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A new genus and species of xanthoid crab (Decapoda: Brachyura) from offshore hard bank habitats in the Gulf of Mexico

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Abstract

Speciose populations of small xanthoid crabs on offshore banks and reefs of the northern Gulf of Mexico include a new species that is not assignable to presently named genera. Morphological diagnoses of the new genus and species are underpinned by previously published gene sequence analyses, originally misattributed to another species but now known to apply to this taxon. Herein named *Guinope tiara* **n. gen., n. sp.,** the species shows molecular phylogenetic affinities with the family Linnaeoxanthidae Števčić, 2005, an ally of panopeid and pseudorhombilid crabs. Specimens from *Occulina* banks off the Florida Atlantic coast, previously regarded to represent *Garthiope barbadensis* (Rathbun, 1921), are not that species but instead morphologically assignable to *Guinope* **n. gen.** Whether they represent variants of *Guinope tiara* **n. gen, n. sp**. or a second species of the genus awaits the collection of fresh materials for DNA analyses.

Key words: Xanthoidea, Linnaeoxanthidae, *Guinope tiara*, deep reef

Introduction

During a series of cruises undertaken over the last two decades, primarily to survey macroalgal and decapod crustacean diversity on offshore hard banks in the Gulf of Mexico, an assortment of small xanthoid crabs were collected in abundance, most of them being confusingly similar in general habitus, and representing sympatrically distributed species of the regional genera *Batodaeus* Vázquez-Bader & Gracia, 2004*, Garthiope* Guinot, 1990*, Glyptoplax* Smith, 1870*, Milnepanopeus* Thoma & Felder, 2012*, Melybia* Stimpson, 1871*, Micropanope* Stimpson, 1871*, Nanoplax* Guinot, 1967*, Panoplax* Stimpson, 1871*,* and *Scopolius* Števčić, 2011. Subsequent studies of these collections revealed one species that strongly resembled *Garthiope barbadensis* (Rathbun, 1921) in carapace shape and ornamentation, though the narrow first pleopod (= gonopod 1) appeared most similar to that of *Batodaeus urinator* (A. Milne-Edwards, 1880a). Several of these specimens were reported erroneously as *G. barbadensis* in previous studies (Thoma *et al*. 2009; Felder & Thoma 2010), preceding synoptic comparisons that later showed them to instead represent the herein described new genus and species.

Our sampling efforts on deep hard banks on the middle to outer continental shelf in the Gulf of Mexico, mostly at depths greater than 50 meters, have found this new species to occur commonly among eroded rocks and attached epibiota. While such banks were not heavily sampled prior to 2000, it is likely that this species would have occurred in at least some regional environmental surveys and impact assessments that examined these and similar habitats, especially those that preceded extensive oil and gas exploration and production in the region. Being one of several small, similarly shaped, sympatric xanthoid species in such habitats, all varying with maturity and poorly illustrated in taxonomic literature, it is not unexpected that an undescribed species could be overlooked. However, where previous reports are based upon archived materials, as in the case of Thoma *et al.* 2009, 2014; Felder & Thoma 2010; and Lai *et al.* 2011, we herewith provided characters for correction of at least some previous misidentifications.

The present study builds upon previous efforts to clarify species composition and evolutionary relationships

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of American xanthoid crabs (Thoma *et al.* 2009, 2014; Felder & Thoma 2010; Thoma & Felder 2012; Lasley *et al*. 2013). It augments previously reported molecular genetic inferences with morphological findings to justify a family assignment and provides taxonomic descriptions at the generic and species level.

Materials and methods

Material examined include holdings from the University of Louisiana at Lafayette Zoological Collection, Lafayette, LA (ULLZ) and National Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM). As the lengthy process of transferring the University of Louisiana's Lafayette Zoological (ULLZ) collections to the Smithsonian Institution's National Museum of Natural History, Washington (USNM) is currently underway, one or both catalog numbers may be used (all will be permanently cross-referenced). Specimen size (to nearest 0.1 mm) is reported as carapace width (cw), measured at the widest point including anterolateral teeth. Where shown, meters (m) indicate collection depths. GenBank accession numbers are as previously published by Thoma *et al*. (2009, 2014), with the addition of equivalent USNM catalog numbers shown for the archived source specimens of extracted tissues.

Taxonomy

Superfamily Xanthoidea MacLeay, 1838

Family Linnaeoxanthidae Ševčić, 2005

Guinope n. gen.

Type species. *Guinope tiara* **n. sp.**

Diagnosis. Carapace broader than long, weakly convex, regions poorly defined by shallow grooves, surface granulate, granules increasing in size and density anteriorly in each region; frontal margin bilobed, slightly thickened by dense granules, median fissure distinct; anterolateral teeth moderately-well developed, arrayed in arc, first and second fused, nearly obsolete, giving appearance of three teeth, third and fourth acute to subacute with third directed anteriorly to anteromedially, fourth directed anteriorly to anterolaterally, fifth tooth reduced to small acute process. Chelipeds densely granulate on superior and extensor surfaces, carpus with superoflexor margin having two distinct acute to subacute processes, largest near distal margin, apex directed dorsally. Pereopods two through five (walking legs) with merus extensor margin bearing distinct row of distally-directed, subacute, triangular teeth, strongest distal. Male pleon anteriorly elongate, reaching beyond first pereopod condyle; second somite width subequal to that of first, obscuring seventh sternite except for, at most, small sliver to either side; third through fifth fused, sutures visible externally only as small notches laterally; telson rounded. Male first pleopod (gonopod) long, sinuous, reaching beyond anterior end of median sternal groove in pleonal depression, visible to either side of flexed pleon distally, apex narrowly spatulate. Male second pleopod one-third or less length of first.

