

FIGURE 12.—Lateral views of members of genus *Atya* (numbers in parentheses = carapace length in mm): a, *A. innocous*, Mannet's Gutter, Dominica (♂, 24.4); b, syntype of *A. tenella* (= *A. innocous*) (♂, 16.2); c, holotype of *A. ortmannioides* (♀, 15.9); d, *A. intermedia*, effluent of Crater Lake, Annobón (♂, 25.4); e, *A. lanipes*, Río Maricoa, Puerto Rico (♂, 21.0); f, holotype of *A. dressleri* (♂, 20.4); g, holotype of *A. brachyrhinus* (♀, 15.7).

### Key to Species of the Genus *Atya*

1. Cephalic section of carapace with median dorsal row of spines extending onto rostrum; prominent ridges on carapace also studded with spines ..... ***A. crassa***
- 1'. Cephalic section of carapace and rostrum lacking median dorsal row of spines; ridges present or absent from carapace, if present never studded with spines ..... 2
- 2(1'). Rostral margins with angular (acute or right angle, never obtuse) bend or lateral prominences; tubercles on flexor surface of dactyl of third pereiopod arranged in small cluster or in single row ... 3
- 2'. Rostral margins with or without subangular bend, if present obtuse or with extremities rounded; tubercles on flexor surface of dactyl of third pereiopod never arranged in cluster or single row except latter in *A. africana* in which rostral margins tapering from base ..... 5
- 3(2). Flexor surface of propodus of third pereiopod with some of heavily cornified squamous tubercles arranged in longitudinal rows, at least part of those in mesial row quite or nearly contiguous; most American representatives with row of sclerotized denticles on ventral margin of second abdominal pleuron ..... ***A. scabra***
- 3'. Flexor surface of propodus of third pereiopod with few to many heavily sclerotized elevated or squamous tubercles, if some forming linear series, those in mesial row never nearly or quite contiguous; sclerotized denticles never present on second abdominal pleuron 4
- 4(3'). Carapace strongly sculptured; flexor surface of propodus of third pereiopod with conspicuous tufts of long plumose setae and with very few squamous tubercles; corresponding surface of dactyl of same appendage with single or cluster of tubercles just proximal to sclerotized tip; sternum of fifth abdominal segment with median curved hornlike projection ..... ***A. gabonensis***
- 4'. Carapace comparatively weakly sculptured; flexor surface of propodus of third pereiopod without conspicuous tufts of long plumose setae, with prominent squamous tubercles; corresponding surface of dactyl of same appendage with single row of tubercles; sternum of fifth abdominal segment with small median tubercle .....  
..... ***A. margaritacea***
- 5(2'). Dorsal surface of proximal article of antennular peduncle with 1 to 3 sclerotized spinules; flexor surface of propodus of third pereiopod with tubercles arranged in 2 subparallel rows, those in mesial row subcontiguous and none between rows; corresponding surface of dactyl of same appendage with tubercles arranged in single row ..... ***A. africana***
- 5'. Dorsal surface of proximal article of antennular peduncle lacking sclerotized spinules; flexor surface of propodus of third pereiopod with scattered tubercles, if rows evident always with other tubercles between them; corresponding surface of dactyl of same appendage disposed in 2 rows, more proximal one almost always situated proximomesial to distal row ..... 6
- 6(5'). Rostrum with margins strongly convex laterally, apex falling far short of second segment of antennular peduncle ..... ***A. brachyrhinus***

- 6'. Rostrum with margins subparallel to strongly convergent, apex reaching or almost reaching base of second article of antennular peduncle ..... 7
- 7(6'). Rostral margins with strong subangular bend; ventral margin of third through fifth abdominal pleura with or without sclerotized spinules ..... 8
- 7'. Rostral margins tapering from base; ventral margin of third through fifth abdominal pleura without sclerotized spinules ..... 10
- 8(7). Lateral surface of merus of third pereiopod lacking conspicuous tubercles, all small and weakly, if at all, cornified; cephalolateral surface of carapace straight; rostrum, with acumen longer than basal part, directed anteriorly ..... *A. ortmannioides*
- 8'. Lateral surface of merus of third pereiopod studded with tubercles; cephalolateral surface of carapace convex (anterior to posterior); rostrum directed anteroventrally ..... 9
- 9(8'). Ventral margin of third through fifth abdominal pleura, except in specimens from Pacific Basin, usually with sclerotized spinules; median tubercle on sternum of fifth abdominal segment comparatively inconspicuous; preanal carina with single spine ..... *A. innocous*
- 9'. Ventral margin of third through fifth abdominal pleura always devoid of sclerotized spinules; median tubercle on sternum of fifth abdominal segment comparatively large; preanal carina with 2 spines ..... *A. intermedia*
- 10(7'). Pterygostomian angle produced in prominent spine; dorsal surface of penultimate podomere of antennular peduncle with scattered spines; merus of third pereiopod without tubercles dorsally or laterally; preanal carina with vestigial spine; dorsal surface of telson with rows of 5 to 7 spines ..... *A. lanipes*
- 10'. Pterygostomian angle weak or obsolete; dorsal surface of penultimate podomere of antennular peduncle with lateral row of about 6 spines and 1 to 3 more mesially situated; merus of third pereiopod with distinct tubercles dorsally and laterally; preanal carina produced in well developed caudally directed spine; dorsal surface of telson with rows of 7 to 9 spines ..... *A. dressleri*

***Atya africana* Bouvier**

FIGURES 1*a*, 9–11*a*, 13, 14

*Atya scabra*.—Rathbun, 1900:313 [in part]; 1901:119 [in part].—De Man, 1925:28 [in part].

*Atya africana* Bouvier, 1904:138 [type-locality: "Samkitta dans la rivière Ogooué," Gabon; type: MHNP 593, 1♂]; (?)1905:120, fig. 24; 1925:292, 305–308, 310, 311, 322, 323, 356, 358, figs. 682–689.—De Man, 1925:26, 27, fig. 3*a*,*b*.—(?)Holthuis, 1951:20–24, fig. 3; 1963:67; 1966:237.—Lebour, 1959:121, 134.—Vogel and Crewe, 1965:122.—Monod, 1967:110, 119, 135, pl. 9: figs. 1–10; 1980:375, 376, figs. 3, 4, 7.—Disney, 1969:292; 1971:83, 85, 87–89, 91, fig. 1; 1975:69.—Lewis, Disney, and Crosskey, 1969:229, 232, 238.—(?)Crosnier, 1971:570, 571.—Lemasson, 1973:68, 70.

*Atya serrata*.—Bouvier, 1925:295 [in part].—Holthuis, 1951:25, 26 [in part].

*Atya gabonensis*.—Holthuis, 1951:25 [in part].

REVIEW OF LITERATURE.—The first reference to this shrimp was that of Rathbun (1900) who reported the occurrence of *Atya scabra* in Liberia, a record established in part upon the misidentification of specimens of *A. africana* from Mt. Coffee and Beulah, Liberia. One of the specimens (USNM 20662) from the former was a member of *A. scabra*. Presumably the inclusion of "West Africa" in her summary of the range (1901) was based upon the same specimens. The Mt. Coffee record was repeated for *A. scabra* by De Man

(1925). A single male from the Ogooué River at Samkitta, Gabon, constituted the material on which Bouvier (1904) briefly described *Atya africana*, largely contrasting it with his concurrently described *A. intermedia*. The features pointed out were the longer, narrower rostrum on which the dorsal carina is not deflected apically, the strong, toothed ventral rostral carina, and the well-developed armature of the merus of the third pereopod. Bouvier (1905) illustrated the cephalic region of the holotype in dorsal and lateral aspects and amplified his earlier description by adding that the third legs are enormously developed and covered with numerous irregularly dispersed corneous tubercles, and furthermore that the inferior border of the merus of this appendage possesses a movable spine. In the account of this species in his monograph of the family, Bouvier (1925) contrasted *A. africana* with *Atya moluccensis* De Haan (1850:186), describing and illustrating the former much more completely. A number of the characters chosen, however, are shared by other members of the genus, and few of those mentioned are useful in distinguishing *A. africana* from its congeners. Only three specimens of *A. africana* were reported by Bouvier, the holotype and a male and female from Booué, Gabon. A fourth specimen was available to him, for the single shrimp in the collection of the (former) United States National Museum from the "Muhlenberg Mission, W. Africa, O.J. Cook" referred to by Bouvier (1925:295) and assigned to *Atya serrata* Bate (1888), is a member of *A. africana*. (See locality 4 in Liberia below).

De Man (1925) recorded the presence of this shrimp in Mbuma, Zaire, and Holthuis (1951) tentatively assigned juveniles collected from off Liberia and Cameroon and from Boma, Zaire, to this species. Holthuis described the specimens from the latter in considerable detail and pointed out several striking differences between these juveniles collected in fresh water and those from the two marine localities. He illustrated the cephalic region, caudal part of the telson, and several appendages of the specimens from Boma and the caudal part of the telson of one of those

from off Cameroon. He suggested (p. 23) that the differences noted

may be due to the different stages of development. The specimens from Boma show more resemblances to the adult form (absence of exopods on the pereopods, shape of the telson), than the specimens from Stations 57 [off Liberia] and 119 [off Cameroon]. The smallest specimen from Boma, 9 mm. in length, is, however, quite identical with the other material from the same lot and is different from the largest specimen from Sta. 119. The Boma specimens were collected in fresh or brackish water, while the specimens from Sta. 57 and 119 were taken in pure sea water. This might indicate that the early stages of this species are spent in the sea and that, when growing older, it returns to fresh water, just as is the case in some species of the Palaemonid genus *Macrobrachium*.

Holthuis' (1951:25, 26) reference to Bouvier's (1925) report of *A. serrata* from Muhlenberg Mission (see above) was based upon Bouvier's misidentification of *Atya africana*. Lebour (1959) cited a new Liberian record for the species.

In describing *Atya lanipes*, Holthuis (1963) stated that *A. africana* was its closest relative and that the former could be distinguished from the latter by the more slender third pereopod of the adult male, the shape of the endopod of the first pleopod, and by the appendix masculina. Following his redescription of *Atya intermedia*, Holthuis (1966) noted its close relationship to *A. africana* and corroborated the existence of the differences between the two species pointed out by Bouvier (1925). Vogel and Crew (1965) recorded this shrimp from the Mungo River, Cameroon.

Monod (1967) reported *Atya africana* to be a large species (as long as 11 cm) occurring in Gabon and Congo; the illustrations were those of Bouvier (1925) and De Man (1925). Disney (1969) and Lewis, Disney, and Crosskey (1969) found that the young stages of certain phoretic blackflies utilize *Atya africana* as a host in the Bille, Meme, and Mungo rivers in West Cameroon. In much expanded reports, Disney (1971, 1975) presented his observations on this shrimp in tributaries of the Mungo and Meme rivers near Kumba, West Cameroon, where it is infested with the larvae and pupae of three species of blackflies (*Simulium dukei*, *S. kenya*, and *S. damnosum*). Most

of the adult shrimp were found under stones, whereas the smaller individuals were more abundant among tangles of leaves. The composition of a population as revealed by netted specimens was roughly 57% having a total carapace length (c.l.) of 6 to 15 mm, about 23% with 16 to 20 mm c.l., 11% with 21 to 25 mm c.l., 6% with 26 to 30 mm c.l., and the remaining 3% with 31 to 45 mm c.l. He found that in 1968–1969 the ovigerous females, which possessed total carapace lengths from 11 to 25 mm, occurred in greatest numbers from October to November and from April to May (ratio of 8:5) with an apparent “breeding pause” from December to March. The *Simulium* larvae occur in the gill chamber or among the cephalothoracic appendages of the shrimp, and the pupae were found only on the ventral side of the scaphocerite.

Crosnier (1971) found juvenile specimens, which he tentatively assigned to *A. africana*, at a depth of about 10 meters in the Bay of Pointe Noire, Congo. He stated that they resemble the specimens from off Cameroon described by Holthuis (1951) and not those from the freshwater habitat in the Belgian Congo (= Zaire). Lemasson (1973) added no new information but expressed the opinion that this shrimp, which attains a total length of 11 cm, might lend itself to cultivation in Africa.

