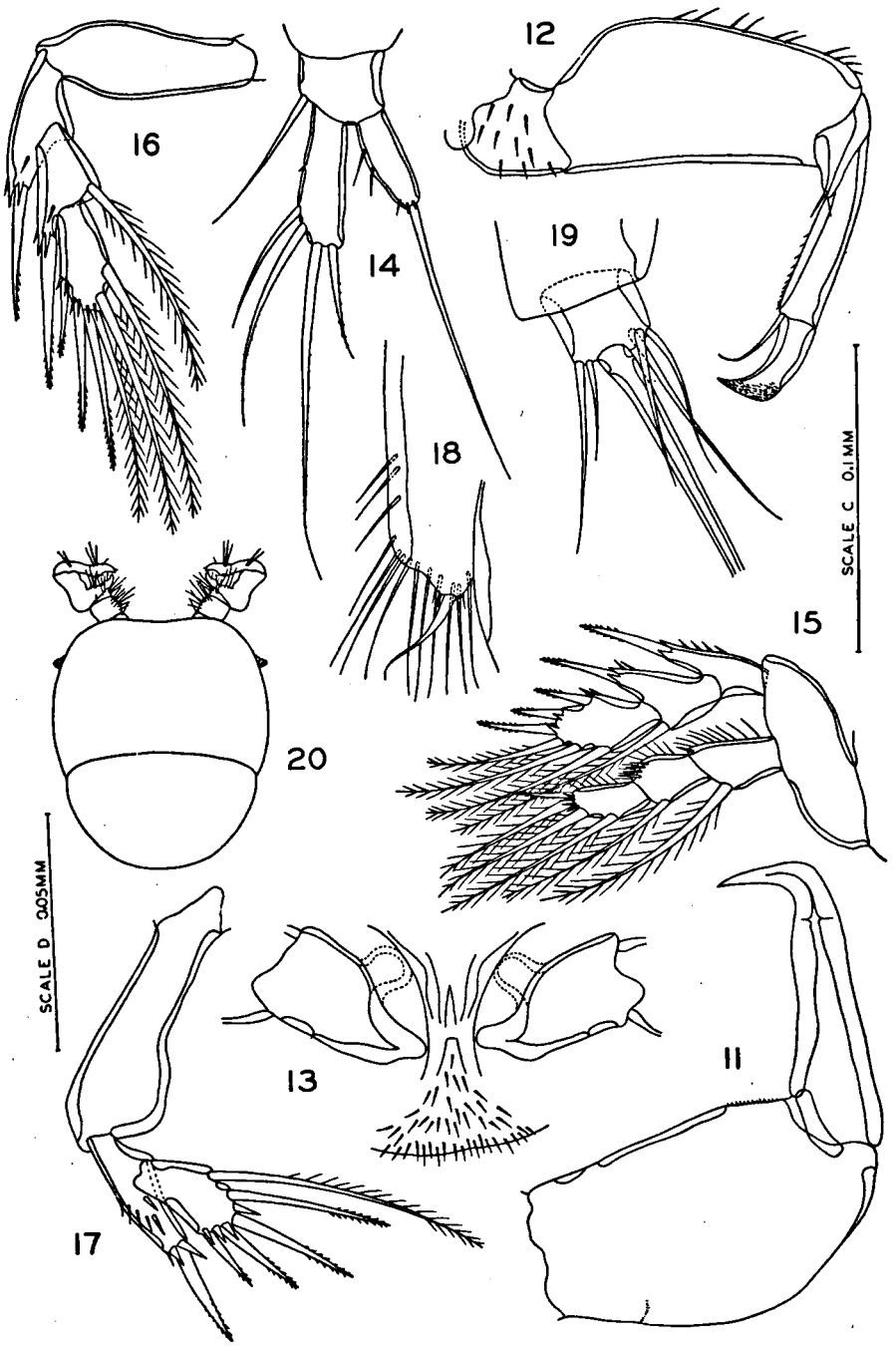

Fig. 11–20. *Nanaspis pollens* n. sp.; 11–19 female, continued, 20 male. — 11. Second maxilla (C). — 12. Maxilliped (C). — 13. Postoral protuberance, ventral (C). — 14. Leg 1 (D). — 15. Leg 2 (C). — 16. Leg 3 (C). — 17. Leg 4 (C). — 18. Leg 5 (E). — 19. Caudal ramus, ventral (E). — 20. Dorsal (A).

