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A Key to the Crabs of Liberian Freshwaters

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(With 2 figures)

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Introduction

Parasitologists working on paragonimiasis in Liberia must regularly sample freshwater crab populations, since it is these animals which serve as second intermediate hosts to *Paragonimus uterobilateralis,* a human lung fluke autochthonous to Africa. It is important, therefore, for such workers to be able to distinguish quickly and easily between the different species of crabs which they encounter. At present, only two species of Liberian crabs can be identified using the keys currently available for West Africa (BOTT, 1955, 1959; MONOD, 1977, 1980; CUMBERLIDGE, 1988). These species are *Liberonautes latidactylus* (DeMan, 1903) and *Globonautes macropus* (Rathbun, 1898) the former species being very common, the latter extremely rare.

The present work documents two species new to Liberian freshwaters: the spiny river crab *Liberonautes chaperi* (A. Milne-Edwards, 1887), and the Angolan marsh crab *Sesarma (Chiromantes) angolense* (Capello, 1864). The key presented here incorporates these two new records, and allows for the identification of the four Liberian species. The key also takes into account the revision concerning *L. chaperi* made by CUMBERLIDGE (1985).

The key is designed to be used in conjunction with the accompanying illustrations (Fig. 1 a - m, Fig. 2 n - y) to aid in locating the anatomical parts of the crab under consideration. The key also distinguishes between freshwater crabs and brackish water and land crabs found in Liberia, since the freshwater crab host of *Paragonimus (L. latidactylus)* is often found in the coastal region where these other species occur. The key allows the identification of specimens of marine, brackish water or land crabs only to the family level (either **Ocypodidae, Grapsidae** or **Gecarcinidae**), with the exception of the freshwater-living *Sesarma angolense* which is identified to species.

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Methods

The key is designed to be used to identify adult male specimens. The size of adult crabs varies according to species, so in practice this would mean selecting males in a certain size range for each species. As a rough guide, specimens should be not smaller than carapace width (CW) = 55.0 mm for *L. latidactylus*, CW = 45.0 mm for *L. chaperi*, CW = 27.0 mm for *G. macropus*, and CW = 35.0 mm for *S. angolense*. The mandibular palp and the form of the third maxillipeds have been found to be the best way to distinguish between crabs at the family level. The mandible and the gonopods should first be removed from the animal and examined under a low power microscope. The first gonopod, carapace, and the major cheliped were characters found to provide the most conclusive means of species identification. Measurements of the dimensions of the carapace, walking legs, and gonopods were taken with vernier calipers.

Identification of *Liberonautes latidactylus, L. chaperi*, and *Globonautes macropus* was made by reference to the type specimens. These specimens were examined in the British Museum (Natural History) London (BMNH), the Museum National d'Histoire Naturelle, Paris (MNHN), and the Smithsonian Institution, National Museum of Natural History, Washington, D.C. (USNM) respectively. *Sesarma (Chiromantes) angolense* (Capello, 1864) was identified using keys to the crabs of Nigeria compiled by POWELL (1983, unpublished).

Material

A combination of fresh material collected in Liberia, and preserved specimens held in museum collections, was examined in this study. Over 400 specimens of *Liberonautes latidactylus* were collected from Cape Mount, Montserrado, Margibi, Grand Bassa, Bong, Lofa, Nimba and Grand Gedeh Counties in Liberia. Other material, consisting of 56 specimens of *L. latidactylus* from Senegal, Guinea, Sierra Leone, Ivory Coast, and Ghana, held in the collections of the MBNH, MNHN, USNM, and the Institut Fondamental d'Afrique Noire (IFAN), Senegal, was also examined. Five new specimens of *L. chaperi* from Bong and Grand Gedeh Counties, Liberia, were examined together with seventeen preserved specimens of *L. chaperi* from Ghana and Ivory Coast, held in the collections of the BMNH and the MNHN. Eigtheen new specimens of *G. macropus* were collected in Bong and Cape Mount Counties of Liberia. Three specimens of *S. (C.) angolense* from Cape Mount County were kindly loaned to the authors by Dr. R. GARMS.

Systematics

The following key has been specially designed for the identification of crabs found in Liberian freshwaters. Specimens from other parts of West Africa that do not key out should be identified by reference to the keys provided by BOTT (1955, 1959) and MONOD (1977, 1980), since the freshwater crab fauna of other West African countries includes other species which are not dealt with here.