**PUBLISHED ILLUSTRATIONS.**—The following illustrations of Bouvier's *Atya africana* are available. Dorsal and lateral views of the cephalic extremity of the carapace were presented by Bouvier (1905) and republished by him (1925) along with others of the first pleopod of the male, the appendix masculina, the caudal angles of the fourth and fifth abdominal segments, the uropodal angle, and the caudal region of the telson; in the same year, dorsal and lateral views of the cephalic region were depicted by De Man (1925). Monod (1967) reproduced the illustrations of Bouvier (1925) along with those of De Man (1925).

Illustrations of juvenile specimens tentatively assigned to this species by Holthuis (1951) include dorsal and lateral views of the cephalic region as well as drawings of the basal antennular segment,

mandible, first maxilla, distal podomeres of the first, third, and fifth pereopods, and caudal part of the telson. These drawings were based on specimens from off Cameroon and from Boma.

**DIAGNOSIS.**—Cephalic region of carapace not conspicuously sculptured, lacking spines other than antennal, pterygostomian, and ventral rostral; pterygostomian spine strong. Rostrum with margins tapering from base, lacking angular bends. Ventral margin of all abdominal pleura usually lacking sclerotized spinules (occasionally present on fifth), and caudoventral angles of fourth and fifth pleura not produced in spines. Sternum of fifth abdominal segment with small median tubercle, that of sixth about 1.5 times as broad as long. Preanal carina with compressed spine not overreaching posterior extremity of basal part of carina. Telson 1.8 to 1.9 times as long as broad with 4 or 5 spines in each of 2 rows. Antennular peduncle with dorsal surface of proximal article bearing 1 to 7 sclerotized spinules proximal to distal row; penultimate article 1.1 to 1.5 times as long as wide and dorsal surface with several to many spinules, some of which sometimes arranged in sublateral row. Coxae of third and fourth pereopods lacking prominent anterolateral spine. Third pereopod with merus rounded ventrally, 2.9 to 4.1 times as long as high, ventromesial surface slightly to strikingly bowed, never parallel to that of corresponding podomere of other third pereopod, and lateral surface rather strongly tuberculate, tubercles sublinearly arranged; propodus 2.1 to 3.2 times as long as wide, extensor surface studded with strongly sclerotized subspiniform tubercles, and flexor surface with similarly sclerotized scalelike to spiniform ones somewhat linearly arranged, those comprising row immediately mesial to median line contiguous to subcontiguous; dactyl freely movable and bearing single row of corneous scalelike to spiniform denticles on flexor surface.

**MALE** (Cavalla River, Bolobo, Liberia).—Rostrum (Figure 13a, d) with margins tapering from base, bearing only slightest angle delimiting posterior end of acumen; apex of latter reaching no more than 0.25 length of penultimate podomere

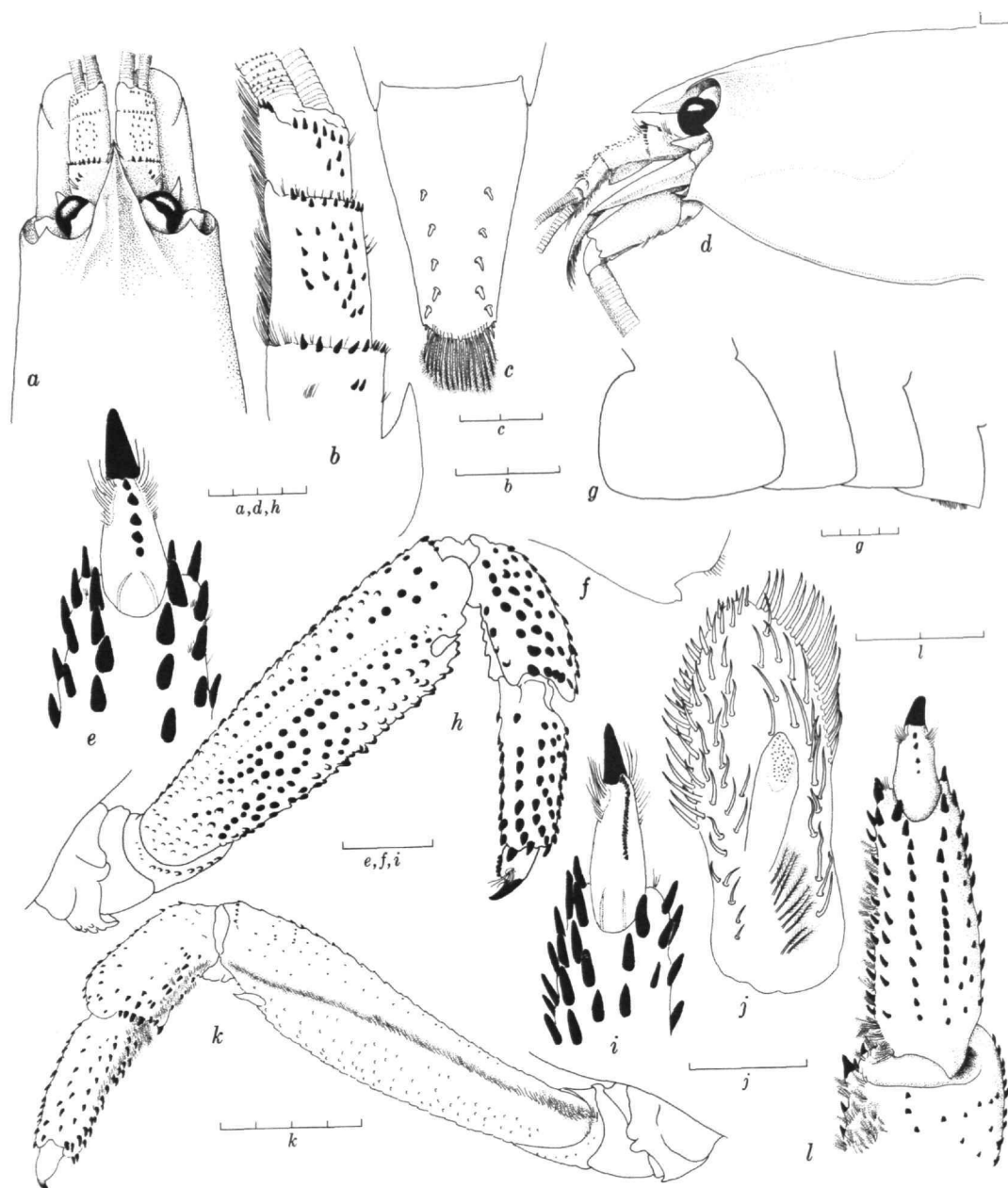


FIGURE 13.—*Atya africana* (all from male from Cavalla River, Bolobo, Liberia, except *e, h, i* from Mt. Coffee, Liberia): *a*, dorsal view of cephalic region; *b*, dorsal view of antennular peduncle; *c*, dorsal view of telson; *d*, lateral view of cephalic region; *e*, flexor surface of distal part of fourth pereiopod; *f*, lateral view of preanal carina; *g*, lateral view of second through fifth abdominal pleura; *h, k*, lateral view of third pereiopod; *i*, flexor surface of distal part of fifth pereiopod; *j*, mesial view of appendices masculina and interna; *l*, flexor surface of distal part of third pereiopod. (Scales marked in 1 mm increments.)

of antennule; dorsal median carina gently curved, not excavate dorsally, not dipping below level of lateral carinae posterior to acumen, and reaching apex of acumen; ventral carina with single weak tooth at base of apical fourth of rostrum; ocellar beak, hidden in lateral view by eyes, with dorsal margin only slightly arched and meeting vertical anterior margin at right angle, its anterior extremity not approaching level of tip of stylocerite. Antennal and pterygostomian spines moderately strong and acute; no spines present between them. Surface of carapace with many small, shallow, setiferous punctations, but devoid of ridges and spines other than those just mentioned; setae borne in ventral submarginal punctations not conspicuous.

Pleura of first three abdominal segments (Figure 13g) with rounded posteroventral extremities; corresponding parts of fourth and fifth angular but not produced in spines. All pleura lacking corneous spinules on ventral margin, but fifth with conspicuous fringe of plumose setae. Fourth abdominal tergum about 1.1 times as long as fifth (sixth subequal in length to fifth) and subequal in length to telson; sixth tergum only slightly shorter than telson. Sternum of fifth abdominal segment with small laterally compressed median tubercle (Figure 1h). Sternum of sixth segment almost 0.7 as long as broad. Free part of preanal carina (Figure 13f) very short, apex not reaching level of caudal extremity of basal part of sclerite. Telson (Figure 13c) little more than twice as long as broad, its dorsal surface bearing paired concave rows of 5 corneous denticles and posteromedian tubercle, latter slightly overhanging caudal margin.

Proximal podomere of antennule (Figure 13b) with stylocerite reaching base of distal third or fourth of segment; dorsal surface with linear cluster of setae and 2 corneous spinules; distal margin bearing row of 7 (right) or 9 (left) corneous spinules; penultimate segment of peduncle about 1.2 times as long as wide and bearing 20 spinules on dorsal surface and 10 on distal margin; ultimate podomere with row of 6 spinules at base of lateral flagellum, 3 at base of mesial one, and 4

proximal to lateral row. Antenna with ventrolateral spine on basis reaching about same level as left stylocerite but not quite so far as right (latter attaining base of distal third of proximal segment of antennular peduncle); lateral spine on scaphocerite strong, extending much beyond tip of rostrum, almost to end of antennular peduncle; lamella overreaching latter; flagellum extending to fifth abdominal tergum.

Third maxilliped overreaching antennular peduncle by almost half length of distal podomere of endopod; tip of exopod reaching base of distal third of penultimate podomere of endopod; latter between 1.3 and 1.4 times length of ultimate podomere.

First pereopod reaching distal end of antennular peduncle, second reaching base of distal fifth of fingers of first pereopod; terminal brush of setae of both appendages lacking scraping denticles. Third pereopod (Figure 13k,l) with lateral distoventral spine on merus and carpus, and, when extended anteriorly, overreaching antennular peduncle by dactyl and four-fifths length of propodus; merus with ventromesial margin bowed, about 4 times as long as high, 2.2 times as long as carpus, and 1.8 times as long as propodus; latter 2.7 times as long as wide, 1.2 times as long as carpus; distoventral margin of coxa entire (weakly undulate), and mesial caudoventral prominence lacking conspicuous setal clusters. Lateral, dorsal, and ventral surfaces of merus studded with many small apically sclerotized tubercles, most arranged in sublinear series; clusters of plumose setae flanking tubercles, most conspicuous tufts forming oblique row on lateral surface; mesial extremity of podomere weakly produced at level of mesial articular condyle of carpus. Carpus strongly tuberculate except ventrally where fewer tubercles, but clusters of long plumose setae present, especially ventrolaterally. Propodus with most tubercles arranged in linear series, 2 parallel rows on flexor surface well defined. Dactyl movable, its flexor surface with single longitudinal row of 4 denticles flanked distally by paired clusters of setae.

Fourth pereopod with dactyl reaching end of

proximal third of propodus of third pereiopod; length of merus 2.5 times that of carpus, and latter 0.7 as long as propodus. Fifth pereiopod reaching articulation of carpus and propodus of fourth; merus about 1.3 times as long as carpus, latter approximately 0.8 as long as propodus. Ornamentation of merus, carpus, and propodus of fourth pereiopod similar to that of third except for additional spine on ventral surface of merus at base of distal third, 3 distolateral spines and conspicuous row of long plumose setae on lateral surface of carpus and propodus. Ornamentation of fifth pereiopod like fourth but with 2 ventral spines on merus proximal to distal ventrolateral spine, and 3 distolateral spines.

Diagnosis of lateral ramus of uropod flanked proximally by row of 17 articulated corneous denticles and slightly larger fixed spine at lateral end of row.

**COLOR NOTES.**—According to C.B. Powell (pers. comm.), in Nigeria this shrimp is rich brown with a yellowish to tan mid-dorsal stripe, bordered with black, extending from the rostrum almost to the tip of the telson, and there is a dark band across the tail fan in young individuals.

**SIZE.**—The largest specimen of which we are aware is a male with a carapace length of 35.2 mm. The largest female measured by us has a carapace length of 21.0 mm. The smallest and largest ovigerous females have corresponding lengths of 11.1 and 20.4 mm, respectively.