Male. — The body form (fig. 20) resembles that of the female, but the anterior margin is flattened or slightly concave and the posterior margin of the body shield is rounded. The size, not including the setae on the caudal rami, is 499 μ (470–515 μ) × 439 μ (426–448 μ), based on 10 specimens. The dorsal surface has fine hairs as in the female. In dorsal view the first antennae project anteriorly, and the tips of the second antennae may be visible. The remaining appendages and the urosome are concealed in dorsal view, with the latter usually curved ventrally in alcoholic specimens.

The segment behind that bearing the pair of appendages interpreted by us as leg 5 is here termed the genital segment by analogy with the condition in the female and other copepods. However, we have no evidence that the genital openings are actually located on this segment: indeed, it seems functionally more probable that spermatophores are extruded between the fifth pedigerous and genital segments. This raises the question whether the appendages interpreted as leg 5 are not in reality leg 6.

The segment bearing leg 5 and the genital segment are not as wide as in the female (figs. 21–22). The segment of leg 5 is somewhat longer ventrally than dorsally, as in the female, the distinction between these segments being more evident ventrally than dorsally. The ventral surface of the fifth pedigerous segment is armed with rows of spinules as in the figure, the spinules in the medially interrupted row along the posterior border of the segment being longer and stouter than the others. The genital segment is broadly rounded posteriorly. Behind it is a single segment bearing a few small spinules on its ventral surface and, as in the female, split longitudinally by the anal indentation.

The rostral area is even less well developed than in the female; the thickened areas which form its sides in the female have here fused into a single median sclerotization. The first antenna (fig. 23) is 5-segmented. On the third segment there is a small projection bearing 2 setae. The last two segments form a prominent chela. The penultimate segment has an expanded posterior border and the basal anterior corner is produced to form a fixed finger bearing 2 groups of small knobs on its extremity. The last segment forms an elongated, slender, movable finger or claw 120 μ long. Between these

2 segments is a region which probably represents an articular membrane but bears a seta on its ventral surface.

The oral cone, postoral protuberance and the appendages, except leg 5, are similar to those of the female. Leg 5 (fig. 24) consists of a basal projection bearing a slender terminal seta 26 μ long, with a few minute setae around its base, and a short subterminal seta. Leg 6 is absent.

The caudal ramus is armed as in the female, but is slightly more elongated, measuring 17 × 13 μ.

The spermatophore (fig. 25) is slender, 174 × 65 μ, not including the neck.

The specific name *pollens* (Latin = powerful) alludes to the well developed chela on the first antenna of the male.

Nanaspis exigua n. sp.

(Figs. 26–31)

Type material. — JAMAICA: 22 females and 11 males from the body surface of 13 *Isostichopus badionotus* (Selenka) in 3 meters at Drunkenman's Cay, off Kingston, September 3, 1959. Holotype female, allotype male and 9 paratypes deposited in the United States National Museum; 9 paratypes in the Zoölogisch Museum; and the remaining paratypes in the collection of A. G. Humes.

Other specimens. — JAMAICA: 3 females and 9 males from the same host (a single individual) at the same locality, August 28, 1959. — 5 females and 7 males also from the same host in 1 meter on rocks near the tide gauge at Port Royal, near Kingston, September 2.

Female. — The body form (fig. 26) resembles that of *N. tonsa*, but does not show the long posterolateral lobes of that species. The size, not including the setae on the caudal rami, is 465 μ (459–470 μ) × 386 μ (381–392 μ), based on 6 specimens. The dorsal surface of the body bears fine hairs as in the other species. The segmentation is like that of *N. tonsa* and *N. pollens*, with the appendages concealed in dorsal view.

The segment bearing leg 5 is about as long as the genital segment, but is slightly longer ventrally than dorsally (figs. 27–28), and bears transverse rows of spinules ventrally as indicated. The genital segment is not rounded posteriorly as in *N. pollens*, but instead is rather truncated and bears on each side a short unarmed postero-