Key to the Crabs of Liberian Freshwaters

1 Third maxillipeds meet along entire length of inner margins (Fig. 2 u). Propods of walking legs (periopods 2 - 5), smooth (Fig. 1 b, j; Fig. 2 o), dactyls of walking legs toothed (Fig. 1 b, j; Fig. 2 o). Front narrow (front width one-third to one-quarter of carapace width), eyes positioned inward from anterolateral margin of carapace (Fig. 1 a, g; Fig. 2 n). Chelipeds rounded, length of movable finger less than half length of propodus (Fig. 1 f; Fig. 2 t) 2

1' Third maxillipeds do not meet completely along inner margins, leaving diamond-shaped gap between them (Fig. 2 y). Propods of walking legs (peripods 2 - 5) with dense hair on upper and lower margins (Fig. 2 w), dactyls of walking legs smooth (Fig. 2 w). Front very broad (three-quarters of carapace width), eyes positioned at anterior corners of carapace, close to anterolateral margin (Fig. 2 v). Chelipeds flat, movable finger long, more than half length of propodus (Fig. 2 x).

Found throughout coastal West Africa in freshwater rivers, creeks, and brackish water lagoons ..... *Sesarma (Chiromantes) angolense* (Fig. 2 v - y)
Angola marsh crab
Family: **Grapsidae**

2 Postfrontal crest present, extending laterally between epibranchial teeth on anterolateral margins of carapace, and separating frontal and postorbital areas from the main carapace surface; postfrontal crest either in one piece extending across whole carapace (Fig. 1 a, Fig. 2 n) or broken in places (Fig. 1 g) 4

2' No postfrontal crest; frontal and postorbital areas continuous with rest of dorsal carapace surface 3

3 Dactyls of walking legs with hairs or bristles, but no teeth. Eyestalks very long, length of eye equal to, or several times greater than, interorbital distance. Carapace rectangular.

Coastal regions, estuarine or marine intertidal zone often found on land ..... Ghost crabs, fiddler crabs
Family: **Ocypodidae**

3 Dactyls of walking legs toothed only on outer margin. Eyestalks relatively short, length of eye equal to interorbital distance. Carapace rounded.

Coastal regions, found in burrows above the high tide line, nocturnally active on land. ..... Land crabs
Family: **Gecarcinidae**

4 End segment of mandibular palp divided into two equal parts (Fig. 1 l). Flagellum of exopodite of third maxilliped reduced to very short stump (Fig. 1 k). Body thick appearance, highly arched in anterior third of cephalothorax, where carapace thickness almost half carapace width (ratio of CT/CW = 0.43) (Fig. 1 m). Anterolateral margin of carapace lacks an intermediate tooth between exorbital and epibranchial teeth (Fig. 1 g). Walking legs extremely long, length of periopod 5 (from ishium to dactylus inclusive) (Fig. 1 j) greater than carapace width. End segment of gonopod 2 extremely short, about one-tenth length of penultimate segment (ratio of length of end to penultimate segment = 1:10) (Fig. 1 i). End segment of gonopod 1 directed straight upwards (Fig. 1 h).

Found only in rain forest habitats in Liberia and Guinea. Crabs ihnabit water-filled holes in tree stumps, rock crevices, and in places wherever rain water

collects. Crabs may be encountered climbing tree trunks or walking on land. ..... *Globonautes macropus* (Fig. 1 g - m)
Tree hole crab
Family: **Gecarcinucidae**

4' End segment of mandibular palp in one piece, not divided (Fig. 2 r). Flagellum of exopodite of third maxilliped long, as long as expodite (Fig. 2 u). Body either moderately arched in anterior third of cephalothorax (carapace thickness about one third of carapace width; ratio of CT/CW = 1:0.30) (Fig. 2 s), or flattened (carapace thickness about one quarter of carapace width; ratio of CT/CW = 1:0.25) (Fig. 1 e). Anterolateral margin of carapace with intermediate tooth between exorbital and epibranchial teeth (Fig. 1 a; Fig. 2 n). Walking legs relatively short, length of periopod 5 (from ishium to dactylus inclusive) (Fig. 1 b, Fig. 2 o) equal to the carapace width. End segment of gonopod 2 extremely long, longer than penultimate segment (Fig. 1 d, Fig. 2 q). End segment of gonopod 1 directed inwards (Fig. 1 c, Fig. 2 p). 5

5 Series of pointed teeth (3 - 5) on anterolateral margin of carapace behind epibranchial tooth (Fig. 1 a). Intermediate tooth large, triangular, pointed (Fig. 1 a); epibranchial tooth large, pointed (Fig. 1 a). Movable finger of major cheliped curved, thin, enclosing wide space when closed (Fig. 1 f).