Etymology. The generic name *Guinope* honors our greatly admired colleague, Danièle Guinot, for her extensive contributions to studies of xanthoid and other brachyuran crabs over a very distinguished career.

Assigned species. *Guinope tiara* **n. gen., n. sp.** (monotypic)

Remarks. Previous molecular genetic analyses showed that the species now assigned to *Guinope* **n. gen.** shared little phylogenetic affinity with other xanthoid genera, though it did appear closely related to *Melybia thalamita* (Stimpson, 1871) in a clade sister to panopeids and pseudorhombilids (Thoma *et al*. 2014). Analyses based on three mitochondrial markers, 12S rDNA, 16S rDNA, and cytochrome oxidase I (COI), along with three nuclear markers, 18S rDNA, enolase (ENO) and histone H3 (H3) recovered *Guinope tiara* **n. gen., n. sp.** (then under "Gen. nov., sp. nov. near *Garthiope barbadensis"*) as sister to *Melybia thalamita* in a clade proposed to represent Linnaeoxanthidae Ševčić, 2005. This clade (i.e., now *Guinope tiara* **n. gen., n. sp.** + *Melybia thalamita*) was in turn sister to a clade comprised of Panopeidae Ortmann, 1893 and Pseudorhombilidae Alcock, 1900 (Thoma *et al.* 2014), though without

these molecular phylogenetic analyses having included the Indo-West Pacific type species of the family, *Linnaeoxantho acanthomerus* (Rathbun, 1911) (see Mendoza *et al.* 2012; Thoma *et al.* 2014). Morphologically, *Guinope* **n. gen.** shares few of the diagnostic features proposed by Mendoza *et al.* (2012) to join the linnaeoxanthid genera *Linnaeoxantho* and *Melybia*, and differs from them in lacking any evidence of a ventrodistally directed spine on the posterior (inferoventral) margin of any ambulatory pereopod. For the present, we regard its assignment to the family Linnaeoxanthidae as provisional, pending molecular genetic analyses that include the type of the family.

In a previous study of the group, focused on Old World xanthoids, analyses inferred from four loci (12S, 16S, COI, and H3) recovered a similar arrangement with *Guinope tiara* **n. gen., n. sp.** (therein "new genus nr. *Garthiope"*) as sister to a clade comprised of taxa now considered to represent the families Panopeidae and Pseudorhombilidae (Lai *et al*. 2011, fig. 1). While support for this arrangement was poor (BS 56 / pP 62), it must be noted that *Guinope tiara* **n. gen., n. sp.** was represented by only two (12S and 16S rDNA) of the four genes applied to most other species in this particular analysis.

In earlier analyses of the group, the relationship between *Guinope tiara* **n. gen., n sp**. and other representatives of Xanthoidea varied by loci, with analyses of 12S and 16S rDNA inferring somewhat different relationships. In analysis of 16S rDNA, *Guinope tiara* **n. gen., n. sp.** (therein as "*Garthiope barbadensis"*) was recovered as sister to a poorly supported clade (BS < 50/ pP 68) comprised of *Glyptoplax smithii* A. Milne-Edwards, 1880b and *Eucratopsis crassimanus* (Dana, 1851) (Thoma *et al*. 2009, fig. 1). In the same study, analyses of 12S rDNA recovered *Guinope tiara* **n. gen., n. sp.** (again as "*Garthiope barbadensis"*) near the root as sister to all other xanthoids + pilumnoids, but support values for this arrangement were generally poor as well (BS < 50 / pP <50) (Thoma *et al*. 2009, fig. 2). While not recognized at the time (nor in Felder & Thoma 2010), that analysis did include *Garthiope spinipes* (A. Milne-Edwards, 1880), type species of its genus, albeit as a juvenile originally misidentified as *Batodaeus urinator*. In the analyses of Thoma *et al.* (2014), labeling the type-species of *Garthiope* was corrected, showing that genus to be well separated from the clade herein assigned to the *Guinope* **n. gen.**

Although phylogenetic relationships *Guinope tiara* **n. gen., n. sp.** to other xanthoids remain somewhat unresolved, molecular genetic analyses unambiguously show that *Guinope tiara* **n. gen., n. sp.** is part of the superfamily Xanthoidea and that it has affinities to both panopeids and pseudorhombilids. While current analyses indicate that *Guinope tiara* **n. gen., n. sp.** is more closely related to *Melybia thalamita* than to any other genetically compared xanthoid, it clearly represents a separate genus from *Melybia*, both as inferred from molecular phylogenetic analyses and as readily evident in morphology. *Guinope* **n. gen.** shares with *Melybia* a generally quadridentate anterolateral carapace margin, but the overall carapace shape and marginal tooth development, proportions of the chelipeds, and armor of the pereopods is not similar in the two genera. Further morphological comparisons of the sympatric species representing these two monotypic genera are undertaken under Remarks following the description of *Guinope tiara* **n. gen. n. sp.** that follows.

Guinope tiara **n. gen., n. sp.**

(Figs. 1A–M; 2A–D)

Garthiope barbadensis, Thoma *et al*. 2009: tab. 2, figs 1 & 2, 563. Not *Garthiope barbadensis* (Rathbun, 1921).
"Gen. nov., sp. nov. near *Garthiope barbadensis"*, Thoma *et al*. 2014: 90, tab. 1.
"nov. gen. nov. sp. near *Garthiope barbadensis*", Thoma *et al.* 2014: fig. 1, 92.
"New genus nr. *Garthiope"*, Lai *et al.* 2011: tab. 1, fig. 1, 421, 422, 432, 442.

