

A New Cone Shell (Gastropoda: Conidae) from the Southeastern United States

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ABSTRACT A new species of Conidae in the genus *Gradiconus* is named from the Georgian Subprovince of the Carolinian Molluscan Province, ranging from Cape Hatteras, North Carolina south to Fort Pierce, Florida. This Carolinian Atlantic coast conid species has been erroneously referred to for years as *Gradiconus largillierti* (Kiener, 1847), a species which is restricted to the Gulf of Mexico, from the northern section of the Suwannean Subprovince along the coast through the Texan and Yucatanian Subprovinces.

KEY WORDS *Gradiconus alicae*, *G. largillierti*, Conidae, Carolinian Molluscan Province, Georgian Subprovince, United States Atlantic Coast, United States East Coast

INTRODUCTION

Of the five subprovinces (of the subtropical Carolinian Molluscan Province (Figure 1), only one ranges beyond the Gulf of Mexico and extends up the eastern coast of the United States. Named the Georgian Subprovince, (for the State of Georgia, which is its geographic center; see Petuch and Berschauer, 2021), this bioregion is far less species-rich than the combined malacofauna of the Gulf of Mexico (Petuch and Berschauer, 2025). Extending from Cape Hatteras, North Carolina south to Palm Beach, Florida, the Georgian Subprovince has been found to house unusual regional ecosystems unlike any others found in the other four subprovinces in the Gulf of Mexico. Primary among these is a unique biotope that is based upon immense beds of the large pectinid bivalve, *Argopecten gibbus carolinensis* (Grau, 1952), which are found in offshore waters. This large and globose scallop, which often occurs in shoals of millions of individuals, forms the foundation of an interesting ecosystem that

supports distinctive east coast gastropods such as the fascioliids *Latirus williamlyonsi* Petuch and Sargent, 2011, *Cinctura keatonorum* Petuch, 2013, the volute *Scaphella junonia sheltoni* Petuch and Berschauer, 2025, and the olivid *Americoliva bollingi clenchi* Petuch and Berschauer, 2019 (for discussions of the scallop bed fauna, Mosher *et al.*, 2024; Petuch, 2013; Petuch and Berschauer, 2021). These large and important predatory gastropods are all endemic to the impoverished Georgian Subprovince and are important biogeographical index species.

While compiling data on the molluscan faunas of the eastern United States for a new upcoming book, we discovered that an ornately colored cone shell that is associated with the scallop beds represented a new and previously overlooked species. Referred to as “*Conus largillierti*” in several recent publications (such as Mosher *et al.*, 2024) and websites, we show that this large cone is unnamed and that the taxon *largillierti* does apply to the Georgian

Subprovince shell. The new species, here named *Gradiconus alicae*, is described in the following sections and is compared to the Gulf of Mexico endemic *Gradiconus largillierti*. The holotype and several paratypes are deposited in the type collection of the Division of Mollusks, Department of Invertebrates, National Museum of Natural History, Smithsonian Institution, Washington, D.C.

SYSTEMATICS

Class	Gastropoda Cuvier, 1795
Subclass	Sorbeoconcha Ponder and Lindberg, 1997
Order	Prosobranchia Milne-Edwards, 1848
Infraorder	Neogastropoda Wenz, 1938
Superfamily	Conoidea Fleming, 1822
Family	Conidae Fleming, 1822
Subfamily	Coninae Tucker and Tenorio, 2009
Genus	<i>Gradiconus</i> da Motta, 1991

Gradiconus alicae Petuch and Berschauer, new species

(Plate 1 Figures A-H, Plate 2 Figures A-D)

Description. Shell of average size for genus, with adults generally reaching lengths of 40 mm; body whorl elongated, subcylindrical; shell profiles variable, with some specimens having relatively straight sides and others having distinctly pyriform shapes; spire elevated, protracted, broadly subpyramidal, slightly scalariform on many specimens; shoulder broad, sharply angled, distinctly carinate; body whorl and spire whorls smooth and shiny; base color of body whorl deep yellow-orange or bright pinkish-orange, with scattered large amorphous patches of light tan or orangish-brown; base color overlaid with 15-16 rows of evenly-spaced, closely-packed brown dashes; smaller and fainter secondary

rows of tiny dots often present between larger primary rows of dashes; spire whorls and shoulder carina white with evenly-spaced large crescent-shaped dark brown flammules; protoconch and early whorls deep orange-tan; anterior tip of body whorl white or whitish-yellow; aperture uniformly narrow; interior of aperture white; periostracum pale tan, thin and transparent.