**DISTRIBUTION AND SPECIMENS EXAMINED.**—*Atya africana* ranges from Liberia southward to Zaire (Figure 14). Records for the known localities are listed below. Collections that we have examined are marked with an asterisk if they have been previously reported and with a dagger if they are reported herein for the first time. Numbers following the specimens listed are measurements, in mm, of the carapace length or, if followed by "t.l.," total length. Some listings lack the date the collection was made and/or the name of the collector; these could not be determined.

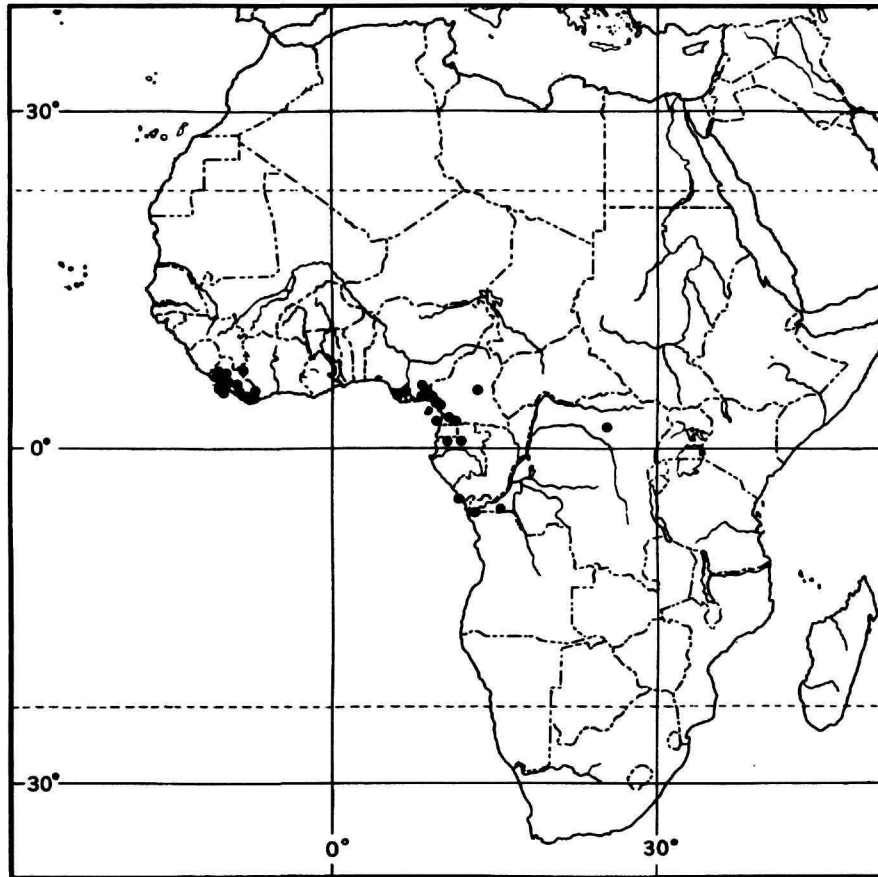
**LIBERIA:** (1) †USNM, Beulah, Bassa Co, 1♀ (12.9), Feb 1896, O.F. Cook. (2) †BM, St. Paul River near Hendi, Bong Co, 1♂ (8.2), 1 ovig ♀ (13.5), 13 Jun 1969, R. Garms. (3) †USNM, Mt.

Coffee, St. Paul River, 1♂ (22.9), 21 Apr 1897, R.P. Currie. (4) †USNM, Muhlenburg Mission, 1♂ (7.1), May 1892, OFC. (5) \*BM, St. John River near Yila, at 190m, 1♂ (27.7), 2 Mar 1971, RG. (6) †USNM, Cavalla River at Bolobo, 5♂ (11.4–18.6), 2 ovig ♀ (10.8–13.9), Jun 1946, H.A. Beatty. (7) †BM, Cavalla River near Nyaake (4°52'N, 7°35'W), Grand Gedeh Co, 1♂ (35.2), 13 Dec 1970, RG. (8) †BM, Monot River (4°51'N, 7°39'W), Grand Gedeh Co, 1♂ (14.3), 16 Oct 1969, RG. (9) †BM, Masowa Creek at Bendaja (7°9'N, 11°15'W), Grand Cape Mount Co, 1♀ (9.1), 14 Apr 1971, RG. (10) †BM, Masowa Creek near Dambala, Grand Cape Mount Co, 4♂ (6.1–13.3), 1♀ (8.5), 14 Apr 1971, RG. (11) †BM, Koejar River near Mano River Mine (7°16'N, 11°10'W), 1♂ (19.2), 1 ovig ♀ (13.8), 18 Jun 1969, RG. (12) †BM, Mafa River near Bendouma (7°12'N, 10°59'W), Grand Cape Mount Co, 1♀ (8.6), 17 Jun 1967, RG. (13) †BM, Yah River near Zangbuck Town (6°50'N, 9°6'W) at 200 m, 1♀ (17.9), 2 Mar 1971, RG. (14) †BM, Lower Given River (6°8'N, 9°4'W), Nemba Co, 3♀ (9.1–13.0), 4 May 1971, RG. (15) †BM, Koene near Bestmantown, Kulu, Sinse Co, at 100 m, 13♂ (6.5–23.7), 12♀ (6.9–17.3), 2 ovig ♀ (12.9, 14.7), 19 Mar 1970, RG. (16) Atlantide sta 57 "off Liberia" (5°59'N, 10°27'W), bottom sample, 1 juv (9.0, t.l.) questionably assigned to this species, 8 Jan 1946 (Holthuis, 1951:20). (17) Atlantide sta 53 off Port Marshall (Lebour, 1959), "a few specimens" questionably assigned to this species, 4–7 Jan 1946.

**NIGERIA:** (1) †BM, Ataiyo River at Oban Hills, at 150 m, 1♀ (12.6), P.A. Talbot. (2) Affluent of Akpe-Yafe River at Aking, Cross River State (5°25'N, 8°37'E) (fide C.B. Powell). (3) near Ogoja, migrating juveniles (fide CBP). (4) Nun River at Kaiama, migrating juveniles (fide, CBP); 17 juv (3.7–5.2), 22 Jun 1977, CBP (these specimens from the Nun River are tentatively assigned to this species).

**CAMEROON:** (1) \*BM, Blackwater River (4°22'N, 9°47'E) (Lewis, Disney, and Crosskey, 1969:232), 2♂ (10.6, 20.0), 1 juv (5.8), R.L.H. Disney; 1♂ (25.6), 7 Oct 1968, RLHD; 2♂ (14.5, 24.8), 2♀ (14.2, 20.4), 1 juv (7.0), 3 Dec 1968,



FIGURE 14.—Distribution of *Atya africana*.

RLHD; 2♂ (27.1, 28.5), 11 Dec 1968, RLHD; 2♂ (28.0, 31.8), 13 Feb 1969, RLHD; 6♂ (8.9–20.1), 6♀ (8.5–17.7), 2 ovig ♀ (13.1, 18.0), 1 juv (5.3), 17 Mar 1969, RLHD; 4♂ (9.8–16.0), 6♀ (8.8–16.9), 22 Mar 1969, RLHD; 1♂ (18.8), 1♀ (12.1), 1 ovig ♀ (19.6), 31 Mar 1969, RLHD; 5♂ (10.0–29.2), 6♀ (11.1–17.9), 1 juv (6.8), 10 Apr 1969, RLHD; 1 ovig ♀ (16.4), 23 Apr 1969, RLHD. (2) \*BM, Meme River (4°19'N, 9°4'E) (Disney, 1971), 1♂ (27.3), 2 Nov 1968, RLHD; 1♂ (20.0), 5♀ (8.7–15.0), 4 ovig ♀ (12.5–16.0), 1 juv (4.6), 8 Nov 1968, RLHD; USNM, 1♀ (17.2), 2 ovig ♀ (11.7, 17.1), 8 Nov 1968, RLHD; BM, 1♀ (14.0), 3 ovig ♀ (13.9–14.0), 19 Nov 1968, RLHD; 1♂ (24.0), 1♀ (14.1), 25 Nov 1968, RLHD; 1♂ (19.6), 1♀ (12.0), RLHD. (3) †BM, Wowe River, 1♂ (25.0), 3♀

(8.1–21.0), 1 ovig ♀ (12.2), 12 Apr 1969, RLHD; 1 ovig ♀ (15.8), 28 Apr 1969, RLHD; 27 juv (4.9–6.2), 23 Oct 1970, RLHD. (4) †BM, Kobe Let, 1 juv (4.6), 11 Jun 1970, RLHD. (5) †BM, Kobe River near Etam, 1 ovig ♀ (20.0), 6 Dec 1968, RLHD; 2 juv (5.3, 5.5), 12 Mar 1969, RLHD; 2♂ (10.9, 12.1), 24 Apr 1969, RLHD. (6) \*BM, Bille River (Disney, 1971), 3 ovig ♀ (11.1–18.2), 1 juv (7.0), 11 Nov 1968, RLHD; 4♂ (17.3–23.8), 1 ovig ♀ (15.3), 12 Nov 1968, RLHD; 4♂ (10.8–27.6), 1♀ (15.2), 1 juv (5.0), 5 Dec 1968, RLHD; 2♀ (9.2, 10.1), 18 Mar 1969, RLHD; 1♂ (10.9), 2♀ (7.4, 12.0), 1 ovig ♀ (14.8), 17 Apr 1969, RLHD; 3♂ (10.5–13.0), 2 ovig ♀ (13.6, 15.4), 19 May 1969, RLHD. (7) †BM, Mengo River, 1♂ (11.4), 3♀ (10.4–13.4), Mar 1969, RLHD; 1♂

(12.1), 29 Oct 1969, RLHD. (8) \*BM, Mungo River near Boduma (Vogel and Crewe, 1965), 1 ovig ♀ (14.8), 8 juv (5.1–6.5), 26 Nov 1968, RLHD. (9) Atlantide sta 119 (2°55'N, 9°21'E), stramin net 100 cm, 3 juv ♂ (2.3–3.0) (questionably assigned to this species; Holthuis, 1951:20), 28 Feb 1946.

GABON: (1) Booué, 1♂, 1♀ (Bouvier, 1925:307). (2) \*MHNP, Ogooué River at Samkitta (Bouvier, 1904:138), 1♂ (46.0, holotype), Mar 1877. (3) †MHNP, Ogooué, 1♂ (14.3), M. Marche.

CONGO: "baie de Pointe-Noire, 10 m env.," 54 juv (9.9–11.5, t.l.), A. Crosnier (Crosnier, 1971:570, questionably assigned to this species).

ZAIRE: (1) Mbuma dans le Mayumbe (De Man, 1925:26), 1♂ (96, t.l.), 2 ovig ♀ (65, 70, t.l.), 7 other specimens, 25–26 Oct 1920, Dr. Schouteden. (2) \*BM, Atlantide sta 127, Boma, 4 juv (2.3–4.2), (questionably assigned to this species; Holthuis, 1951:20), 10 Mar 1946. (3) ? †MCZ, Zaire River near Bulu, W of Luozi (5°1'S, 14°1'E) swimming at surface in protected cove, 1 juv ♀ (7.1), 15 Jul 1973, T.R. Roberts, D.J. Stewart (see "Variations").

VARIATIONS.—Few variations worthy of mention have been noted. Most appear to be associated with the size, and presumably the age, of the individual. This is particularly true of the larger spines on the various podomeres of the ambulatory pereopods; the smaller specimens, for the most part, have more, a full complement consisting of a series of three spines on the ventrolateral surface of both the merus and carpus of all three legs; the spines are progressively larger from proximal to distal end of each podomere, and the most persistent with age of the shrimp is the distal ventrolateral member on the merus. The fringe of setae that extends along the lateral surface of the merus distally to about midlength of the propodus of the same pereopods is also best developed in comparatively small individuals that have recently molted, but in the more crusty, larger males, little more than a trace of the row is evident on the merus, and it is often reduced throughout its length. The rostrum is variable in length, attaining the basal one-third to almost two-thirds of the penultimate podomere of the

antennular peduncle and exhibits as many as three ventral spines, but they may be lacking. The range of variation in the number and disposition of the corneous spinules on the antennular peduncle is mentioned in the "Diagnosis." None of the variations noted seems to be restricted to a limited part of the range of the species.