Type material. Northern Gulf of Mexico: Holotype: male, cw 4.2 mm, Sackett Bank, Louisiana, 28° 37.81′ N, 89° 33.32′ W, 63–65 m, 28 June 2006, USNM 1577453 (= ULLZ 8183, part, genetic voucher). Paratypes: 2 males, cw 3.4, 3.6 mm, 1 ovigerous female, cw 3.9 mm, Sackett Bank, Louisiana, 28° 37.81′ N, 89° 33.32′ W, 63–65 m, 28 June 2006, USNM 1543543 (= ULLZ 8183, part, photograph voucher); 1 male, cw 2.2 mm, 3 females, cw 2.6, 3.2, 3.4 mm, Sackett Bank, Louisiana, 28° 37.81′ N, 89° 33.32′ W, 63–65 m, 28 June 2006, USNM 1543552 (= ULLZ 8210); 1 male, cw 4.2 mm, 1 female, cw 4.0 mm, Sackett Bank, Louisiana, 28° 37.89′ N, 89° 33.27′ W, 63–68 m, 28 June 2006, USNM 1577531 (= ULLZ 18299); 1 ovigerous female, cw 4.0 mm, Sackett Bank, Louisiana, 28° 38.033′ N, 89° 33.387′ W, 61–71 m, 7 September 2014, USNM 1549376 (= ULLZ 16150, photograph voucher); 3 males, cw 2.8, 3.7, 4.0 mm, 1 female 3.2 mm, Sackett Bank, Louisiana, 28° 38.125′ N, 89° 33.478′ W, 60–61 m, 2 December 2010, USNM 1547191 (= ULLZ 13760); 1 ovigerous female, cw 4.5 mm, Sackett Bank, Louisiana,

28° 38.047′ N; 89° 35.826′ W, 58–80 m, 24 August 2012, USNM 1547740 (= ULLZ 14552, photograph voucher); 1 male, cw 6.9 mm, off Alabama, 29° 24.43′ N, 87° 58.63′ W, 72-74 m, 29 June 2006, USNM 1543895 (= ULLZ 8581, photograph voucher); 1 male, cw 3.3 mm, 1 female, cw 2.8 mm, off Alabama, 29° 19.57′ N, 87° 46.29′ W, 96–106 m, 30 June 2006, USNM 1543550 (= ULLZ 8208); 6 males, cw 3.1–3.8 mm, 5 females (1 ovigerous), cw 2.3–5.8 mm, off Alabama, 29° 24.61′ N, 87° 58.62′ W, 71–73 m, 29 June 2006, USNM 1543544 (= ULLZ 8191); 1 male, cw 5.0 mm, off Alabama, 29° 24.61′ N, 87° 58.62′ W, 71–73 m, 29 June 2006, USNM 1547121 (= ULLZ 13266 genetic voucher); 1 male, cw 3.7 mm, 2 females, cw 5.6, 5.8 mm, off Alabama, 29° 24.43′ N, 87° 58.63′ W, 72–74 m, 29 June 2006, USNM 1543849 (= ULLZ 8173, photograph voucher); 4 males, cw 3.1, 3.8, 4.4, 4.9 mm, 1 female, cw 5.1 mm, off Alabama, 29° 24.43′ N, 87° 58.63′ W, 72–74 m, 29 June 2006, USNM 1543542 (= ULLZ 8170, genetic voucher); 2 males, cw 4.3, 5.2 mm, 3 females, cw 5.9, 3.7, 3.4 mm, off Mississippi-Alabama border, 29° 15.68′ N, 88° 20.24′ W, 78–86 m, 27 August 2011, USNM 1547899 (= ULLZ 14614). **Northwestern Gulf of Mexico:** 2 males, cw 5.6, 7.0 mm, off Louisiana, "The Halo" WW II shipwreck, 28° 42.01′ N, 90° 08′ W, 143 m, 14 August 2004, USNM 1547695 (= ULLZ 14505); 1 male, cw 4.8 mm, off Louisiana, Ewing Bank, 28° 05.011′ N, 90° 58.646′ W, 79–82 m, 5 December 2010, USNM 1547058 (= ULLZ 13237); 1 male, cw 4.8 mm, Ewing Bank, 28° 05.029′ N, 90° 58.656′ W, 78–83 m, 5 December 2010, USNM 1547060 (= ULLZ 13242); 1 male, cw 3.7 mm, 1 female, cw 4.0 mm, Fishnet Bank, TAMU submersible dive 74-G-10, 28° 09′ N, 91° 49′ W, 21 June 1974, USNM 1538101 (= ULLZ 12242); 1 male, cw 3.5 mm, West Flower Garden Banks, diver collection 48 m, 7 May 1972, USNM 1538099 (= ULLZ 12233); 1 male, cw 4.9 mm, off Louisiana, 28° 05.009′ N, 91° 09.393′ W, 109–110 m, 24 August 2008, USNM 1538097 (= ULLZ 11911); 1 male, cw 3.2 mm, Mysterious Bank, Texas, R/V Falkor ROV, 26° 46′ N, 96° 42′ W, 26 November 2012, USNM 1547880 (= ULLZ 14592); 1 male, cw 3.6 mm, 1 ovigerous female, cw 4.4 mm, Mysterious Bank, Texas, R/V Falkor ROV, 26° 46′ N, 96° 42′ W, 27 September 2012, USNM 1548935 (= ULLZ 15560); 2 males, cw 3.7, 2.3 mm, 3 females (2 ovigerous), cw 4.5, 4.8, 2.8, 4 unsexed tentatively identified juveniles, cw 1.6–1.9 mm, Aransas Bank, Texas, R/V Falkor ROV, 27° 36′ N, 96° 27′ W, 21 September 2012, USNM 1547711 (= ULLZ 14581, photograph voucher); 3 males, cw 3.2, 3.5, 4.4 mm, 1 ovigerous female, cw 4.3 mm, Aransas Bank, Texas, R/V Falkor ROV, 27° 03′ N, 96° 43′ W, 21 September 2013, USNM 1547888 (= ULLZ 14602); 1 unsexed damaged, cw 3.4 mm, Dream Bank, Texas, R/V Falkor ROV, 27° 03′ N, 96° 43′ W, 23 September 2012, USNM 1547891 (= ULLZ 14605).