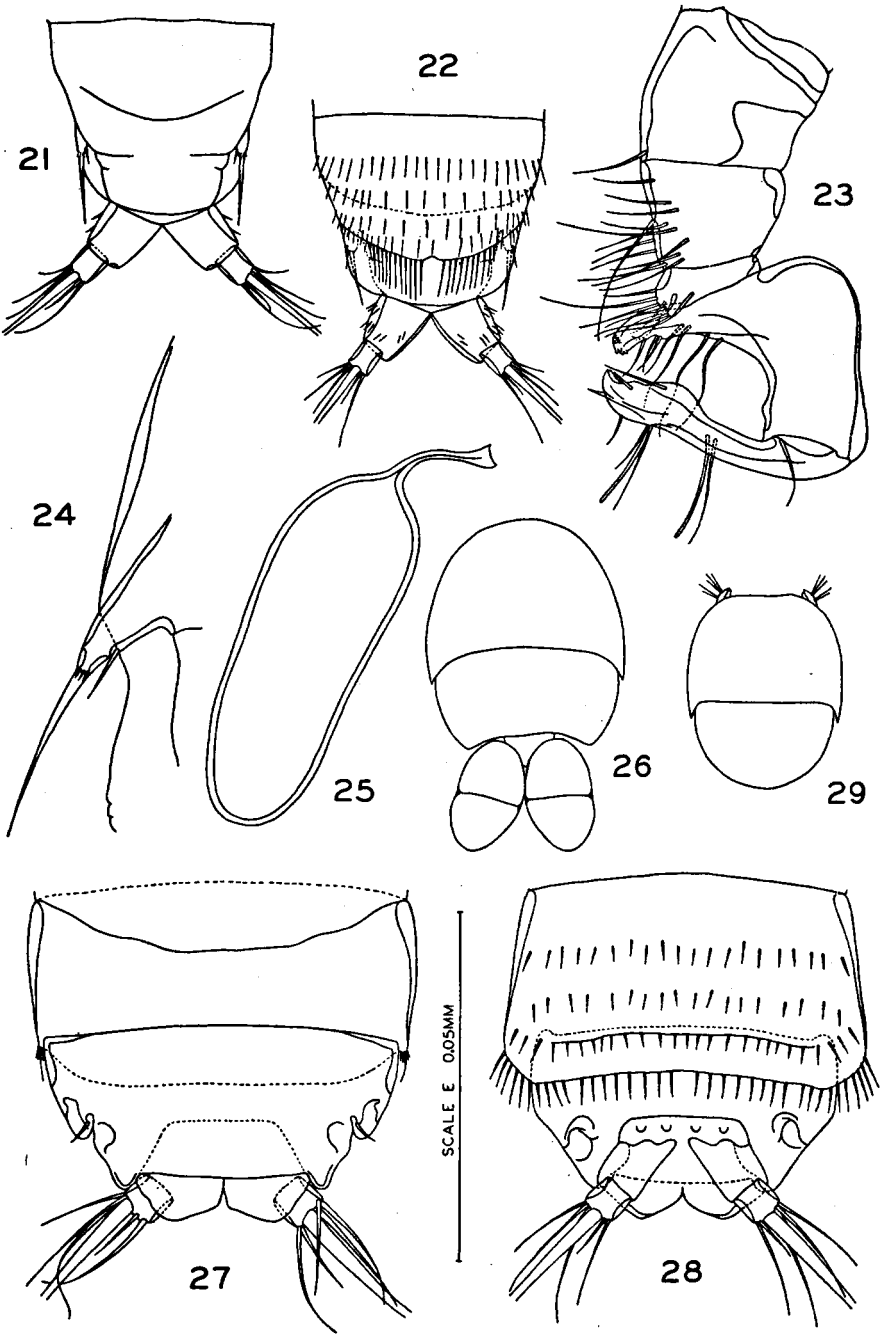

Fig. 21–25. *Nanaspis pollens* n. sp., male, continued. — 21. Urosome, dorsal (B). — 22. Same, ventral (B). — 23. First antenna (B). — 24. Leg 5 (E). — 25. Spermatophore (B).

Fig. 26–29. *Nanaspis exigua* n. sp.; 26–28 female, 29 male. — 26. Dorsal (A). — 27. Urosome, dorsal (C). — 28. Same, ventral (C). — 29. Dorsal (A).

lateral lobe (fig. 27). A single posterior segment arises under the edge of the genital segment and is angularly indented by the anus.

The egg sac attachment is dorsolateral on the posterior half of the genital segment and bears a single seta. The egg sac (fig. 26) contains 2 eggs, one in front of the other.

The rostral area, first antenna, second antenna, mouthparts, oral cone, postoral protuberance, legs 1–5 and caudal ramus are as in *N. pollens*.

Male. — The body form (fig. 29) resembles that of the female, but the anterior margin is flattened and the posterior margin of the prosome is rounded. The size, not including the setae on the caudal rami, is 406 μ (392–426 μ) × 339 μ (336–347 μ), based on 6 specimens. The dorsal surface of the body has fine hairs as in the female. In dorsal view the tips of the first antennae project only slightly. The remaining appendages and the urosome are hidden.

The segment bearing leg 5 and the genital segment are like those of *N. pollens*. There is a single postgenital segment as in the other species.

The first antenna (fig. 30) is 5-segmented. The last 2 segments form a chela (fig. 31). The fixed finger on the penultimate segment bears 2 distinct, minutely toothed, short processes on its extremity. The last segment forms a rather short, stout movable finger 50 μ long, with a blunt, slightly recurved tip.