Found in forest areas of Liberia, Ivory Coast and Ghana, inhabiting fast-flowing shallow waters of major rivers (30 m wide, 2 m deep), usually where river bed is rocky ..... *Liberonautes chaperi* (Fig. 1 a - f)
Spiny river crab
Family: **Potamonautidae**

5' Anterolateral margin of carapace behind epibranchial smooth or with low serrations (Fig. 2 n). Intermediate tooth and epibranchial tooth both small, not pointed (Fig. 2 n). The movable finger of the major cheliped is broad, and encloses a long thin space when closed (Fig. 2 t).

Found in forest areas of Ghana, Ivory Coast, Liberia, Sierra Leone, Guinea, and in savanna in Mali and Senegal. In Liberia, found in creeks (2 - 10 m wide, 1 m deep) major rivers (30 m wide, 2 m deep), in burrows near water, and occasionally on land. ..... *Liberonautes latidactylus* (Fig. 2 n - u)
Creek crab
Family: **Potamonautidae**

Discussion

The two species of potamonautid crab and the single species of gecarcinucid crab found in Liberia are true freshwater crabs capable of completing their entire life cycles in freshwater. The grapsid crab, *Sesarma,* is a brackish water lagoon crab, which invades freshwaters but must return to salt water to breed.

Liberonautes latidactylus is undoubtedly the most important and most often-encountered freshwater crab in Liberia. It is this species which is commonly found infected with *P. uterobilateralis,* and this species which is regularly sold as food in rural markets (SACHS et al., 1986). *Liberonautes chaperi* and *G. macropus* also occur in, or close to, known foci of

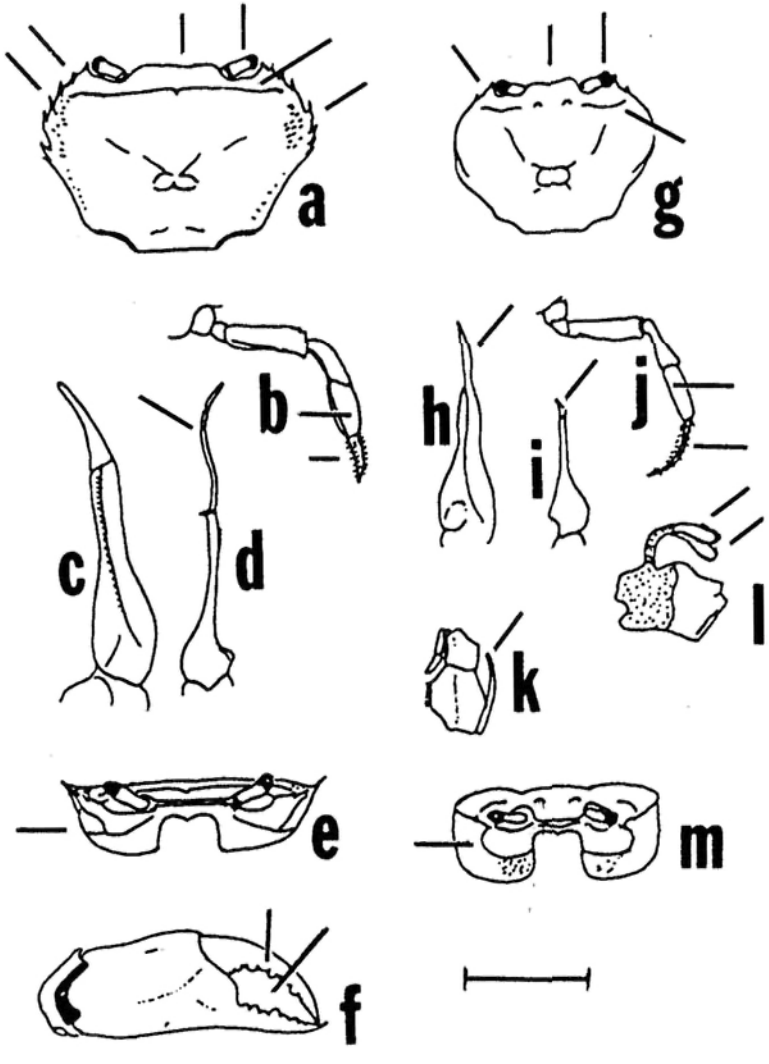

Fig. 1. *Liberonautes chaperi* (a - f). – *Globonautes macropus* (g - m).