Diagnosis. Carapace wider than long (length near 2/3 width), dorsal surface weakly convex, regions poorly-defined, granulate, size and density of granules increasing anteriorly in each region; frontal margin bilobed, median fissure distinct; anterolateral teeth arrayed in arc, first and second often fused, appearing as weakly spiniform lobes to nearly obsolete, third and fourth acute to subacute, third directed anteriorly to anteromedially, fourth directed anteriorly to anterolaterally, fifth at most a denticle or subacute process. Chelipeds densely granulate on superior and extensor surfaces, carpus superoflexor margin with two distinct acute to subacute processes, largest distal, apex directed dorsally. Pereopods two through five (walking legs) with merus superior margin bearing distinct row of small distally directed, triangular teeth, strongest distal. Male pleon anteriorly elongate, reaching beyond first pereopod condyle; second somite width subequal to that of first, seventh sternite obscured or at most visible as small sliver to either side; third segment proximo-lateral extremities broadly subtriangular, unevenly rounded, slightly overreaching fifth pereopod coxa proximally; third through fifth fused, sutures visible externally only as small notches laterally; sixth segment slightly broader than long; telson rounded. Male first pleopod (gonopod 1) long, sinuous, reaching beyond anterior end of median sternal groove, visible to either side of pleon distally, apex narrowly spatulate. Male second pleopod less than one-third length of first. Applicable GenBank sequence accession numbers for USNM 1543542 (= ULLZ 8170) and USNM 1577463 holotype (= ULLZ 8183, part) are as follow: (16s) EU863367, EU863366; (12s) EU863301, EU863300.

Description. Carapace (Fig. 1A) weakly convex, distinctly wider than long, dorsal regions poorly-defined by shallow grooves, surface sparsely granulate, granules increasing in size and density anteriorly, most dense in hepatic and frontal regions, occasionally forming weak rows or carinae; frontal margin bilobed, downturned, slightly thickened by dense granules, median fissure distinct, lobes broadly convex, antennal sinus shallow, distinct; supraorbital margin granulate, median fissure small, indistinct, lateral fissure obsolete, or nearly so. Pterygostomial and subhepatic regions (Fig. 1B) granulate, granules small; pterygostomial ridge reduced, present as slightly raised line of granules. Branchiostegite below anterolateral teeth with ventral margin nearly straight above coxa of each walking leg, at most slightly cuspate. Second and third pleurites with full width narrowly visible below ventral margin of branchiostegite above pereopod coxae, anterolateral margin of fourth pleurite occasionally visible as small wedge-

like prominence. Anterolateral teeth moderately developed, first and second teeth weak to obsolete, often reduced to spinous prominences; third and fourth teeth (appearing as second and third, respectively, given obsolescence to fusion of preceding and counting outer orbital angle as first) anterolaterally directed, typically ending in acute spiniform process distally, third largest; fifth tooth typically small, nearly obsolete, acute to subacute. Eyestalk with distinct raised, coarsely granulate anterior crest.

Third maxilliped (Fig. 1B–D) protopod subcuneate, narrowing laterally, bearing small subtriangular projection proximomesially, external surface with slight notch or groove near distomesial margin, patch of medium length simple setae distolaterally, continuing slightly onto epipod, distal surface deeply grooved to accept ventral edge of carapace, internal surface with two unequal projections on distal margin. Epipod strongly curved posteroventrally near one-third length, distally fringed with long simple setae; podobranch gill typically small, short, lamellae limited to tight terminal bundle (not shown). Endopod basis subtriangular, basis suture with ischium nearly fused, indistinct; ischium broadly subrectangular, proximal portion deflected laterally, external surface with few sparse granules near distomesial corner, mesial margin with irregular fringe of short to medium length simple setae, continued for short distance on internal surface, subtriangular uncalcified region at articulation with merus; merus subquadrate, lateral margin concave, distal margin with indentation mesially, distomesial corner excavated to accommodate carpus, external surface with several large coarse granules near distal and distomesial margins, internal surface deeply excavate to accept endopod of second maxilliped, excavation with fringe of short simple setae, internal surface with raised ridge of setae near mesial margin proximal to articulation with carpus, distomesial uncalcified region at articulation with carpus, mesial margin with sparse fringe of medium length simple setae; carpus appearing subcylindrical externally, subobovate internally, external surface granulate especially near extensor margin, internal surface with fringe of medium-long stout simple setae on distal margin; propodus cylindrical, internal surface with short row of medium-length stout simple setae near midlength; dactylus subcylindrical, tapering distally, nearly twice as long as propodus, flexor margin with short fringe of medium-length stout simple setae proximally, extending about half dactylus length, tip bearing dense tuft of long stout simple setae. Exopod sublanceolate, nearly linear, slightly tapering distally, internal surface mesial margin produced, forming subtriangular projection in distal third, projection fringed with several short to medium length simple setae, external surface mesial margin subtly crenulate, lateral margin with sparse fringe of very short simple setae in proximal one-half, internal surface with short irregular row of short to medium-length setae near mesial margin in proximal one-half; flagellum recurved, multi-articulate distally, bearing numerous long, simple setae.