Like those specimens cited above that were questionably assigned to this species by Holthuis (1951) and Crosnier (1971), the juvenile female listed from the third locality in Zaire is only tentatively assigned to this species. The absence of a pterygostomian angle and only three spines in each of the two rows on the dorsal surface of the otherwise typically appearing telson are unique among the specimens we have examined. The third pereopods are so poorly developed that they are not helpful in identifying the specimen. The long tapered rostrum is the single character that suggests its being a young member of *Atya africana*.

ECOLOGICAL NOTES.—There is little information concerning the habitats exploited by members of this species except that these shrimp frequent creeks and rivers from sea level to 200 m. A juvenile with a carapace length of 7.1 mm, believed to be a member of this species, was caught swimming at the surface of a protected cove in the Zaire River near Bulu, Zaire. If the juveniles described by Holthuis (1951:20–23) and Crosnier (1971:571) prove to be members of *A. africana*, then a part of the life cycle is probably typically spent in salt water at depths ranging from five to 62 meters; at least the young can tolerate sea water within this depth range. As pointed out by Holthuis (pp. 20, 23), juveniles that may be conspecific and that are smaller than the largest found in salt water also occur in fresh water.

Disney (1971), working in streams in the vicinity of Kumba, West Cameroon, found that most of the adult members of the *A. africana* population occurred under stones and that the smaller individuals were found more frequently among leaves and other debris, suggesting to him a difference of preference in the microhabitats of the smallest and adult members of the species. A brief account

of the population structure reported by him is presented in the "Review of Literature" above.

We were informed by C.B. Powell (pers. comm.) that his specimens taken at Aking, Nigeria, came from a wide, shallow river with a bottom made up almost entirely of rocks and boulders, and where there was a swift current. The specimens were caught among accumulations of dead leaves and other debris wedged between rocks in places where the current was fastest.

**LIFE HISTORY NOTES.**—Ovigerous females have been obtained from March to June and from October to December. To our knowledge, collections have not been made during other months of the year. Reference to the juveniles in "Ecological Notes" above suggests that if those in question are members of this species, like the larval members of other species of the genus studied by Hunte (1975, 1977, 1979b), the first larva must return to salt or brackish water. At least some of these juveniles occur in such habitats when they attain a total length of 12 mm (Holthuis, 1951:20). De Man (1925) reported the eggs of ovigerous females from "MBuma," Zaire, to be 0.32 mm wide and 0.58 to 0.62 mm long. In specimens from the Blackwater River, Cameroon, we found eggs ranging from 0.3 to 0.4 mm wide by 0.6 to 0.7 mm long.

Disney (1971) has added more than any other to our knowledge of the life history of this shrimp. In the vicinity of Kumba, West Cameroon, he found that the ovigerous females, ranging in total carapace length from 11 to 25 mm (about half of them 16 to 20 mm) appeared in greatest numbers from October to November and about five-eighths as many from April to May. An apparent "breeding pause" occurs from December to March. Juveniles of small size, which were believed to be migrating, were collected by an assistant to C. B. Powell (pers. comm.) near Ogoja and Kaiama, Nigeria.

**REMARKS.**—Because of the tapering rostral margins of this shrimp, its identity is as readily recognized among the African members of the genus as is the highly sculptured *Atya gabonensis*. Its affinities, however, are not entirely clear. In

most of its features it resembles *Atya dressleri*, *A. lanipes*, and, to a lesser extent, *A. innocous* and *A. intermedia*. The acuminate rostrum, the rather weakly developed tubercles on the merus of the third pereiopod, the proportions of this podomere, and the absence of corneous spinules on the ventral margin of the abdominal pleura align this shrimp with *A. dressleri* and *A. lanipes*. The moderately short sternum of the sixth abdominal segment is more like that of *A. dressleri*, *A. innocous*, and *A. intermedia* than like that of *A. lanipes*, but the preanal spine is quite short. Certainly it appears to be more closely allied to the four just mentioned species than it is to *A. scabra* and *A. margaritacea*. Nevertheless the ornamentation of the flexor surface of the propodus and ischium of this appendage is positioned as it is in *A. scabra*, that is, the spines on the mesioventral surface of the propodus are arranged in a row, and are subcontiguous, and those of the dactyl are dispersed in a single series. Individually, however, the spiniform tubercles of the entire appendage, especially those on the flexor surface of the propodus, resemble those of *A. dressleri* and *A. lanipes* more closely than they do the more heavily cornified discoid ones in *A. scabra* and *A. margaritacea*. Cornified spinules on the dorsal surface of the basal segment of the antennule are similar to those in *A. scabra*.

### *Atya brachyrhinus*, new species

FIGURES 1c, 9, 10, 12g, 15

**DIAGNOSIS.**—Cephalic region of carapace not conspicuously sculptured, densely covered with fine setae borne in small punctations, lacking spines other than antennal and pterygostomian; rostrum with convex margins tapering anteriorly, only slight irregularity in position corresponding to angle in some congeners; apex not nearly reaching distal extremity of proximal segment of antennule; pterygostomian angle acute but dorsal margin not excavate. Ventral margin of third, fourth, and fifth abdominal pleura with linear clusters of sclerotized spinules; caudoventral angles of fourth and fifth pleura not produced in

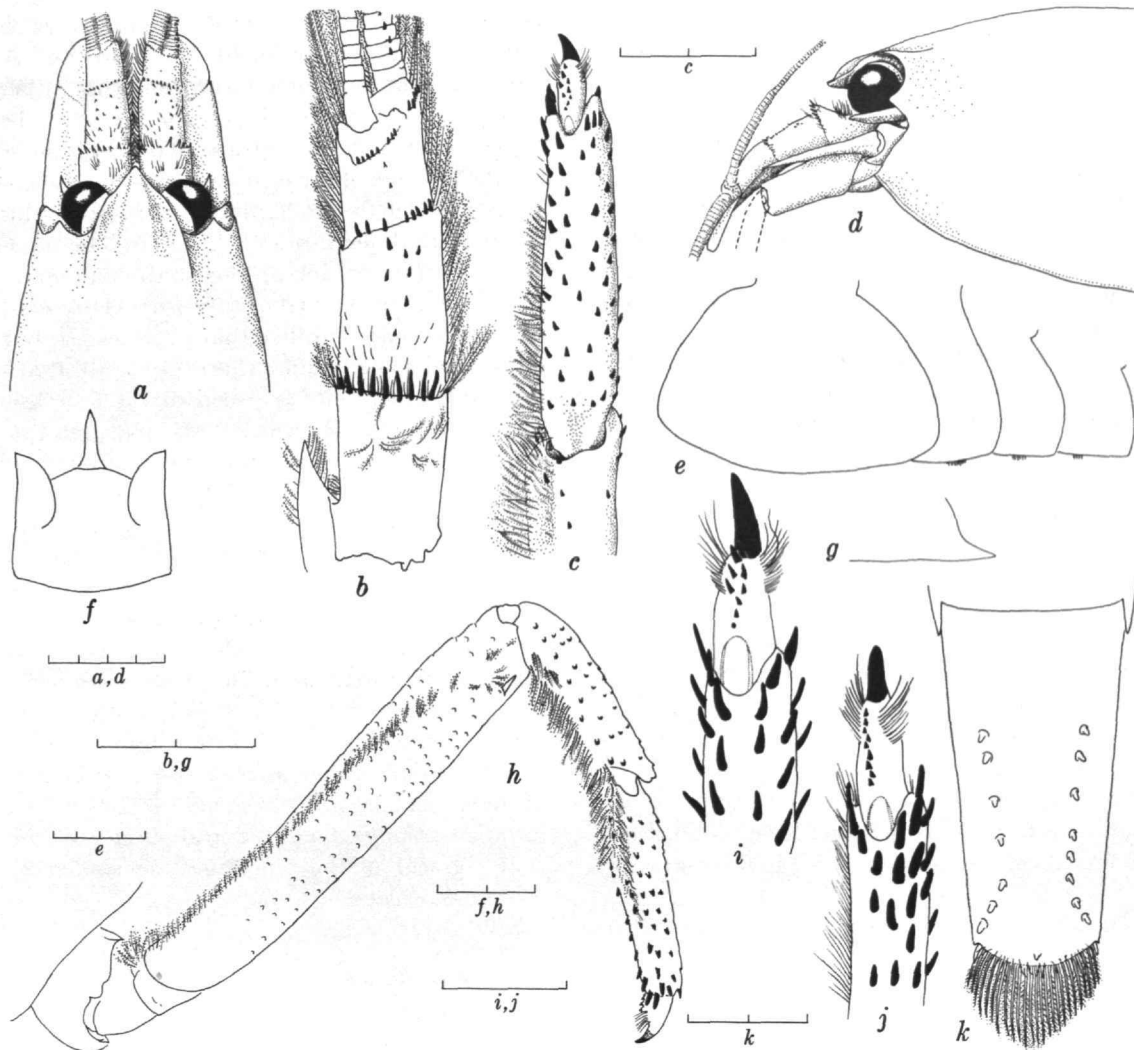


FIGURE 15.—*Atya brachyrhinus* (all from holotypic female except *b, i, j* from paratypic female): *a*, dorsal view of cephalic region; *b*, dorsal view of antennular peduncle; *c*, flexor surface of distal part of third pereiopod; *d*, lateral view of cephalic region; *e*, lateral view of second through fifth abdominal pleura; *f*, sternum of sixth abdominal segment and preanal carina; *g*, lateral view of preanal carina; *h*, lateral view of third pereiopod; *i*, flexor surface of distal part of fourth pereiopod; *j*, flexor surface of distal part of fifth pereiopod; *k*, dorsal view of telson. (Scales marked in 1 mm increments.)

spines. Sternum of fifth abdominal segment with prominent median tubercle, that of sixth about 1.3 times as broad as long. Preanal carina with well-developed spine. Telson about twice as long as wide and with 7 to 9 spines in each of 2 dorsal rows. Antennular peduncle with proximal article

lacking premarginal sclerotized spinules dorsally; penultimate article approximately 1.4 times as long as wide, its dorsal surface provided with somewhat linearly arranged spinules. Coxae of third and fourth pereiopods lacking prominent ventrolateral spine. Third pereiopod with merus

rounded ventrally, about 5.5 times as long as high, ventromesial surface bowed, never parallel to that of corresponding podomere of other third pereopod; lateral surface with small, inconspicuous, nonsclerotized tubercles; propodus about 5 times as long as broad; extensor and flexor surfaces bearing many small sclerotized spines; dactyl approximately 3 times as long as wide, freely movable, and bearing 2 oblique rows of sclerotized spines on flexor surface; rather prominent band of setae extending from dorsolateral surface of basis to beyond midlength of lateral margin of propodus.

**HOLOTYPE FEMALE.**—Rostrum (Figure 15*a,d*) with convex margins bearing trace of emargination delimiting base of acumen, latter falling far short of distal margin of proximal podomere of antennule; rounded dorsal carina not excavate dorsally (not dipping below level of lateral carinae posterior to acumen) and ending preapically on acumen; ventral carina lacking teeth or serrations; ocellar beak, hidden in lateral view by eyes, with anterodorsal margin arched, its anterior extremity falling short of faceted part of eye. Antennal spine acute; pterygostomial angle acute but dorsal side not strongly concave, thus not appearing produced in prominent spine. Carapace devoid of other spines or ridges; surface punctate with fine setae, lacking pile of short stiff setae.

Pleura of second and third abdominal segments (Figure 15*e*) with rounded posteroventral extremities, although fourth and fifth subangular, none produced in spines. Ventral margin of third, fourth, and fifth pleura with linear clusters of 9, 6, and 4 fine corneous spinules, respectively, also with additional fine plumose setae. Fourth abdominal tergum approximately 0.9, 0.7, and 0.55 times as long as fifth, sixth, and telson, respectively; that of sixth about 1.3 times length of fifth and 1.4 times that of telson. Sternum of fifth abdominal segment (Figures 1*c*, 15*f*) with rather large tuberculiform prominence, that of sixth about 0.76 as long as broad. Preanal carina (Figure 15*g*) with strong spine extending caudally beyond base of carina. Telson (Figure 15*k*) almost twice (1.9) as long as wide, its dorsal surface

studded with paired, mesially concave rows of corneous denticles (dextral row of 9 and sinistral of 7) and posteromedian premarginal tubercle.