Type Material. HOLOTYPE - length 37.5 mm, width 18.4 mm, from off Cape Hatteras, North Carolina at 62 meters depth, USNM 83854. PARATYPES - paratype 1, length 33.5 mm, width 14.4 mm, from, 8 miles SE of Tybee Island, Georgia, USNM 485884; paratype 2, length 34.9 mm, width 17.2 mm, from 18 miles SE of Port Royal Sound, South Carolina, USNM 48593; paratype 3, length 33.3 mm, from S. of Harkers Island, Carteret County, North Carolina at 37 meters depth, USNM 765746; paratype 4, length 56.0 mm, width 27.0 mm, trawled by a commercial scallop boat north of Cape Canaveral, Brevard County, Florida, in the Petuch research collection; Paratype 5, length 33.0 mm, width 15.5 mm, trawled by a commercial scallop boat from 30 meters depth off of the barrier island of Shackleford banks, Carteret County, North Carolina, in the Berschauer research collection.

Type Locality. From off Cape Hataras, North Carolina at 62 meters depth.

Distribution. The new subspecies is confined to the Georgian Subprovince of the Carolinian Molluscan Province and ranges from Cape Hatteras, North Carolina south to Fort Pierce, Florida. Subfossil (possibly early Holocene) specimens are also known from shallow beach deposits along the coast of Palm Beach County, Florida, but the species is now locally extinct there.

Ecology. *Gradiconus alicae* is a prominent component of the offshore Carolina Bay Scallop beds (*Argopecten gibbus carolinensis* (Grau, 1952)) which are commercially