Chelipeds (first pereopods) (Fig. 1E–G) moderately unequal, sparsely setose, dense broad field of subacute granules covering superior and extensor surfaces, occasionally forming one or more ridges on superior surface of carpus and propodus, especially on major chela; merus superolateral margins with large, broad, subacute, spines, flexor surface granulate, granules larger, sharper near superior and inferior margins, proximo-inferior margin typically fringed with short plumose setae, extensor surface densely granulate, granules decreasing in size and density from superior to inferior margins; carpus densely granulate with broad, subacute granules, strong distal subacute, spiniform, tooth on flexor side of superior surface, two smaller teeth proximally, superior and extensor surfaces with few sparse plumose setae, superodistal margin often with distinct fringe of plumose setae; propodus superior and supero-external surfaces densely granulate with few sparse simple setae, granules broad, subacute, superior surface occasionally with distinct longitudinal groove, flexor surface of palm smooth to micropunctate, distal margin near gape with fringe of small distinct teeth; fixed finger of major chelae short, stout, smooth on both flexor and extensor surface, extensor surface often with two shallow grooves, inferior margin weakly sinuous deflected gently downwards, apex distinctly curved upwards, opposable margin bearing two to three prominent teeth, often with several smaller teeth between, teeth occasionally worn to low rounded lobes; fixed finger of minor chela noticeably longer and more slender than that of major, opposable margin forming slender cutting edge, often with several small teeth proximally, occasionally worn to appear like two distinct platforms or steps; dactylus of major chela curved, slightly longer than fixed finger, superior surface with shallow, longitudinal groove on external side of superior midline, groove widest and deepest proximally, several medium length simple setae on proximal half, cutting edge armed proximally with two large subtriangular teeth, single triangular tooth near mid-length, and numerous small, variably rounded teeth along distal cutting edge, tip strongly curved downwards, forming coniform tooth; dactylus of minor chela curved, longer than fixed finger, superior ridge granulate, granules strongest proximally, shallow narrow groove on external side of superior midline, groove much deeper and broader than on the major chela, cutting edge dentition much weaker than in major chela, appearing as thin, weakly crenulate margin, tip strongly curved downwards to form sharp, coniform tooth.