Basal segment of antennule (Figure 15*b*) with well-developed stylocerite overreaching midlength of segment, dorsal surface with clusters of setae but lacking corneous spinules; distal margin bearing row of 8 (left) and 6 (right) cornified spinules; penultimate segment of peduncle about 1.4 times as long as broad, studded dorsally with 7 (left) or 5 (right) small corneous spinules and 7 (left) or 8 (right) on distal margin; ultimate segment, about 0.5 as long as penultimate, armed with 7 spinules at base of lateral flagellum and row of 4 at base of mesial flagellum. Antenna with ventrolateral spine on basis almost reaching level of tip of stylocerite; lateral spine of scaphocerite weak, extending short distance beyond base of ultimate podomere of antennular peduncle and almost attaining distal end of that of antenna, lamella of scaphocerite overreaching peduncles of both antennule and antenna. Flagellum of antenna broken, but that of paratype extending beyond caudal margin of telson.

Third maxilliped overreaching antennular peduncle by about 0.25 length of distal podomere; tip of exopod reaching base of apical third of penultimate segment of endopod; penultimate segment of endopod about 1.4 times as long as ultimate.

First pereopod slightly overreaching distal extremity of antennular peduncle; second overreaching first by about 0.25 length of fingers; terminal brush of setae lacking scraping denticles. Third pereopod (Figure 15*c,h*) unarmed except for rather prominent spine on distal ventrolateral surface of merus, and when extended anteriorly overreaching antennular peduncle by length of propodus and dactyl. Merus with ventromesial margin weakly bowed, about 5 times as long as high, 2.3 times as long as carpus, and 2.1 times as long as propodus; latter about 4 times as long as wide and 1.1 times as long as carpus; distoventral margin of coxa entire and both mesial caudoventral prominence and distolateral spine lacking. Lateral, dorsal, and ventral surfaces of merus studded with weak, squamous tubercles flanked

distally by plumose setae; longitudinal band of long plumose setae present on lateral surface; mesial extremity of podomere produced in prominent rounded lobe at level of mesial articular condyle of carpus. Carpus studded with small, distally directed, corneous spines, and lateral surface with prominent distoventral spine somewhat obscured by conspicuous ventrolateral tufts of plumose setae extending along length of podomere, setae increasing in length from proximal to distal end of podomere. Propodus also studded with corneous spines, those on flexor surface tending to be linearly arranged toward lateral surface which provided with conspicuous longitudinal band of plumose setae. Dactyl movable, its flexor surface bearing 9 corneous spinules arranged in 2 somewhat arched rows; clusters of setae flanking rows distally.

Fourth pereopod with dactyl reaching end of proximal third of carpus of third; merus almost twice as long as carpus, latter about 0.7 as long as propodus. Fifth pereopod reaching slightly beyond midlength of carpus of fourth pereopod; merus 1.3 times as long as carpus, latter approximately 0.7 as long as propodus. Ornamentation of merus, carpus, and propodus of fourth pereopod consisting of distal ventrolateral spine on merus, ventrolateral row of 4 spines (increasing in size distally) on carpus, and band of plumose setae extending on lateral surface of podomeres from base of merus almost to end of propodus, broadening distally on both merus and carpus. Ornamentation of fifth pereopod like that on fourth except merus provided with 3 additional spines ventrally, and ventrolateral surface of carpus with only 2 spines.

Diagnosis of lateral ramus of uropod flanked proximally by row of 22 articulated corneous denticles and fixed spine at lateral end of row.

COLOR NOTES.—On the label accompanying the holotype was the following: "It was colorless with pink tail when seen. Two black dots only give away."

SIZE.—Carapace length of holotype and paratypic female 15.7 and 15.8 mm, respectively.

TYPES.—The holotypic female is in the British Museum (Natural History), number 1972:539,

and the fragmentary paratypic female, in the National Museum of Natural History, Smithsonian Institution, number 184857.

TYPE-LOCALITY.—Cole's Cave, Barbados, West Indies, 13°10'40"N, 59°34'30"W. Notes accompanying the holotype state that the specimen was collected

high up the side of the large cavern. Water issues . . . through an aperture [sic] estimated two yards horizontally wide with 9" running sheet of water under 6" air space . . . Shrimps seen 15' downstream from tunnel and made off to the tunnel fast . . . in the dark it took up a normal "legs down" position. In the light it went on its side and even on its back and jerked about in spasms.

The identity of the collector is unknown, but the specimen was obtained on 6 October 1972. The paratypic female was found in the same cave by R.R. Allen and C.E. Ray on 28 February 1963.

DISTRIBUTION AND SPECIMENS EXAMINED.—Known only from the type-locality. The sources of the two known specimens are related under "Type-locality": 1♂ (16.0), 23 Feb 1963, R.R. Allen, C.E. Ray; 1♀ (15.7, holotype), 6 Oct 1972.

ECOLOGICAL NOTES.—See "Type-locality."

LIFE HISTORY NOTES.—None.

RELATIONSHIPS.—*Atya brachyrhinus* has its closest affinities with the sympatric *Atya innocous*, with which it shares most of the features mentioned in the "Diagnosis" of each of the two. It differs from all members of the genus in possessing a broad, short rostrum that has strongly convex lateral margins and does not reach the distal end of the proximal podomere of the antennule. It differs from *A. innocous* most conspicuously by the shape of the rostrum; in that species the base of the acumen is clearly delimited by abrupt constrictions of the rostral margins. The pterygostomial angle of *A. brachyrhinus* is less acute, the tubercles on the third pereopod are much less strongly developed, and the spine on the preanal carina projects much beyond the basal part. From its other sympatric relative, *A. scabra*, it differs more strikingly by the absence of an angular bend in the rostral margin marking the base of the acumen, in the absence of corneous spinules on the dorsal surface of the proximal podomere of the antennule, in the absence of short stiff setae stud-

ding the surface of the carapace, in the less spiniform pterygostomian angle, in lacking corneous denticles on the ventral margin of the pleuron of the second abdominal segment, in the proportionately narrower telson with a greater number (7 or 8) tubercles in each of the dorsal rows, in the proportionately longer sternum of the sixth abdominal segment, in the less well-developed tubercles on the lateral surface of the merus and carpus of the third pereopod, and in the size and arrangement of the tubercles on the flexor surface of the propodus and dactyl of the third pereopod.

### *Atya crassa* (Smith)

FIGURES 1m, 9, 10, 11g, 16, 17

*Evatya crassa* Smith, 1871:95-97 [type-locality: "Fresh water streams, Polvon, and the 'Rio Fulva, two and a half miles northwest of Realejo,' Occidental Department, Nicaragua"; types: (?)USNM 84261, 1♀; (?)PM 6038, 1♂, 1♀].—Kingsley, 1878b:57.—Holthuis, 1955b:26.

*Euatya crassa*.—Koelbel, 1884:318, 320.

*Euatya (Evatya) crassa*.—Koelbel, 1884:318.

*Atya (Evatya) crassa*.—Ortmann, 1895:408, 410, 415.—Doflein, 1900:127.

*Atya (Euatya) crassa*.—Ortmann, 1897:184, 186.

*Evatya crassus*.—Sheldon, 1905:343 [erroneous spelling].

*Atya crassa*.—Bouvier, 1905:110, 113, 124; 1925:26-28, 293, 319-323, figs. 54, 68.—Pesta, 1931:173, 178.—Oliveira, 1945:178.—Holthuis, 1951:9; 1955b:26, fig. 9.—Balss, 1955, fig. 1050.—Kaestner, 1970, figs. 13-18f.—Burukovsky, 1974, fig. 85.

REVIEW OF LITERATURE.—Smith (1871) described this shrimp along with *Atya rivalis* and *A. tenella* from freshwater streams at El Polvón in the western part of Nicaragua; he also cited a second locality for *A. crassa*, "Rio Fulva, two and a half miles northwest of Realejo." Kingsley (1878b) added no new information but listed the species and cited it from the west coast of Nicaragua. Koelbel (1884), in describing *Euatya sculptilis* (= *Atya gabonensis* Giebel, 1875) and emending the spelling of *Evatya*, assigned Smith's species to the same genus and reported its occurrence in Río Presidio (perhaps near Mazatlán, Sinaloa), Mexico. Ortmann (1895) recognized two subgenera of the genus *Atya* and placed *A. crassa* in the monotypic subgenus *Evatya*; no new data relative to the

species were included. Doflein (1900), who followed Ortmann in the subgeneric assignment, listed this shrimp from the Atlantic side of Panama. In the meantime, Ortmann (1897) had employed the combination *Atya (Evatya) crassa*, presented a diagnosis of the species, and included Nicaragua and Mexico in his summary of distribution. Sheldon (1905) added no new information. Bouvier (1905), not recognizing the subgeneric designations of Ortmann, provided a key to the species of the genus, and pointed out the similarity in the serrate rostra of *A. crassa* and *A. (= Micratya) poeyi* Guérin-Méneville (1855). In his monograph of the Atyidae, Bouvier (1925) emphasized the relationships of *A. crassa* with *A. gabonensis*, considering them to be the most advanced members of the genus. A key to the species was provided along with a summary of the locality records (those just cited), an illustration, in lateral aspect, of a male, and another of the telson. Pesta (1931), reporting on the Austrian expedition of 1930 to Costa Rica, added a new locality for the species: Río Nuevo that flows into Golfo Dulce. Oliveira (1945), in his study of *Atya scabra* in northeastern Brazil, mentioned *A. crassa* but added nothing to our knowledge of the species, nor did Holthuis (1951); however, the latter (1955b) cited this shrimp as the type of Smith's *Evatya* and included the illustration of the entire animal that appeared in Bouvier's monograph. Balss' (1955) figure was also taken from Bouvier, Kaestner's (1970) from Balss, and Burukovsky's (1974) from Holthuis.

PUBLISHED ILLUSTRATIONS.—The only illustrations of this shrimp are a dorsal view of the telson and a lateral one of an entire animal included in Bouvier (1925). The latter figure was reprinted by Holthuis (1955b) and Balss (1955), and indirectly by Kaestner (1970) and Burukovsky (1974).

DIAGNOSIS.—Cephalic region of carapace strongly sculptured and bearing many rows of corneous-tipped spines and tubercles. Rostrum with margins tapering from base and studded with median dorsal row of corneous-tipped spines. Pterygostomian angle produced in prominent spine. Ventral margin of abdominal pleura lacking sclerotized denticles; caudoventral angle of

fourth and fifth pleura usually produced in spines. Fifth abdominal segment with median tubercle on sternum moderately to strongly developed; sternum of sixth abdominal segment less than half as long as wide. Preanal carina in form of subconical spine directed caudally to caudoventrally. Telson 1.2 to 1.4 times as long as broad and bearing paired arched dorsal rows of 4 to 6 spines. Antennular peduncle with dorsal surface of proximal article lacking sclerotized spinules proximal to transverse distal row; penultimate article 1.5 to 2.2 times as long as wide and bearing dorsolateral longitudinal row of spinules. Coxa of third and fourth pereopods with prominent ventrolateral spine, that of third also with strong mesial caudoventral prominence. Third pereopod with merus subplane ventrally, 1.5 to 2.3 times as long as high, ventromesial margin subangular and parallel to that of corresponding podomere of other third pereopod, and lateral surface bearing irregular rows of spines, many of which with flattened corneous extremities; propodus 1.3 to 1.6 times as long as broad, studded with scalelike tubercles on extensor surface and with few similar ones of flexor surface, latter largely obscured by conspicuous tufts of long plumose setae; dactyl apparently inflexibly fused with propodus and bearing 1 or 2 small scalelike tubercles on flexor surface just proximal to corneous tip.

**MALE** (Río Chucunaque, Darién Province, Panama).—Rostrum (Figure 16*a,c*) with margins tapering from base to corneous, acute apex, latter almost reaching distal end of antennular peduncle; dorsal median carina rounded and bearing row of 7 corneous-tipped spines, 4 of which situated behind orbit, directed dorsally, and decreasing in size posteriorly; those on rostrum subequal in size, 2 more posterior ones directed dorsally, and anteriormost anterodorsally. Ventral surface of rostrum evenly rounded transversely, lacking clearly defined carina; lateral carinae very small, becoming obsolete at base of anteriormost spine. Ocellar beak upturned and so well concealed beneath rostrum and between eyes that hardly noticeable. Antennal and pterygostomial spines acute, and cephalic border of carapace between

them bearing 2 large, acute, corneous-tipped spines. Entire surface of carapace densely punctate, and cephalic half very ornate dorsally and dorsolaterally, bearing paired ridges studded with rows of corneous-tipped spines; ventrolateral punctations bearing conspicuous setae.