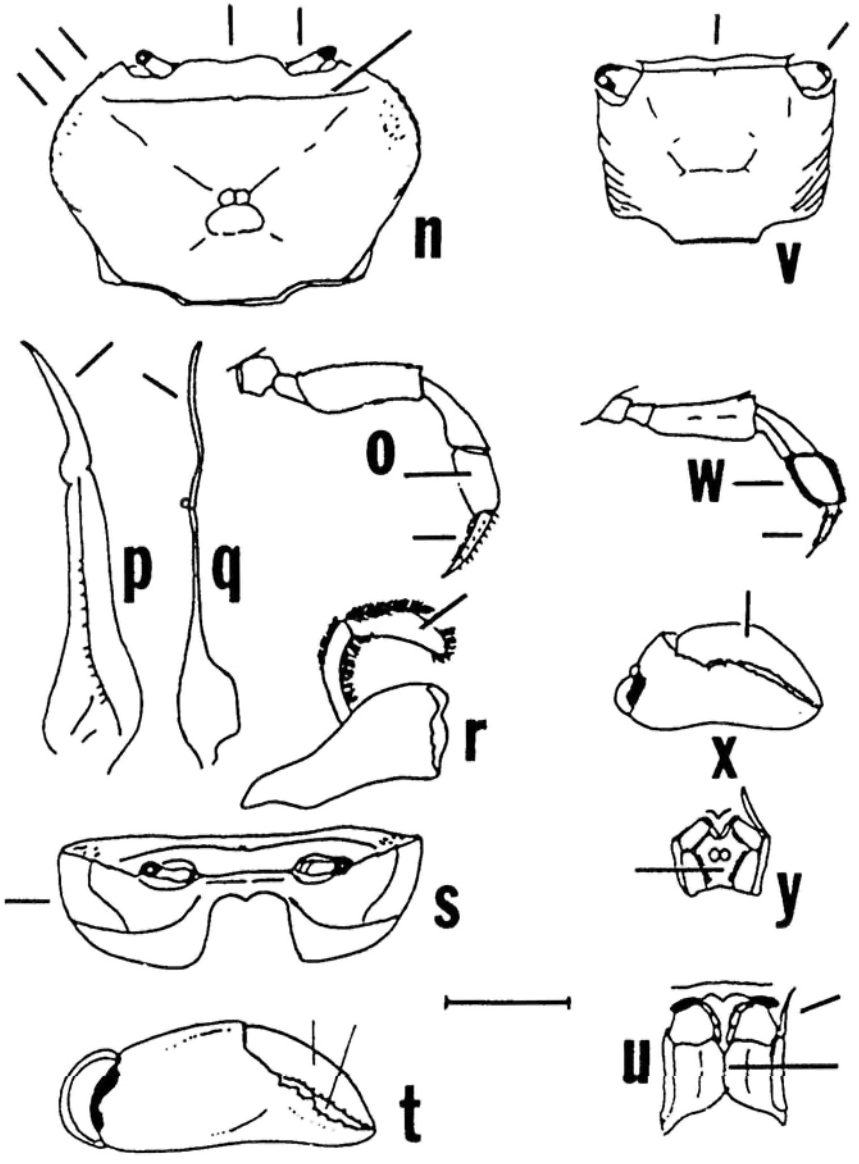

Fig. 2. *Liberonautes latidactylus* (n - u). – *Sesarma (Chiromantes) angolense* (v - y).

paragonimiasis in Liberia, but these crabs are not eaten by the local human population in the same quantities as *L. latidactylus*. Both *L. chaperi* and *G. macropus* are not yet available in sufficient numbers for parasitological examination to see whether they, too, serve as host to *P. uterobilateralis* in Liberia.

Similarly, only three specimens of *Sesarma (Chiromantes) angolense* are known from Liberian freshwaters, and no parasitological examination of this species has yet been done. Interestingly, three other species of *Sesarma* have been shown to serve as hosts to *Paragonimus ohirai* in Japan und China (YOKOGAWA et al., 1960). It remains to be seen whether *S. angolense* is a host to *P. uterobilateralis* in Africa.

The freshwater crab fauna of Liberia and the surrounding countries is still poorly known, and it is likely that further collections in the rain forests in Liberia may yet reveal the presence of other species.