The rostral area, second antenna, mouthparts, oral cone, postoral protuberance, legs 1–4 and caudal ramus are like those of the female. Leg 5 is like that of the male of *N. pollens*.

No spermatophore was seen.

The specific name *exigua* (Latin = small) refers to the rather small size of this species.

Nanaspis media n. sp.

(Figs. 32–35)

Type material. — PUERTO RICO: 22 females and 23 males from the body surface of 6 *Isostichopus badionotus* (Selenka) in 1–2 meters on the lee side of a small mangrove island at the east end of Magüeyes Island, off La Parguera, southwestern Puerto Rico, July 29, 1959. Holotype female, allotype male and 12 paratypes deposited in the United States National Museum; 12 paratypes in the Zoölogisch Museum; and the remaining paratypes in the collection of A. G. Humes.

Other specimens. — PUERTO RICO, all from *Isostichopus badionotus:* 2 females and 2 males from a single host in 1 meter on the lee side of El Corral Reef, south of Magüeyes Island, July 31, 1959. — 3 females and 4 males from 13 hosts in 1 meter at Mata Flores Island, near Magüeyes Island, August 3. — 1 male from a single host in 1 meter at Phosphorescent Bay, east of La Parguera, August 10. — 165 copepods from 4 hosts in 2–3 meters at Laurel Reef, south of Magüeyes Island, August 13. — 120 copepods from 11 hosts in 3 meters at Enrique Reef, south of Magüeyes Island, August 17.

Female. — The body form (fig. 32) resembles that of *N. tonsa*, but is proportionately a little wider. The size, not including the setae on the caudal rami, is 510 μ (482–526 μ) × 409 μ (403–426 μ), based on 10 specimens. The dorsal surface of the body bears minute hairs as in the preceding species. The segmentation is like that of other species in the genus.

The segment bearing leg 5 is about as long as the genital segment, but is longer ventrally than dorsally (fig. 33) and bears 4 transverse ventral rows of setae which appear to be more nearly double rows than in *N. exigua*. The genital segment is not rounded posteriorly, but is shaped more like that of *N. exigua*. The dorsal surface of this segment has a few minute spinules. The anal segment is divided posteriorly. A few spinules are located on the ventral surface of this segment.

The egg sac attachment is located dorsolaterally in the posterior half of the genital segment and bears a small seta. The egg sac (fig. 32) contains 2 eggs in tandem arrangement.

The rostral area is more weakly defined anteriorly and posteriorly than in *N. pollens*. The first antenna, second antenna, oral cone, mouthparts, postoral protuberance, legs 1–5 and caudal ramus are as in that species.

Male. — The body form (fig. 34) resembles that of the female, but with the anterior margin flattened and the posterior margin of the prosome rounded as in the previous species. The size, not including the setae on the caudal rami, is 437 μ (426–448 μ) × 377 μ (370–381 μ), based on 10 specimens. The dorsal surface of the body bears minute hairs as in the female. In dorsal view the first antennae project conspicuously.

The segment of leg 5, the genital segment, the anal segment and the rostrum are as in *N. pollens*.