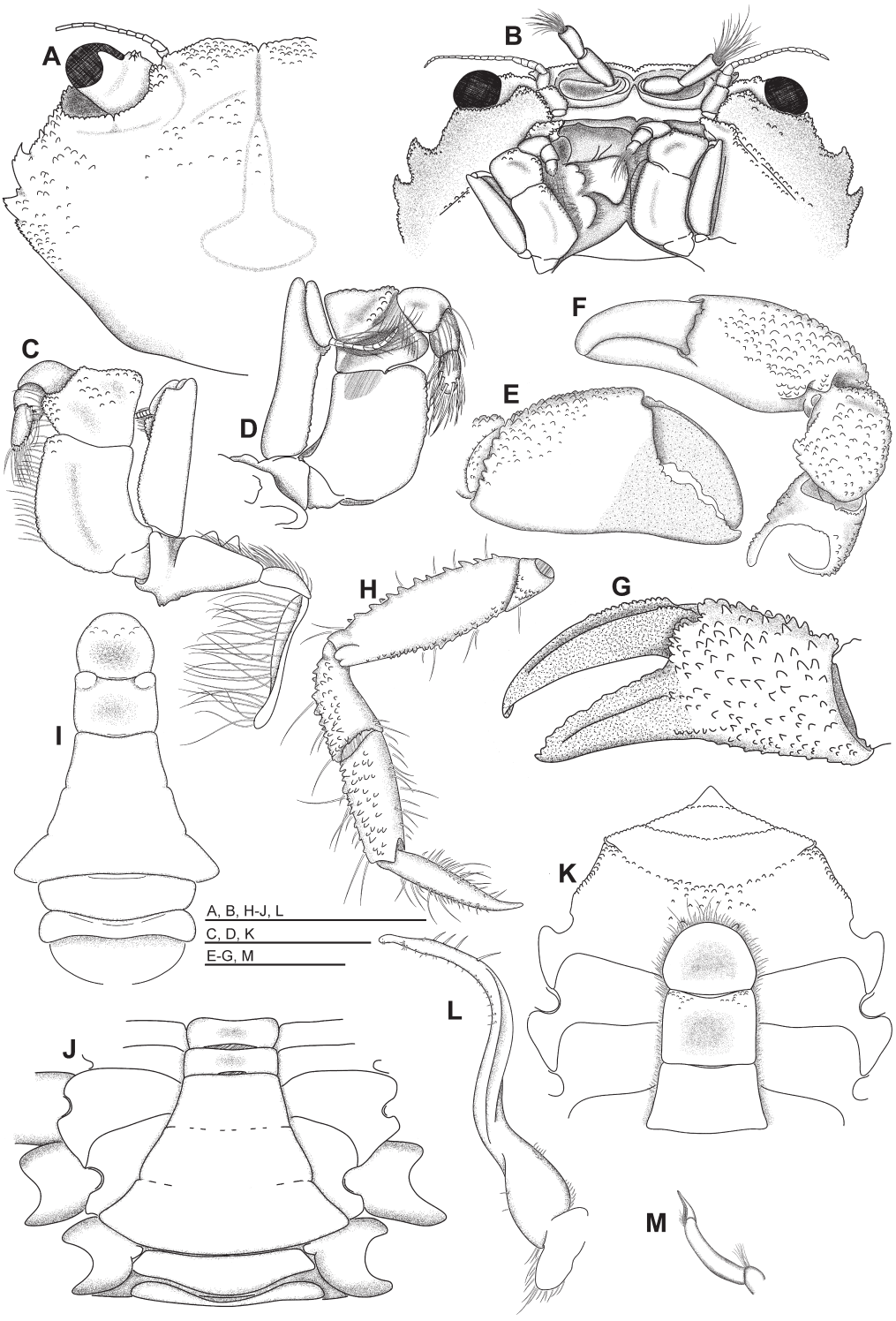

FIGURE 1. *Guinope tiara* **n. gen., n. sp.** A–F, H, J, L, M = male holotype, cw 4.2 mm, northern Gulf of Mexico, Sackett Bank, Louisiana, 28° 37.81′ N, 89° 33.32′ W, 63–65 m, 28 June 2006, USNM 1577463 (= ULLZ 8183, part); G, I, K = male paratype, cw 5.2 mm, northern Gulf of Mexico, 120 km south of Mississippi-Alabama state border, 29° 15.68’ N, 88° 20.24’ W, 78–86 m, 27 August 2011, USNM 1547899 (= ULLZ 14614): A, carapace, left half only; B, buccal region; C, left third maxilliped, external surface; D, left third maxilliped, internal surface, E, right (major) chela, extensor surface; F, right (major) cheliped, superior surface; G, left (minor) chela, extensor surface; H, right second pereopod, anterior surface; I, pleon, external surface; J, posterior sternum overlain by flexed pleon, postero-ventral surface; K, anterior sternum overlain by flexed pleon, ventral surface; L, right first gonopod, pleonal-mesial surface; M, right second gonopod, lateral surface. Scale bars A, B, E–I = 2.0 mm; C, D, J, L, M = 1.0 mm; K = 0.4 mm.

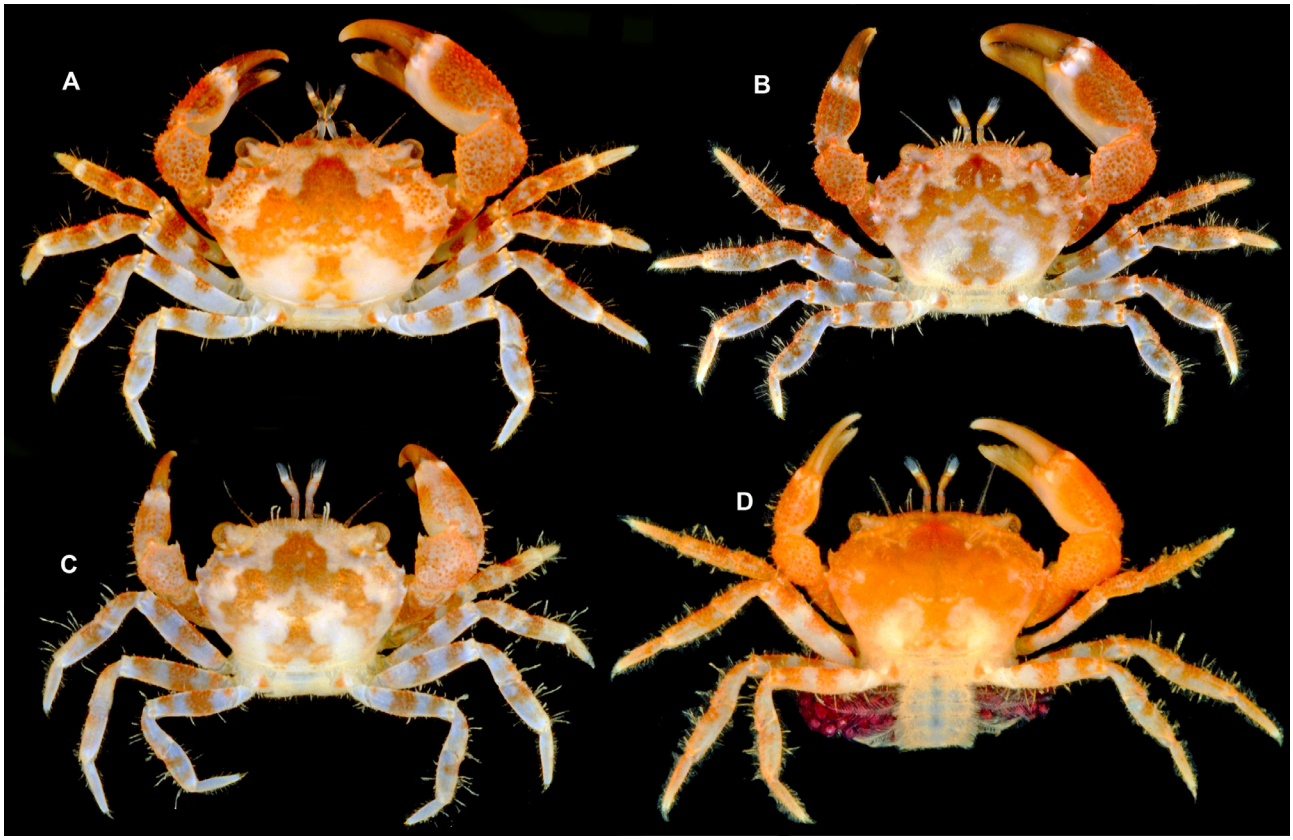

FIGURE. 2. *Guinope tiara* **n. gen., n. sp**., color variants, northern Gulf of Mexico: A, female, cw 5.8 mm (USNM 1543849 = ULLZ 8173); B, male, cw 6.9 mm, USNM 1543895 (= ULLZ 8581); C, male, cw 3.7 mm, USNM 1543849 (= ULLZ 8173); D, ovigerous female, cw 4.5 mm, Sackett Bank, Louisiana, USNM 1547740 (= ULLZ 14552).