Pleura of first and second abdominal segments (Figure 16*i*) with rounded posteroventral extremities, corresponding parts of third obtuse, and those of fourth and fifth acute with corneous apices; anteroventral angle of sixth also with acute, corneous, caudoventrally directed tip. All pleura lacking corneous denticles on ventral margin, but fourth and fifth with row of prominent plumose setae. Fourth abdominal tergum approximately 1.2 times as long as fifth, length of sixth subequal to that of fifth and almost 0.9 as long as telson. Sternum of fifth abdominal segment (Figure 16*m*) with very prominent, corneous-tipped, acute median spine directed caudoventrally; sternum of sixth segment about 0.42 times as long as broad. Preanal carina (Figure 16*k*) represented by strong, caudally directed, corneous-tipped spine. Telson (Figure 16*b*) about 1.3 times as long as wide, its dorsal surface bearing paired rows of 6 corneous denticles and with posteromedian tubercle slightly overhanging caudal margin.

Proximal podomere of antennule (Figure 16*a,l*) with strong stylocerite overreaching midlength of segment, dorsal surface with few setae but lacking corneous spinules; distal margin studded with row of 5 corneous spinules; penultimate segment of peduncle 1.5 times as long as wide and provided with 4 spinules on dorsolateral surface and row of 3 (right) or 4 (left) on distal margin; ultimate podomere with no spinules on dorsal surface but with row of 5 flanking dorsal base of lateral flagellum and 2 at dorsal base of mesial flagellum. Antenna with ventrolateral spine on basis reaching proximal end of penultimate podomere of antennular peduncle, distinctly overreaching stylocerite; lateral spine on scaphocerite strong, extending to level of tip of rostrum; lamella overreaching peduncles of antennule and antenna; flagellum of antenna reaching caudal margin of telson.

Third maxilliped overreaching antennular pe-



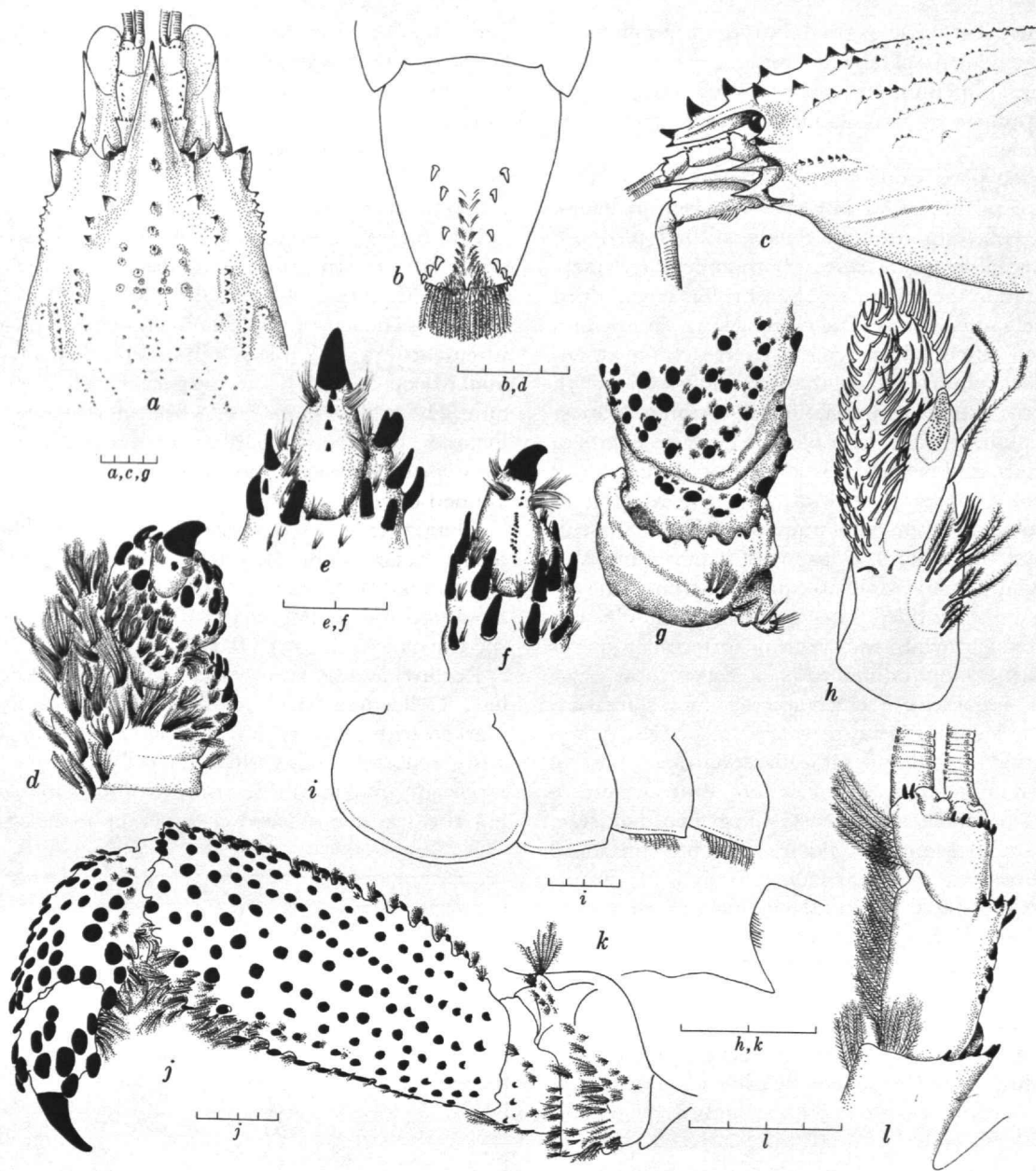


FIGURE 16.—*Atya crassa* (all from male from Río Chucunaque, Panama, except *b* from male from Río Lempa, El Salvador): *a*, dorsal view of cephalic region; *b*, dorsal view of telson; *c*, lateral view of cephalic region; *d, e, f*, flexor surface of distal part of third, fourth, and fifth pereopods, respectively; *g*, ventral view of base of right third pereopod; *h*, mesial view of appendices masculina and interna; *i*, lateral view of second through fifth abdominal pleura; *j*, lateral view of third pereopod; *k*, lateral view of preanal carina; *l*, dorsal view of antennular peduncle. (Scales marked in 1 mm increments.)

duncle by 0.25 length of ultimate segment of endopod; tip of exopod almost reaching mid-length of penultimate podomere of endopod; penultimate segment about 1.6 times as long as ultimate.

First pereopod reaching level of base of ultimate podomere of antennule, second reaching base of distal fifth of dactyl of first pleopod; terminal brush of setae of both appendages lacking scraping denticles. Except for coxa, third pereopod (Figure 16*d,g,j*) lacking spines and when extended anteriorly, overreaching antennular peduncle by length of propodus and dactyl. Merus with ventromesial margin straight, almost 1.5 times as long as high, 14.1 times length of carpus, and 4.4 times as long as propodus; latter slightly longer than wide and 0.48 as long as carpus; distoventral margin of coxa strongly scalloped, distolateral surface with strong spine, and mesial caudoventral prominence strongly developed and studded with prominent setal clusters. Lateral, dorsal, and ventral surfaces of merus bearing longitudinal rows of conspicuous, corneous tubercles of which apices of most somewhat flattened and bearing sharp free edge; paired clusters of plumose setae flanking distal base of most tubercles; tubercles on ventral surface largely concealed by dense, shaggy beard of setae; mesial extremity of podomere slightly produced at level of mesial articular condyle of carpus; strong tubercle on distal mesioventral angle opposing tubercle on carpus. Ventral and ventromesial surface of carpus heavily bearded. Flexor surface of propodus with few widely spaced tubercles, almost all obscured by tufts of setae borne proximally on podomere; dactyl fused with propodus, its flexor surface bearing median cluster of small, corneous denticles flanked by pair of setal clusters.

Fourth pereopod with dactyl reaching base of distal third of merus of third pereopod; length of merus slightly greater than twice that of carpus, latter 1.1 times longer than propodus; coxa with strong distolateral spine. Fifth pereopod reaching end of basal fifth of carpus of fourth; merus about 1.5 times as long as carpus, and latter 0.86 as long as propodus. Ornamentation of merus, carpus,

and propodus of fourth pereopod similar to that of third except ventral surface of merus with 3 articulated spines, and ventrolateral surface of carpus with 1; only 2 such spines present on merus of fifth pereopod, and flexor surface of dactyl with row of many more spinules, ornamentation otherwise similar to that of fourth.

Diagnosis of lateral ramus of uropod flanked proximally by 16 articulated corneous denticles and slightly larger fixed lateral spine.

SIZE.—The largest specimen for which measurements are available is a male from Río Presidio, Mexico, which has a carapace length of 60.0 mm. The largest female, one from northwestern Ecuador, has a corresponding length of 41.4 mm. No ovigerous females have been reported or examined by us.

DISTRIBUTION AND SPECIMENS EXAMINED.—This species ranges along the Pacific slope from Presidio (probably Sinaloa), Mexico, southward to Ecuador, and in Panama it has been found on the Caribbean slope (Doflein, 1900) (Figure 17).

Records for the known localities are listed below. Collections that we have examined are marked with an asterisk if they have been previously reported and with a dagger if they are reported herein for the first time. Numbers following the specimens listed are measurements, in

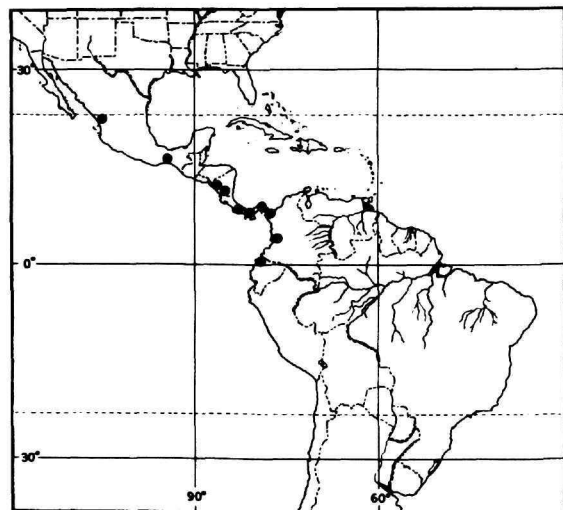


FIGURE 17.—Distribution of *Atya crassa*.

mm, of the carapace length or, if followed by "t.l.," total length. Some listings lack dates and/or collectors; if so, these could not be determined.

MEXICO: (1) \*BM, Río Presidio (?Sinaloa) (Koelbel, 1884:318), 1♂ (60.0), 2♀ (17.7, 23.3), A. Forrer; MHNP, 1 specimen (35.5). (2) †USNM, Río Tehuantepec, Oaxaca, 1♂ (50.5), T. MacDougall.

EL SALVADOR: †USNM, Río Lempa at Suchitoto, 2♂ (29.3, 28.7), 1♀ (29.0), 9 Feb 1924, C.A. Hildebrand and Foster; USNM, 2♂ (22.6, 32.8), 5 Feb 1924, CAH and F.

NICARAGUA: (1) \*USNM, freshwater streams, El Polvón (12°27'N, 87°05'W) or Río Fulva, 2.5 mi NW of Realejo (Smith, 1871), 1♀ (40.0), syntype, 1869, J.A. McNeil. (2) †PM, "Río Frilo," (probably Río Frío), about 1.8 km NW of Realejo, 1♂ (11.2), 2♀ (8.5, 15.0), 1869, J.A. McNeil.

COSTA RICA: Río Nuevo (Halbinsel Osa), Golfo Dulce (Pesta, 1931:178), 1♂ (120, t.l.), 4 juv, 1 Apr 1930.