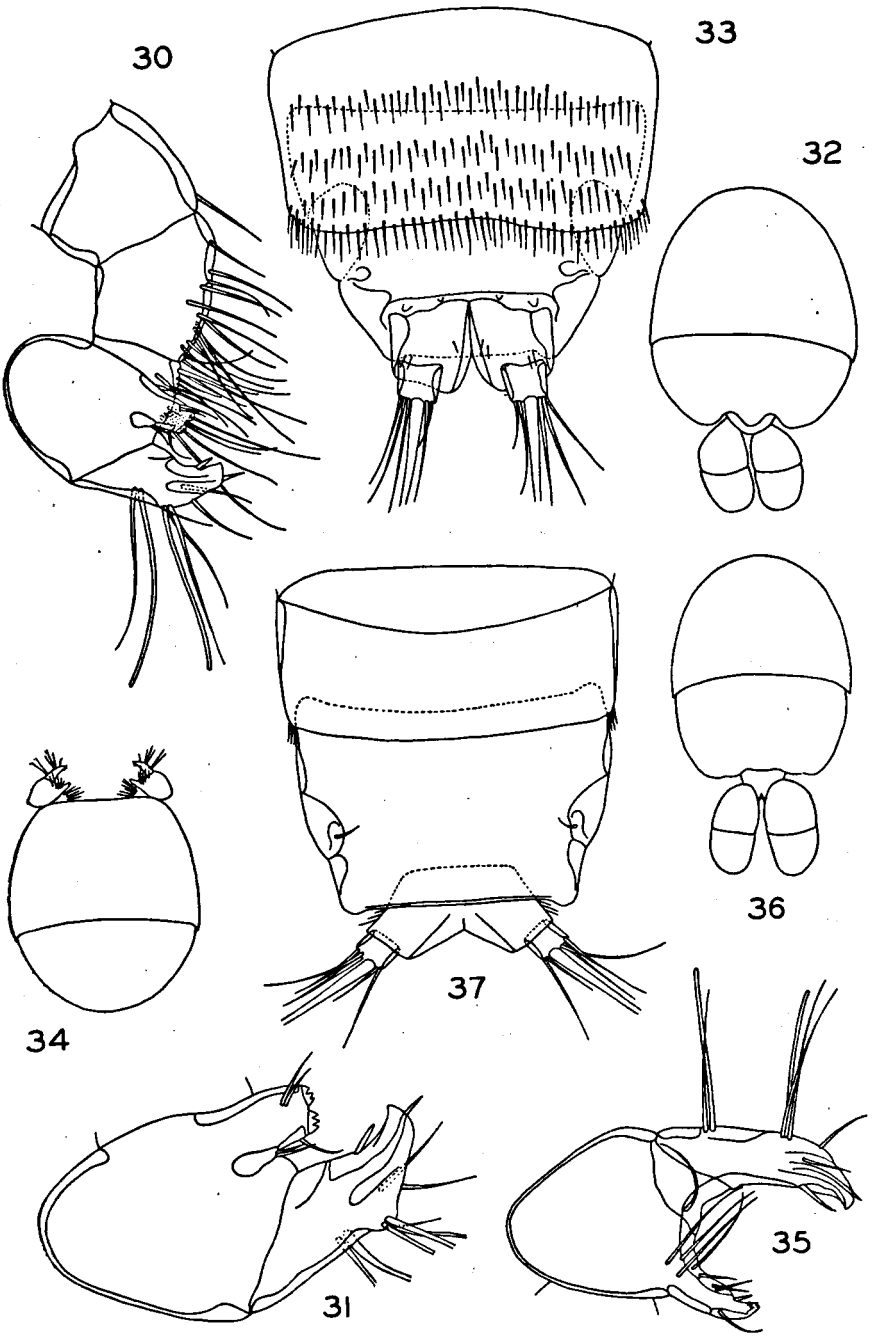

Fig. 30–31. *Nanaspis exigua* n. sp., male, continued. — 30. First antenna (C). — 31. Last two segments of first antenna (D).

Fig. 32–35. *Nanaspis media* n. sp.; 32–33 female, 34–35 male. — 32. Dorsal (A). — 33. Urosome, ventral (C). — 34. Dorsal (A). — 35. Last two segments of first antenna (C).

Fig. 36–37. *Nanaspis truncata* n. sp., female. — 36. Dorsal (A). — 37. Urosome, dorsal (C).

The second antenna, mouthparts, oral cone, postoral protuberance, legs 1–5 and caudal ramus are like those of the female.

The first antenna is 5-segmented. The first 3 segments are similar to those of the preceding species. The last 2 segments (fig. 35) form a chela. The fixed finger on the penultimate segment is more slender and attenuated than in *N. exigua*, and bears distally 2 groups of 3 minute teeth, one group terminal, the other subterminal. The last segment forms a movable finger which is somewhat longer (66 μ) and slenderer than in *N. exigua*. Its tip is slightly recurved.

No spermatophore was seen.

The specific name *media* (Latin = intermediate) alludes to the length of the movable finger on the first antenna of the male, which is between that of *N. pollens* and *N. exigua*.

Nanaspis truncata n. sp.

(Figs. 36–45)

Type material. — PUERTO RICO: 12 females and 17 males from the body surface of 282 *Microthele parvula* (Selenka) under intertidal rocks on the south side of Terremoto Reef, south of Magüeyes Island, off La Parguera, southwestern Puerto Rico, August 1, 1959. Holotype female, allotype male and 12 paratypes deposited in the United States National Museum; 12 paratypes in the Zoölogisch Museum.

Other specimens. — PUERTO RICO: 2 females and 3 males from 120 of the same holothurian at Romero Reef, southeast of Magüeyes Island, August 12, 1959. — 120 copepods from 75 *Brandtothuria arenicola* (Semper) and *Semperothuria surinamensis* (Ludwig) (mixed at the time of collection) in 0.5 meter under *Porites* at Corona del Diablo Reef, near Magüeyes Island, August 23.

Female. — The body form (fig. 36) is like that of *N. tonsa*, but the posterior edge of the prosome is truncated, without posterolateral lobes. The size, not including the setae on the caudal rami, is 479 μ (448–504 μ) × 388 μ (381–403 μ), based on 5 specimens. The dorsal surface of the body has many fine hairs and the segmentation is like that of the preceding species.