Pereopods two through five (walking legs) generally similar in form (Fig. 1H), pereopods two through four subequal, fifth smallest; ischium extensor margin about one-half length of flexor margin; merus length slightly less than three times width at widest point, extensor margin bearing single longitudinal row of irregular acute teeth along with four or five long sparsely-plumose setae, excavate subdistally by smooth transverse depression or groove, disto-extensor margin curved upwards appearing as large distal subacute tooth, flexor margin granulate in proximal three-fourths with several simple setae, longest proximal; carpus strongly bent in flexor plane at near right angle, extensor margin densely granulate appearing as several irregular rows of subacute granules, creating elongate sulcus near extensor margin on posterior surface; propodus extensor margin granulate, granules subacute, with several plumose or simple setae, granules continued onto posterior surface above midline, flexor margin with irregular fringe of mixed short stout setae and long thin setae; dactylar-propodal locking mechanism not developed; dactylus subcylindrial, tapering distally, flexor and extensor margins with short dense pubescence intermixed with long simple setae, corneous tip falciform, lacking subterminal, calcareous, raptorial tooth.

Thoracic sternum of male (Fig. 1J–K) narrow, anteriorly projected, length from apex to suture of fourth and fifth sternites (measured at the edge of the pleon) 0.57–0.61 times greatest width of fourth sternite (including episternites); pleonal depression of fourth sternite shallowly concave near midline, just anterior to median sternal groove; fourth through sixth episternites acutely angled posteriorly; seventh episternite broad, round; eighth sternite not visible between lateral margin of flexed second pleonal somite and fifth pereopod condyle; press-button just posterior to suture of third to fourth sternite.

Pleon of male (Fig. 1I–K) with third through fifth somites fused; first somite lateral margins rounded, widest at articulation with carapace, narrowest at articulation with second somite; second somite narrowest proximally, widest distally near articulation with somite three; third somite widest at lateral flange; fused third through fifth somites narrowing distally, width at articulation with sixth somite half or less that at articulation with second somite, sutures between fused somites evident only as slight indentations on lateral margins; sixth somite lateral margins nearly parallel at most slightly convex proximally, swelling slightly near articulation with telson to accept press-button in-

ternally; telson terminally rounded, widest near mid-length, distolateral margins slightly excavate to accommodate first gonopod. Pleon of female with first somite narrowing distally, widest at articulation with carapace, second somite with margins nearly parallel, slightly expanded distally; fourth somite widest, lateral margins rounded; fourth through sixth somites each tapering to articulation with the next, narrowest point at the articulation between sixth somite and telson; telson subtriangularly rounded.

Male first gonopod (first pleopod) (Fig. 1L) long, sinuous, reaching beyond sternal groove, tips exposed to either side of telson when abdomen flexed in mature; terminal apparatus superficially simple, appearing spatulate with sub-apical microspinulous spines. Male second gonopod (second pleopod) (Fig. 1M) less than one-third length of first gonopod. Female mature gonopore broadly rounded medially, occupying more than half of anterior to posterior transverse width of sixth sternite, largely filled by rounded operculum attached laterally along slightly raised elongate lip, narrow opening to medial side strongly crescentic.

Color. Primarily orange to dark orange or reddish brown patterned over whitish to very light orange background, carapace dorsally with broad intricately margined band of orange arched anteriorly from each branchial region, broadest and usually darkest medially where joined over gastric region, arch forming pattern like front of crown or tiara, usually with somewhat lighter medial extension posteriorly to cardiac region, bifurcated from intestinal region to posterior margin of carapace (Fig. 2A–D). Chelipeds dorsally orange, often darkest on ridges and tubercles, palms with light whitish bands distally, as well as on inner and ventral surfaces, fingers light to dark brown. Walking leg articles with broken bands of orange on whitish background, bands most obvious as orange patches on superior surfaces, usually with three such patches on meri, most proximal of which is smallest and often very diffuse to obsolete. Eggs on ovigerous females reddish magenta.

Habitat. Abundant on offshore reefs and banks, especially in small cavities and interstices of eroded hard substrates as well as among sponges, bryozoans, corals, encrusting algae, and other epibiota of fouling communities. Confirmed depth records range from 58–143 m; some additional collections are from within sponges taken at depths estimated to be 200–300 m (Aransas Bank, TX).

Size. The carapace ranges to a maximum of cw 7.0 mm, determined for the largest male among available collections. Juveniles of neither sex were definitively identifiable at less than cw 2.0 mm, though collections included some specimens of cw 1.6 mm that appear to represent the species. The smallest examined ovigerous female was cw 3.9 mm.

Distribution. Middle to outer continental shelf waters of the northeastern to northwestern Gulf of Mexico.

Etymology. The name "tiara" alludes to the reddish pattern that typically spans the dorsal carapace, the shape of which suggests the elevated front of a tiara or crown.

Remarks. While it is at first glance easy to mistake fresh specimens of *Guinope tiara* **n. gen, n. sp.** for *Garthiope barbadensis*, the distinctive dorsal color pattern on the carapace in both sexes and the occurrence of ovigerous females at rather small sizes bearing clutches of bright reddish magenta eggs usually facilitate recognition, even before microscopic examination of the very diagnostic first gonopods. Among small regional xanthoid crabs, a similar dorsal color pattern is found only in some specimens of *Scopolius nuttingii* (Rathbun, 1898), though it is in that case usually less ornately defined.