PANAMA: (1) "Atlantic side" (Doflein, 1900:127). (2) †USNM, Río Chucunaque near Río Sansón, Provincia de Darién, 3♂ (47.5, 50.8, 56.3), 27 Apr 1958, C.E. Bennett, Jr. (3) †USNM, Río Chucunaque above Membrillo, Provincia de Darién, 1♂ (38.9), 4♀ (15.3–38.6), 7 Apr 1924, J.L. Baer. (4) †LGA, Río Bayano at ford, Provincia de Panamá, 1♀ (6.3), 6 Mar 1973, R.L. Dressler. (5) †LGA, headwaters of Río Bayano 1♂ (28.0), 1♀ (9.6), Dec 1974, L.G. Abele.

COLOMBIA: †USNM, Río Dagua at bridge, 0.25 km from Buenaventura, 6♂ (30.8–41.0), 5♀ (28.7–39.3), 17 Jul 1939, Karl P. Schmitt.

ECUADOR: (1) †BM, NW Ecuador, alt 136 m, 2♂ (38.1, 39.0), 4♀ (32.1–41.4). (2) †MCZ, Ríos Cayapas, Hoja Blanca, and San Miguel, in immediate vicinity of village of San Miguel, Provincia de Esmeraldas, 2♀ (32.9, 37.9), Miyata and Rand. (3) †USNM, junction of Río Cayapas and Río San Miguel, Provincia de Esmeraldas, 1♀ (37.2), Jun 1977, Andris Rankis.

VARIATIONS.—The following few remarks are based on such a limited series of specimens, 11 constituting the greatest number from a single locality, that they should not be considered as conclusive. The specimens from Colombia and

Ecuador differ from those from the Middle American region in possessing fewer tubercles on the lateral surface and dorsal margin of the merus of the third pereopod. In the South American specimens, the dorsal row consists of 12 to 14 (rarely 13 or 14) and in those from Middle America, 15 to 19. Six to 10 spines constitute the median row on the rostrum, and, whereas in the specimens from Ecuador, Colombia, and Panama there are usually six or seven, as contrasted with eight to 10 in the more northern part of the range, the numbers are not consistent, for specimens from both El Salvador and Nicaragua have as few as seven and at least one from each of Colombia and Panama exhibit eight or nine. Of the other features compared in specimens from throughout the range, there seems to be no correlation of a variation with a limited part of the area occupied by the species.

ECOLOGICAL NOTES.—The only data available as to the habitat occupied by *Atya crassa* are in the short statement of Smith (1871:97), "Fresh water streams . . . and 'Río Fulva' . . .," citing the localities from which his specimens were taken, and the inclusion of "Río" among the data accompanying most subsequent collections (see "Distribution"). Some of the specimens cited herein from Ecuador were collected at an altitude of 150 m.

LIFE HISTORY NOTES.—There are no published data relative to the life history of members of this species. Of the specimens known to us, not one is ovigerous, and even the dates collections were made are few. Among the previously recorded localities, only that in Costa Rica (Pesta, 1931) was accompanied by the date on which the collection was made, 1 April 1930.

REMARKS.—Fortunately, *Atya crassa* is the most distinctive member of the genus, for one cannot be certain that any of the existing specimens collected by McNeil in Nicaragua were among the specimens on which Smith based his description. The female in the Smithsonian (USNM 84261) that was formerly in the Kingsley collection is likely one of Smith's specimens. It bears a hand written label carrying the following: "Eva-tya Crussa [the "u" probably an intended "a"]"

Smith (type) for Locality s II & III Ann. Rep. Peabody Aca. Science," and number "216" is included on a second small slip of paper. The smaller male and two females in the Peabody Museum (no. 6083) from "Rio Frilo" are perhaps less likely to have been examined by Smith, for this stream is not mentioned at the end of the description as is Río Fulva. Inasmuch as the latter specimens were collected within such a short distance from Realejo, they are at least virtual topotypes.

### *Atya dressleri* Abele

FIGURES 1g, 9, 10, 12f, 18, 19

*Atya dressleri* Abele, 1975:51-57, figs. 1, 2 [type-locality: Río San Juan, 15 km above town of Calobre (566 m elevation), Provincia de Veraguas, Panama; types, USNM 184856, ♂ holotype; USNM 141845, 8♀ paratypes, 1♂ paratype].

REVIEW OF LITERATURE.—Abele's original description and notes on the range and habitat (see below) of this Panamanian species constitute the only published record of its existence.

PUBLISHED ILLUSTRATIONS.—The illustrations accompanying the original description include dorsal and lateral views of the cephalic region, dorsal view of the telson, illustrations of the antennule, third pereopod, first pleopod of the male, appendices interna and masculina, preanal carina, and a lateral view of an entire animal showing the color pattern.

DIAGNOSIS.—Cephalic region of carapace not conspicuously sculptured, glabrous, lacking spines other than antennal, pterygostomian, and usually ventral rostral; pterygostomian spine absent or rather small; rostrum with margins tapering from base, sometimes with slight irregularity but never angulate. Ventral margin of all abdominal pleura without sclerotized denticles, and caudoventral angles of fourth and fifth pleura not produced in spines. Sternum of fifth abdominal segment with small median tubercle, that of sixth 1.4 to 1.5 times as broad as long. Preanal carina with well-developed curved spine. Telson almost twice as long as wide and with 8 to 10 spines in each of 2 dorsal rows. Antennular peduncle with proximal article lacking premarginal sclerotized

spinules dorsally; penultimate article about twice as long as wide, its dorsal surface usually provided with linear series of spinules. Coxae of third and fourth pereopods lacking prominent anterolateral spines. Third pereopod with merus rounded ventrally, more than 5 times as long as high; ventromesial surface bowed, never parallel to that of corresponding podomere of other third pereopod; lateral surface with linear series of subsquamous, comparatively large tubercles, those constituting median series rather larger than others but none heavily sclerotized; propodus 3 to 4 times as long as broad, extensor surface bearing rather large subsquamous tubercles, flexor surface also with large tubercles bearing sclerotized spines, more lateral tubercles forming row and all flanked by horseshoe-shaped row of setae (latter sometimes absent in later intermolt stage); dactyl about twice as long as broad, freely movable, and usually bearing 2 oblique rows of sclerotized spines on flexor surface, occasional members slightly displaced from either series and rarely spines arranged in single row; except in middle to late intermolt individuals, conspicuous band of setae extending from basal third of lateral surface of merus to distal margin of propodus.

HOLOTYPE MALE.—Rostrum (Figure 18a,d) with margins tapering from base, and hardly hint of angle at base of long acumen; apex of latter slightly overreaching extremity of proximal podomere of antennular peduncle; dorsal median carina gently curved, not excavate dorsally (not dipping below level of lateral carinae posterior to acumen), and reaching apex of acumen; ventral carina with 2 preapical teeth, both on acumen; ocellar beak well hidden between eyes, reaching little beyond level of base of stylocerite, its cephalic border broadly rounded, and dorsal margin embraced by sides of ventral rostral groove. Antennal spine strong; pterygostomian spine rather small; no spine present between them. Surface of carapace bearing crowded minute punctations supporting very short, erect, fine setae, latter nowhere conspicuous; devoid of ridges and spines other than those just mentioned.

Pleura of first 3 abdominal segments (Figure 18e) with rounded posteroventral extremities; cor-

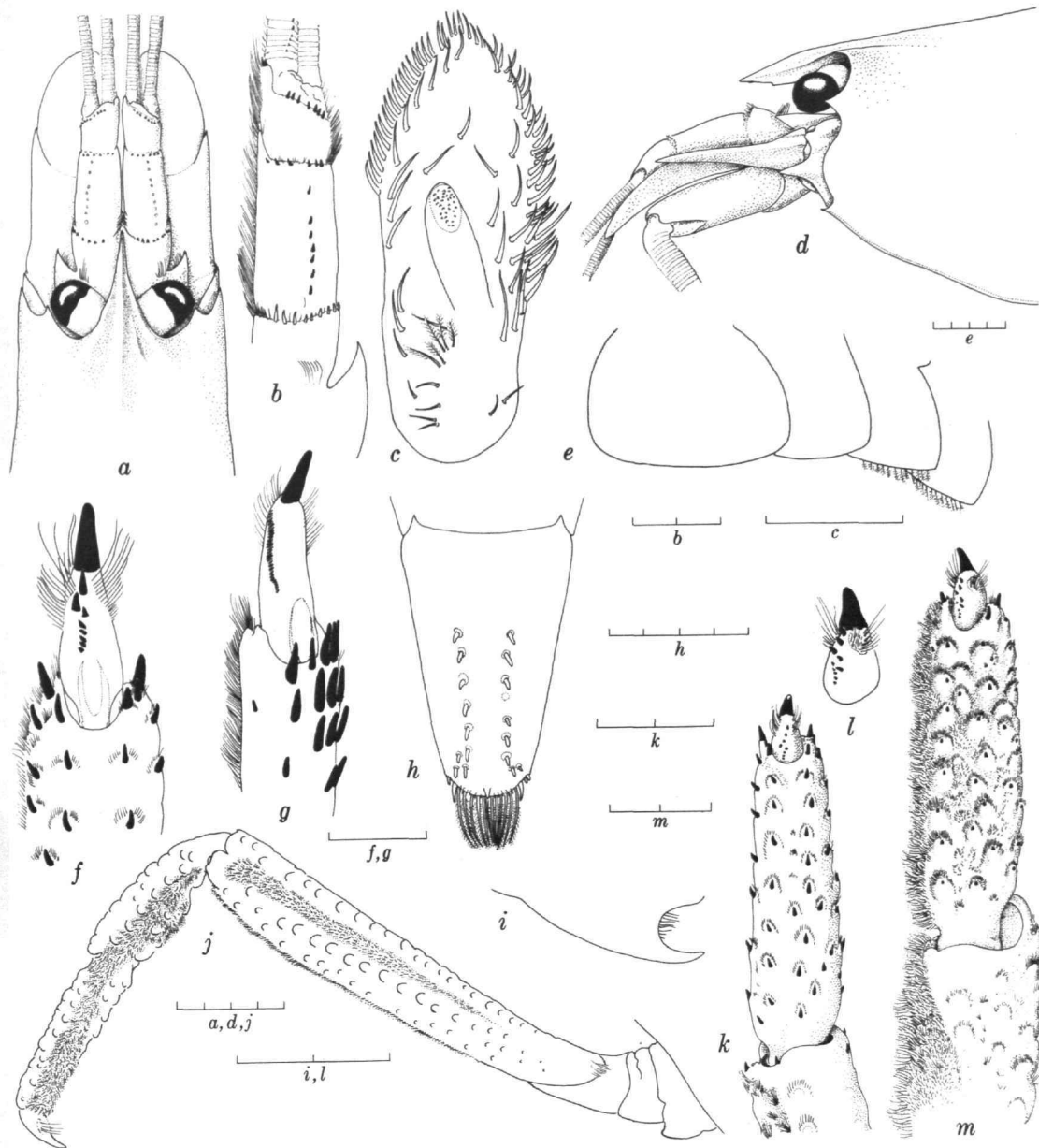


FIGURE 18.—*Atya dressleri* (all from holotype except *k, l* from Santa Fe, Panama): *a*, dorsal view of cephalic region; *b*, dorsal view of antennular peduncle; *c*, mesial view of appendices masculina and interna; *d*, lateral view of cephalic region; *e*, lateral view of second through fifth abdominal pleura; *f*, flexor surface of distal part of fourth pereiopod; *g*, subflexor surface of distal part of fifth leg; *h*, dorsal view of telson; *i*, lateral view of preanal carina; *j*, lateral view of third pereiopod; *k, l, m*, flexor surface of distal part of third pereiopod. (Scales marked in 1 mm increments.)

responding parts of fourth and fifth angular but not produced in spines. All pleura lacking corneous spinules on ventral margin, but fourth and fifth with moderately prominent fringe of plumose setae. Fourth abdominal tergum slightly more than 1.1 times as long as fifth, 1.2 times as long as sixth, and tergum of fifth subequal in length to telson. Sternum of fifth abdominal segment with small acute median tubercle (Figure 1g). Sternum of sixth abdominal segment about 0.7 as long as broad. Free part of preanal carina (Figure 18i) spiniform, curved, and slightly overreaching caudal border of basal part of sclerite. Telson (Figure 18h) little less than 1.6 times as long as broad, its dorsal surface bearing paired, concave rows of 7 corneous denticles flanked posteriorly by 1 (right) or 2 (left) ones; posteromedian tubercle slightly overhanging caudal margin.