The segment bearing leg 5 is a little shorter than the genital segment and is only slightly longer ventrally than dorsally (figs. 37–38). It bears ventrally transverse rows of spinules as indicated. The genital segment is truncated posteriorly with only slight posterolateral lobes. The anal segment is deeply divided anally and bears numerous fine spinules on its ventral surface.

The attachment of each egg sac, located dorsolaterally in the

middle of the edge of the genital segment, is armed with a single seta. The egg sac (fig. 36) contains 2 eggs in tandem arrangement.

The rostral area, first antenna, mouthparts (except the maxillipeds), oral cone, postoral protuberance, legs 3–5 and caudal ramus are like those of *N. pollens*. The second antenna is also like that of *N. pollens* but the terminal claw is less hook-shaped and more rounded. The last 2 segments of the maxilliped (fig. 39) are relatively longer (56 and 28 μ respectively) and slenderer than in *N. pollens*. Leg 1 (fig. 40) has several surficial and marginal spinules on the endopod. The terminal seta of the endopod is much shorter (30 μ) in relation to the length of the endopod (15 μ) than in *N. pollens*. Leg 2 (fig. 41) resembles that of *N. pollens*, but the proximal outer spine on the third exopod segment is shorter (13 μ) in relation to the 2 distal spines than in that species. The second endopod segment is shorter (the 3 segments being 17, 14 and 30 μ in length) than in *N. pollens*, and has only a few submarginal spinules.

Male. — The body form (fig. 42) resembles that of the female, but the anterior margin is flattened and the posterior edge of the body shield is rounded. The size, not including the setae on the caudal rami, is 402 μ (381–426 μ) × 325 μ (314–336 μ), based on 8 specimens. The dorsal surface of the body has fine hairs, the tips of the first antennae project only slightly, and the other appendages and the abdomen are concealed in dorsal view as in *N. exigua*.

The segment of leg 5, the genital segment and the abdomen (fig. 43) are as in the male of the preceding species, but the segment bearing the fifth legs and the anal segment have many fine spinules ventrally, more numerous than in the other species.

The rostral area is much narrower than in the female, but the sides do not merge into a single sclerotized region as in *N. pollens* and *N. media*. The second antenna, mouthparts, oral cone, postoral protuberance, legs 1–4 and caudal ramus are like those of the female.

The first antenna resembles in general form that of the preceding species, but the last 2 segments (fig. 44) are differently shaped. The fixed finger on the penultimate segment bears a few minute terminal bosses and 2 subterminal serrated areas. The movable finger or last segment is about 40 μ in length and slightly attenuated distally,