Summary

An illustrated key is provided for identification of the four species of crabs, belonging to three families, which are found in Liberian freshwaters. The most common species is *Liberonautes latidactylus* **(Potamonautidae)** which is eaten in many parts of Liberia and sold in local markets. This is of public health importance since *L. latidactylus* is the second intermediate host to the African lung fluke *Paragonimus*

Right and left third maxillipeds of *Liberonautes latidactylus* (Fig. 2 u) showing inner margins of ishium and merus, and the flagellum of the exopod. Right periopod 5 showing texture of propodus and dactylus, and the relative lengths of last three segments of *L. chaperi* (Fig. 1 b), *Globonautes macropus* (Fig. 1 j), *L. latidactylus* (Fig. 2 o) and *Sesarma (Chiromantes) angolense* (Fig. 2 w). Dorsal aspect of the carapace showing details of the anterolateral margin of *L. chaperi* (Fig. 1 a), *G. macropus* (Fig. 1 g), *L. latidactylus* (Fig. 2 n) and *S. angolense* (Fig. 2 v).

Right cheliped showing dentition of *L. latidactylus* (Fig. 2 t) and *L. chaperi* (Fig. 1 f). Right and left third maxillipeds of *S. angolense* (Fig. 2 y) showing diamond shape enclosed by inner margins of ishium and merus, and flagellum of the exopod. Right mandible showing mandibular palp of *G. macropus* (Fig. 1 l) and *L. latidactylus* (Fig. 2 r). Right third maxilliped showing flagellum of exopodite of *G. macropus* (Fig. 1 k). Frontal aspect of carapace showing carapace thickness of *L. chaperi* (Fig. 1 e), *G. macropus* (Fig. 1 m) and *L. latidactylus* (Fig. 2 s). Right gonopod 2 showing form of end segment of *L. chaperi* (Fig. 1 d), *G. macropus* (Fig. 1 h) and *L. latidactylus* (Fig. 2 q). Right gonopod 1 showing form of end segment of *L. chaperi* (Fig. 1 c), *G. macropus* (Fig. 1 h) and *L. latidactylus* (Fig. 2 p).

Scale bar for Fig. 1 and Fig. 2: 20.00 mm = a, b, e, f, g, k, j, m, n, o, s, t, u, v, w x and y; 5.0 mm = c, d, h, i, l, p, q, and r.

The specimen of *L. chaperi* (Fig. a - f) illustrated is an adult male, carapace width (CW) = 45.5 mm from the Cavalla River at the sawmill at Tempo, Grand Gedeh County, Liberia; that of *G. macropus* (Fig. 1 g - m) is an adult male (CW = 29.5 mm) from the forest near Masajah Town, Bong County, Liberia; that of *L. latidactylus* (Fig. 2 n - u) is an adult male (CW = 58.5 mm) from Tempo, Grand Gedeh County, Liberia; and that of *S. angolense* (Fig. 2 v - y) is an adult male (CW = 37.5 mm) from Jenne-Liberia, Cape Mount County, Liberia.

uterobilateralis. Two species, *Liberonautes chaperi* **(Potamonautidae)** and *Sesarma (Chiromantes) angolense* are recorded from Liberia for the first time. The fourth species, *Globonautes macropus* **(Gecarcinucidae)**, is a little-known crab adapted to living a semi-terrestrial life and is found predominantly in water-filled holes in tree stumps in the tropical rain forest, away from major water sources.

Zusammenfassung

Für die in Liberia vorkommenden Süßwasserkrabben (vier Spezies aus drei Familien) wurde ein Bestimmungsschlüssel erstellt. Die am häufigsten vorkommende Spezies ist *Liberonautes latidactylus* **(Potamonautidae)**, die in vielen Gegenden Liberias als Nahrungsmittel auf örtlichen Märkten angeboten wird. Dies ist von medizinischer Bedeutung, da *L. latidactylus* der zweite Zwischenwirt für den afrikanischen Lungenegel *Paragonimus uterobilateralis* ist. Zwei Arten, *Liberonautes chaperi* **(Potamonautidae)** und *Sesarma (Chiromantes) angolense* **(Grapsidae)** wurden erstmalig in Liberia gefunden. Die vierte, *Globonautes macropus* **(Gecarcinucidae)** ist eine wenig bekannte Krabbenspezies, die an eine semiterrestrische Lebensweise adaptiert ist und vorwiegend in wasserhaltigen Höhlen alter Baumstümpfe, auch weiter entfernt von Bächen und Flüssen, im tropischen Regenwald vorkommt.

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