Proximal podomere of antennule (Figure 18b) with stylocerite reaching between base of distal fourth and fifth of segment; dorsal surface with linear cluster of setae but lacking corneous spinules; distal margin bearing row of 9 (right) or 6 (left) corneous spinules; penultimate segment of peduncle slightly less than twice as long as wide and bearing dorsal longitudinal row of 7 corneous spinules and transverse distal row of 6; ultimate podomere without spinules on dorsal surface and with row of 7 (right) or 8 (left) at base of lateral flagellum and another of 2 at mesial base of mesial flagellum. Antenna with ventrolateral spine on basis reaching almost as far anteriorly as stylocerite; lateral spine on scaphocerite rather strong, reaching about midlength of ultimate podomere of antennular peduncle; lamella far surpassing latter; flagellum extending to fifth abdominal tergum.

Third maxilliped overreaching antennular peduncle by distal fifth of distal podomere of endopod; tip of exopod attaining base of distal fifth of penultimate podomere.

First pereopod reaching level of base of ultimate podomere of antennular peduncle, second extending to base of distal fifth of fingers of first pereopod; terminal brush of both appendages lacking setae with scraping denticles. Third pe-

reiopod (Figure 18j,m) without lateral distoventral spine on merus and carpus, ventral spine absent from merus, and carpus lacking distolateral spines; when appendage extended anteriorly, overreaching antennular peduncle by dactyl, propodus, and distal third of carpus. Merus with ventromesial margin bowed, almost 7 times as long as high, 2.6 times as long as carpus, and 2.3 times as long as propodus; propodus 3.4 times as long as wide and almost 0.9 as long as carpus; distoventral margin of coxa entire (evenly rounded), and mesial caudoventral prominence absent. Lateral, dorsal, and ventral surfaces of merus studded with moderate number of rather large tubercles little if any cornified and, for most part, arranged in linear series; longitudinal band of setae present on lateral surface of merus; mesial extremity of podomere noticeably produced in rounded lobe at level of mesial articular condyle of carpus. Latter strongly tuberculate, almost all tubercles flanked distally by subsemicircular row of setae; lateral and ventrolateral surfaces matted with tufts of plumose setae. Propodus also strongly tuberculate, almost all tubercles with small cornified spines and, like those of carpus, flanked by setae; those on flexor surface not in well-defined rows proximally; lateral surface with tufts of setae arranged in longitudinal band. Dactyl movable, its flexor surface with 2 oblique rows of denticles flanked distally by usual setal clusters.

Fourth pereopod with dactyl reaching end of proximal fourth of propodus of third pereopod; length of merus slightly more than twice as long as carpus; latter approximately 0.9 as long as propodus. Fifth pereopod reaching anteriorly to end of proximal third of propodus of third pereopod; merus 1.4 times as long as carpus, latter almost 0.7 as long as propodus. Ornamentation of merus, carpus, and propodus of fourth pereopod consisting of distolateral spine and 2 more proximal ones on ventral surface of merus (more distal spine of latter very long), distal ventrolateral spine and 2 small distolateral spines on carpus; lateral surface of merus, carpus, and propodus with conspicuous band of plumose setae. Ornamentation of corresponding podomeres of fifth pereopod quite similar to that of fourth

except distalmost of ventral spines on merus not nearly so large.

Diaresis of lateral ramus of uropod flanked proximally by row of 21 articulated corneous denticles, and fixed spine at lateral end of row.

**COLOR NOTES** (paraphrased from Abele, 1975:55, 56).—Ground color light brown with yellow and black specks. Carapace light brown with dark brown oblong area on anterolateral surface just dorsal to elongate black spot. Short yellow rectangular area with black posterior border posterodorsal to latter. Posteroventral part of carapace with long yellow stripe margined in black. First abdominal segment with sinuous black area covering anterior part of segment; black area bordered by distinct narrow yellow band. Second abdominal segment with anterior and posterior pleural angles outlined in black and with oblique black stripe medial to each; distinct yellow area with black border situated postero-dorsally. Third segment with pleural angle black and bearing oblique stripe anterior to it. Fourth segment bearing hourglass-shaped yellow area bordered in black on posterodorsal surface; pleural angle black and oblique black stripe lying anterior to it. Pleural angle of fifth segment like that of fourth. Almost entire dorsal surface of sixth segment yellow with black border. Distinct black spot present at base of uropods. Antennular peduncle with dorsal surface of antepenultimate and penultimate segments bearing yellow markings; flagella brown. Third through fifth pereopods with 7 yellow bands: 1 at coxa-ischium, 1 about midlength and another toward distal end of merus, 1 at merus-carpal joint, 1 distally on carpus, and 1 at each end of propodus. Remainder of shrimp concolorous brown.

Some individuals lack, or have a modification of, the pattern described; others have a mid-dorsal longitudinal stripe; and the smaller specimens were concolorous light brown.

**SIZE.**—The carapace length of the males ranges from 12.1 to 20.4 mm, and that of the females, from 9.3 to 18.4 mm. No ovigerous females are available.

**DISTRIBUTION AND SPECIMENS EXAMINED.**—Known only from the Pacific slope of Panama in

Panamá and Veraguas provinces at elevations of 566 to 650 m (Abele, 1975:56) (Figure 19).

Records for the known localities are listed below. Collections that we have examined are marked with an asterisk if they have been previously reported and with a dagger if they are reported herein for the first time. Numbers following the specimens listed are measurements, in mm, of the carapace length. Some listings lack the date the collection was made; this could not be determined.

**PANAMA: Provincia de Panamá**—(1) Río Cabra above Cerro Azul, alt 650 m (Abele, 1975), 2♂ (“molts of aquarium specimens”). (2) †LGA, Cerro Jefe, Pacora Basin, 1♂ (exuviae only), 1969, R.L. Dressler. (3) †USNM, stream between Pacora and Chepo, 17 km E of Río Pacora, 1♂ (12.2), 1 exuviae, 20 Feb 1971, RLD. **Provincia de Veraguas**—(4) \*USNM, “Probably near ‘Goofy Lake,’” 1♂ (exuviae, 15.1), RLD. (5) \*USNM, trib of Río Santa María N of Santa Fe, alt 600 m (Abele, 1975), 6♀ paratypes (10.7, 14.1, 16.4, 17.0, 17.0, 18.2), 9 Feb 1962, H. Loftin and E.W. Tyson. (6) \*USNM, headwaters of Río San Juan about 15 km above Calobre, alt 566 m (Abele, 1975), 2♂ (20.0, paratype; 20.4, holotype), 2♀

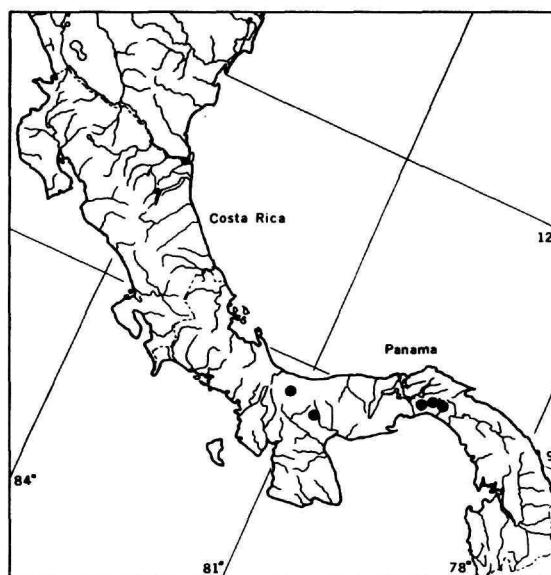


FIGURE 19.—Distribution of *Atya dressleri*.

paratypes (9.3, 18.4), 20 Feb 1973, L.G. Abele and H. Robinson.

**VARIATIONS.**—The most conspicuous variations occur in the spination of the rostrum, the ventral margin bearing one to three spines or serrations, and, whereas the dorsal surface is usually entire, the rostra of the exuviae of one specimen and of a paratypic female exhibit a row of four serrations. The pterygostomian angle may be strongly reduced and rounded, or it may be moderately produced, ending in an acute spine. The telson bears seven to 10 spines in each of the paired dorsal rows. Although in most of the specimens the spines (usually about eight) on the flexor surface of the dactyl of the third pereopod are arranged in two rows, in two individuals examined they occur in a single median series or in a row with one or two spines flanking it.

**ECOLOGICAL NOTES.**—Abele (1975:56) stated that this shrimp “occurs in small fast running freshwater streams from about 560 to 650 m elevation. All of the specimens were collected from vegetation or overhanging roots in areas where the current was swift.”

**LIFE HISTORY NOTES.**—The only information concerning the life history of members of this species is that offered by Abele (1975:56): “This species is fairly long lived. Robert Dressler has kept adult individuals alive in an aquarium for more than 5 years.”

### *Atya gabonensis* Giebel

FIGURES 1n, 3, 9, 10, 11f, 20, 21

*Atya gabonensis* Giebel, 1875:52–55 [type-locality: Gabon; types: disposition unknown].—Thompson, 1901:22.—Bouvier, 1904:138; 1905:110, 112, 123, 124, 128, fig. 26; 1925:20, 22, 26, 27, 29, 293, 317–323, 357, figs. 707, 708.—Monod, 1928:205; 1933:461; 1967:110, 119, 135, pl. 7: fig. 8; pl. 9: figs. 25, 26; 1977:1203, 1204; 1980: 375.—Oliveira, 1945:179.—Irvine, 1947:306, fig. 211.—Holthuis, 1951:9, 25; 1980:69, 71, 181.—Gordon, 1967:52.—Reed, 1967:120, fig. 153.—Motwani and Kanwai, 1970:34.—Rutherford, 1971:87, 90.—Lemasson, 1973:68, 70.—Powell, 1979:116, 134–138.—Hobbs, 1980:111.

*Euatya sculptilis* Koelbel, 1884:317–321, 323, pl. 2: fig. 8; pl. 3: figs. 1–8 [type-locality: Orinoco; type: NMW, 1 specimen].—Hobbs, 1980:111.

*Atya sculptata* Ortmann, 1890:465, 466 [type-locality: Africa, “Vielleicht aus West-Africa . . .”; type: Strassburg Museum].—Aurivillius, 1898:14.—Oliveira, 1945:179.

[*Atya*] *sculptipes*.—Ortmann, 1890:466 [erroneous spelling].

*Atya (Atya) gabonensis*.—Ortmann, 1895:410, 414, 415 [by implication]; 1897:184, 185, 186 [by implication].

*Euatya sculptilis*.—Ortmann, 1897:185 [erroneous transcription of *Euatya*].

*Atya scabra*.—Rathbun, 1900:313, 314 [in part].—Bals, 1914:98 [in part].

*Atya*.—Yaro, 1967:210.—Monod, 1967:176.

**REVIEW OF LITERATURE.**—This shrimp was described in considerable detail by Giebel (1875) on the basis of four specimens that had been sent to him by Baron von Koppenfels from Gabon. Almost a decade later, Koelbel (1884) presented a description and beautiful illustrations of an atyid from the Orinoco Basin of South America that he designated *Euatya sculptilis*, employing a generic name that is an invalid emendation of *Euatya* Smith (1871:95).

In recording the decapod crustaceans housed in the Strassburg Museums, Ortmann (1890) included a brief description of an African shrimp, proposing the name *Atya sculptata* and assigning it to “die margaritacea-Gruppe (zu der margaritacea, robusta, scabra und sculptipes [sic] gehören)” (p. 466). In a subsequent study of the geographical distribution of the family Atyidae, Ortmann (1895) placed Koelbel’s *Euatya sculptilis* and his *Atya sculptata* in the synonymy of *Atya gabonensis* and employed the subgenus *Euatya* in referring to *Atya crassa* (p. 184), thereby implying that the other members of the genus belong to the nominate subgenus. In addition, he reviewed the ranges of *A. gabonensis*, *A. crassa*, and *A. scabra*. In his account of the freshwater shrimps of South America (1897), he included a diagnosis of this species and stated that it is possible that it occurs only in the Orinoco and in Gabon. A single male specimen in the National Museum of Natural History collected by O.F. Cook at Mt. Coffee, Liberia, provides evidence that Rathbun (1900) perhaps had a specimen of *A. gabonensis* before her in preparing her account of the decapod crustaceans of West Africa; however, there was no identification accompanying the uncatalogued