Lacking knowledge of gene sequences, live coloration, or fine sculpture of mature male first gonopods, identification of *Guinope tiara* **n. gen., n. sp.** can be based upon other features in morphology, even though some characters for separations are difficult to quantify. Among other small, regionally distributed xanthoids that occur sympatrically with *Guinope tiara* **n. gen., n. sp.**, the only (albeit provisionally assigned) confamilial) *Melybia thalamita* might be expected to resemble *G. tiara* **n. gen., n. sp**., but it is instead among the least likely to be confused with it. *Melybia thalamita* is immediately separated by its having the merus of pereopod 2 and 3 armed by a unique ventrodistally directed spine on the distal ¼ of the inferior margin, by the third maxilliped merus bearing a uniquely produced lobe on its anterolateral corner, and by strong differences in the carapacial outline (Rathbun 1930; Williams 1984; Mendoza *et al.* 2012). *Melybia* also has a relatively broader fronto-orbital margin, relatively longer posterolateral margin, and much stronger development of its two largest anterolateral teeth into elongate hooked spines than in *Guinope* **n. gen.** In addition, the chelipeds in *Melybia* differ from those of *Guinope* **n. gen**. in being far more elongate and more heavily armed by elongate spines, with a much more elongate palm that itself bears a distinct row of enlarged spines along its superior margin, and otherwise has uniquely elongate spines arming the anterior (superoflexor) margin of the merus and inner (supero-internal) corner of the carpus. This markedly differs from the chelipeds in *Guinope* **n. gen**., which are much more typical of those in panopeid crabs.

Guinope tiara **n. gen., n. sp.** can in turn be distinguished from *Glyptoplax smithii*, *Milnepanopeus lobipes* (A. Milne-Edwards, 1880), *Panoplax depressa* Stimpson, 1871, and *Scopolius nuttingii,* and ?*Micropanope pusilla* A. Milne-Edwards, 1880 (the latter a questionable generic assignment) by its having superior margins on the meri of the walking legs armed by a defined row of well separated short but erect, distally directed, sometimes weakly hooked, spinules (as is also the case in *Batodaeus*, *Garthiope*, the remaining species of *Micropanope*, *and Nanoplax*), instead of having margins that are weakly tuberculate, smooth, granulate, or microdenticulate (see Rathbun 1930; Guinot 1967, 1990; Williams 1984; Lemaitre 1984; Vázquez-Bader & Gracia, 2004, Thoma & Felder 2012). *Guinope tiara* **n. gen., n. sp.** can be separated from all the remaining, other than *Micropanope lobifrons* A. Milne-Edwards, 1880 and *Micropanope sculptipes* Stimpson, 1871, by having the posteriomost anterolateral tooth of the carapace obsolescent, its being evident as a dimunitive blunt angle, tubercle, spinule, or acute granule. The anterolateral margin thus appears to have either 3 or 4 anterolateral teeth (counting the orbital angle), and 4 only if the second tooth remains distinguishable (countable) as at least a small denticle or tubercle. The others, including *Batodaeus urinator*, *Garthiope barbadensis*, *G. spinipes*, *Micropanope truncatifrons* (Rathbun, 1898), *Milnepanopeus lobipes*, *Nanoplax xanthiformis* (A. Milne-Edwards, 1880), and *Panoplax depressa,* all have the positional fifth anterolateral tooth of the carapace small but more strongly developed than in *Guinope tiara* n. **gen., n. sp.**, its sometimes being dentiform or spine-tipped. The margin thus overall appears to have 4 or 5 well-developed anterolateral teeth counting the outer orbital angle, 4 only if the second is indistinguishably fused into a broad lobe with the first or if the positional second tooth is replaced by development of several short spines. Among these, only *Garthiope barbadensis* and *G. spinipes* have their anterolateral teeth arranged in an arc relatively similar to those in *Guinope tiara* **n. gen, n. sp**., whereby the rounded anterolateral margins conform closely to the ovoid outlines of the broad carapace.

Given the challenges of its morphological distinction, and thus suspecting that this relatively common new species could have been previously misreported as *Garthiope barbadensis*, we reviewed the scant regional reports of the latter species in the course of building our synonymy. At one point, we envisioned our synonymy for *Guinope tiara* **n. sp.** should include references to specimens reported as *Micropanope barbadensis* s.l. in studies of larval life history by Gore *et al*. (1981: 28–50, tab.1, figs 1–9) and in ecological studies by Reed *et al.* (1982: 761–786, tab. 2, fig. 7). In both cases, the specimens originated from deep (80 m) habitats on *Occulina* banks accessed off the Atlantic coast of Florida by submarine lock-out divers, with the species being found only at the deepest of several sampled sites. Prior to first-hand study of specimens reported from that site, the record was included in the distribution that Felder *et al*. (2009: 1084) reported for *Garthiope barbadensis.*

Vouchers identified as *Micropanope barbadensis* during the aforementioned *Occulina* bank studies were located and examined at the Harbor Branch Oceanographic Institution (HBOI) collection, an administrative unit of Florida Atlantic University's Fort Pierce campus. Without question, they do not represent *Garthiope barbadensis*, but instead conform closely to our morphological diagnosis for *Guinope* **n. gen.**, including carapacial dentition, the male pleon, and the first gonopods. So nearly as can be determined, this includes the parental females collected alongside archived males and used in the Gore *et al.* (1981) larval study (parental females being found in the HBOI collections, and not the USNM as reported); thus, those larval stage descriptions can no longer be regarded to represent *Garthiope* but rather *Guinope* **n. gen.** However, as these Atlantic specimens are of somewhat larger size and appear to have relatively broader carapaces than do specimens of the type series from the Gulf of Mexico, we cannot state with certainty whether they represent variants of *Guinope tiara* **n. gen., n. sp.** or instead a second species of this new genus. We defer that decision pending comparative gene-sequence analyses and detailed morphological study of materials from Florida *Occulina* bank habitats.

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