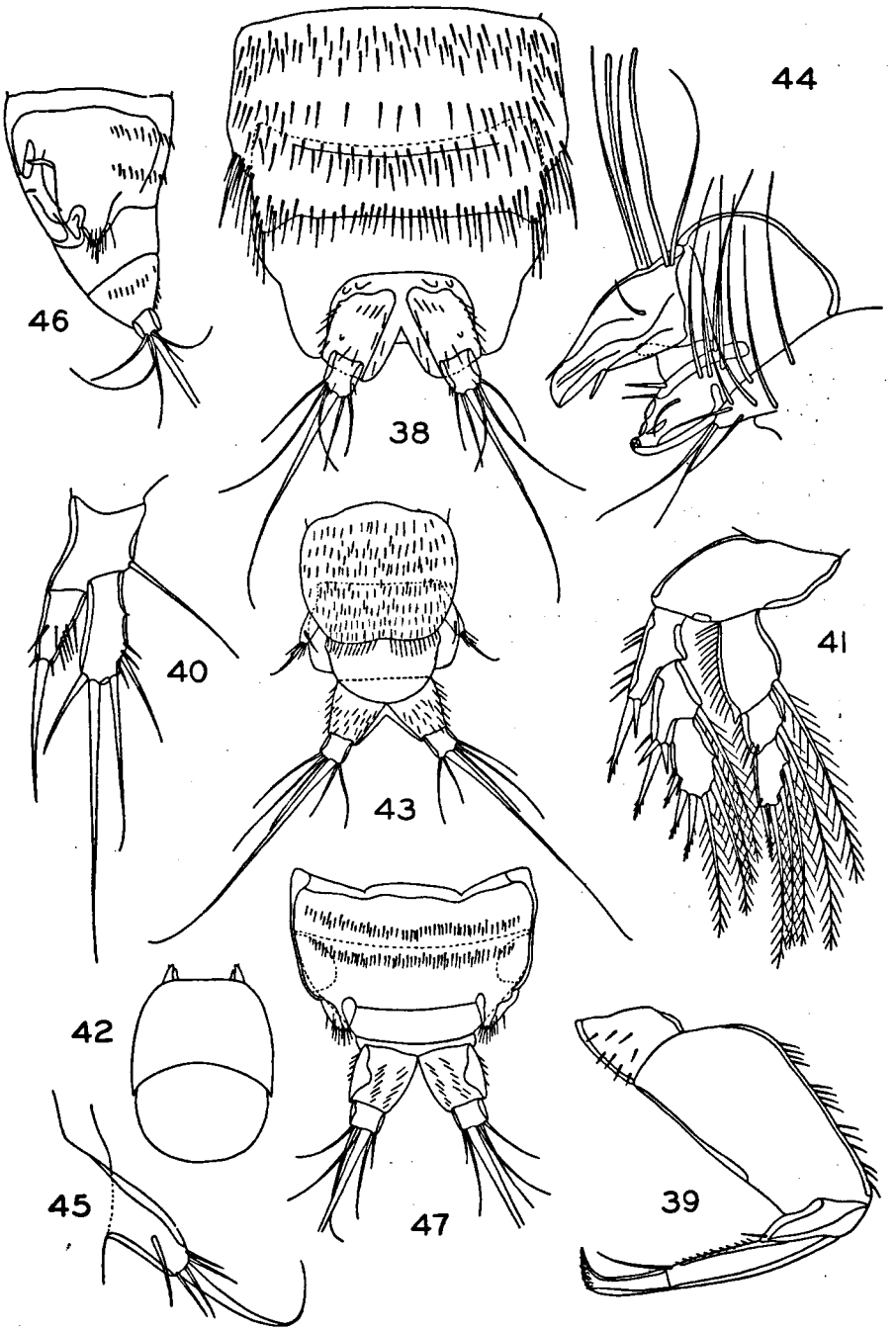

Fig. 38–45. *Nanaspis truncata* n. sp.; 38–41 female, continued, 42–45 male. — 38. Urosome, ventral (C). — 39. Maxilliped (C). — 40. Leg 1 (D). — 41. Leg 2 (C). — 42. Dorsal (A). — 43. Urosome, ventral (B). — 44. Last two segments of first antenna (D). — 45. Leg 5 (E).

Fig. 46–47. *Nanaspis tonsa* Humes & Cressey, 1959, female. — 46. Urosome, lateral (C). — 47. Same, ventral (C).

with the 2 groups of long setae and aesthetes situated near the base of the finger on the outer side.

The fifth leg (fig. 45) is essentially as in other species, but is more prominent, with longer spinules near the base of the terminal seta.

No spermatophore was seen.

The specific name *truncata* (Latin = truncated) refers to the truncated posterior margin of the prosome and genital segment in the female.

Notes on **Nanaspis tonsa** Humes & Cressey, 1959

In the light of observations on the four new West Indian species of *Nanaspis*, the original dissections of *N. tonsa* have been restudied. This has resulted in certain corrections to the original description. In the female the segment bearing leg 5 (figs. 46–47) is about as long as the genital segment, but is much longer ventrally than dorsally. It bears two ventral transverse rows of spinules and has two small posterolateral lobes provided with several slender setae. These two lobes were referred to as the sixth legs in the original description, but, after studying the several species of *Nanaspis*, it appears certain that they represent the fifth legs. The genital segment, much longer dorsally than ventrally, with its dorsal anterior boundary often rather difficult to distinguish, has the egg sac attachments located in its anterior half. Leg 6 is absent. In the male the segment of leg 5 and the genital segment are very similar to those of *N. pollens*. The fifth leg, referred to as the sixth leg in the original description, is like that of *N. pollens*.

The generic and specific characters given by Humes & Cressey (1959) should now be emended as follows:

(The figure numbers referred to in these corrections are those of the original description, not those of the present paper.)

page 209, under *Nanaspis:*

line 12, delete "2-jointed". Add: "2 or 3-jointed".

line 13, delete "Leg 5 absent. Leg 6 a projecting setiferous lobe." Add: "Leg 5 present. Leg 6 absent.".

page 210, under *Nanaspis tonsa:*

line 10, after "corners" add: "The dorsal surface of the body bears minute hairs."

delete lines 17 through 22, "Segment located ..... ventral ridge." Add: "Segment bearing the fifth legs (Fig. 2) about as long as the genital segment, but much longer ventrally than dorsally, with two transverse ventral rows of spinules in its anterior part, and with two small posterolateral setiferous lobes representing the fifth legs (Fig. 3). Genital segment much longer dorsally than ventrally and with its dorsal anterior boundary often difficult to distinguish. Egg sac attachments located anteriorly in the segment. Leg 6 absent."

page 211:

line 6, delete "Leg 5 absent. Leg 6 as in Figure 3." Add: "Leg 5 present. Leg 6 absent."

lines 13–14, delete beginning "Genital segment ....." through "..... lateral hairs", line 17. Add: "Segment bearing the fifth legs (Fig. 20) with its ventral surface showing 4 transverse rows of small spinules and a posterior interrupted row of slightly longer spinules. Fifth leg consisting of an elongated projection bearing a small subterminal seta and a long terminal seta having a few lateral hairs and with some smaller setae around its base (Fig. 21)."

line 30, delete "Leg 5 absent. Leg 6 as in Figure 21." Add: "Leg 5 present. Leg 6 absent."

It may be noted that these changes involve the following alteration to the familial characters given by Humes & Cressey (1959): page 209, under Nanaspidae, lines 9–10, delete "Leg 5 absent. Leg 6 a projecting lobe." Add: "Leg 5 present. Leg 6 absent."

Remarks

Certain details of the segmentation and armature of the first maxilla and of legs 1–4 indicate a close relationship of the four West Indian species of *Nanaspis* as opposed to *N. tonsa* from Madagascar. In the West Indian species the outer branch of the first maxilla has 3 long subequal setae (2 long and 1 short in *N. tonsa*), the exopod of leg 1 has 4 setae (3 in *N. tonsa*), the endopod of leg 2 is trimerous (bimerous in *N. tonsa*), the third segment of the exopod of leg 3 has 3 spines and 3 setae (2 spines and 3 setae in *N. tonsa*), and the outer

distal corners of the antepenultimate and penultimate segments of the exopods of legs 2–4 are produced (not produced in *N. tonsa*).

The species of *Nanaspis* live on the body surface of holothurians. It is not known whether these copepods have specific preferences for certain body regions. The two specimens of *N. pollens* found in washings of the echinoid *Meoma ventricosa* in Jamaica can probably be regarded as accidental. More than one species of *Nanaspis* may occur in a single locality, as seen in the case of *N. pollens* and *N. exigua*, both of which were found at Drunkenman's Cay, Jamaica. Perhaps only one species of *Nanaspis* occurs at a given time on a particular host specimen. In the only case where two species (*N. pollens* and *N. truncata*) were found together, the hosts could have been either or both of two species of holothurians, *Brandtothuria arenicola* or *Semperothuria surinamensis*. These two sea cucumbers unfortunately were mixed at the time of collection. It is worth noting that three *Nanaspis* species (*N. pollens*, *N. exigua* and *N. media*) may occur on the same species of holothurian (*Isostichopus badionotus*), thus raising interesting but as yet unanswerable questions on the nature and causes of speciation in this genus.

The principal points of specific differences among the four West Indian *Nanaspis* lie in the body size, in the form of the segment bearing leg 5 and the genital segment in the female, and in the structure of the last two segments of the first antenna in the male. Of these the male antenna is by far the most reliable and easily determined character. The amount of individual variation in these species appears to be small, and their distinctive characters are clearly defined.

Key to the described species of *Nanaspis*

1. Endopod of leg 2 trimerous; exopod of leg 1 with 4 setae . . . 2
   Endopod of leg 2 bimerous; exopod of leg 1 with 3 setae . *tonsa*
2. Posterior outline of dorsal shield in female deeply sinuous; fixed finger-like process on chela of male first antenna slender . . . 3
   Posterior outline of dorsal shield in female almost straight; fixed finger-like process on chela of male first antenna stout 4

3. Female body more than 560 μ in length; dactyl of male first antenna more than 6 times as long as wide . . . . . *pollens*
   Female body less than 530 μ in length; dactyl of male first antenna less than 4 times as long as wide . . . . . *media*
4. Length of female genital segment more than 3/5 width; both aesthete-seta groups on dactyl of male first antenna in proximal half of segment . . . . . *truncata*
   Length of female genital segment less than half width; one aesthete-seta group on dactyl of male first antenna in distal half of segment . . . . . *exigua*

A few late copepodids (the earliest representing a stage possibly comparable to copepodid III in other forms) were present in our collections. The main differences from the adults lie in the body form, first antennae and legs 2–5. These stages do not add to the present morphological interpretations or further clarify the taxonomic position and are not considered here. However, comparisons of what appears to be the same developmental stage in different species suggest that the external anatomy of the instars may provide additional characters of value in separation at the specific level.

REFERENCE

HUMES, A. G. & CRESSEY, R. F., 1959. A new family and genus of cyclopoid copepods parasitic on a holothurian. *Journal of Parasitology 45*, p. 209–216.