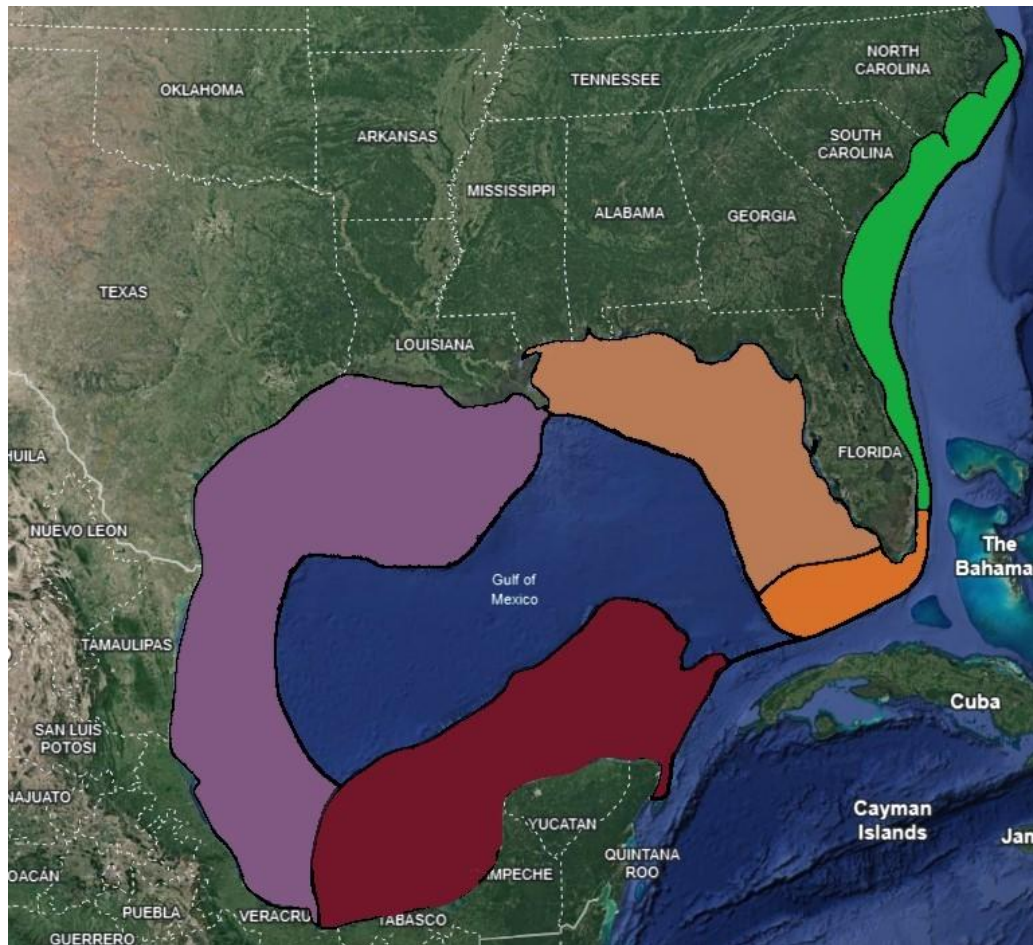


Figure 1. Biogeographical map showing the subprovinces of the Carolinian Molluscan Province. **Green**= Georgian Subprovince; **Orange**= Floridian Subprovince; **Tan**= Suwannean Subprovince; **Purple**= Texan Subprovince; **Maroon**= Yucatecan Subprovince. Each subprovincial area contains its own fauna of endemic *Gradiconus* species. Only *Gradiconus largillierti* occurs in more than one Gulf subprovince and *G. aliceae* is the only Carolinian Province species that occurs outside the Gulf of Mexico.

harvested all along the southeastern United States coast, from Cape Hatteras, North Carolina south to off Fort Pierce, Florida. Within the scallop beds, *Gradiconus aliceae* is the primary predator on amphinomid polychaete worms, which occur in abundance within the gritty substrate sediments. Rarely, individuals are found on sandy sea floors closer to shore in shallower water and have reportedly been collected by SCUBA divers.

Etymology. Named for Alice Oven, Senior Editor for Life Science and Veterinary Medicine, Taylor and Francis/CRC Press, Abingdon, Oxon, England, United Kingdom. In recognition of her invaluable mentorship and

guidance during the publication of our last five CRC Press books.

DISCUSSION

Gradiconus aliceae is the newest member of a tightly knit complex of species that is endemic to the Carolinian Molluscan Province. At present, nine species are recognized, with the new species being the only one of the genus that is not confined to the Gulf of Mexico and its four molluscan subprovinces (Petuch and Berschauer, 2025); shown here on Figure 2. The eight Gulf of Mexico species include: **1.** *Gradiconus maya* Petuch and Sargent, 2011

and 2. *Gradiconus sennottorum* (Rehder and Abbott, 1951), both from the Yucatecan Subprovince; 3. *Gradiconus largillierti* (Kiener, 1847) from the northern section of the Suwannean Subprovince along the coast through the Texan and Yucatecan Subprovinces; 4. *Gradiconus optabilis* (A. Adams, 1854) from the western edge of the Florida Platform in the Suwannean Subprovince; 5. *Gradiconus floridanus* (Gabb, 1869) from southwestern Florida (incorrectly

referred to as “*Conus anabathrum* Crosse” by some recent workers, such as Mosher *et al.*, 2024: 188; see Berschauer, 2022 and Petuch and Berschauer, 2025: 118); and 6. *Gradiconus patglicksteinae* (Petuch, 1987), 7. *Gradiconus mazzolii* Petuch and Sargent, 2011, and 8. *Gradiconus burryae* (Clench, 1942), all from the Florida Keys and Floridian Subprovince. This is the largest number of *Gradiconus* species found in one geographically small area within the entire Tropical Western Atlantic.

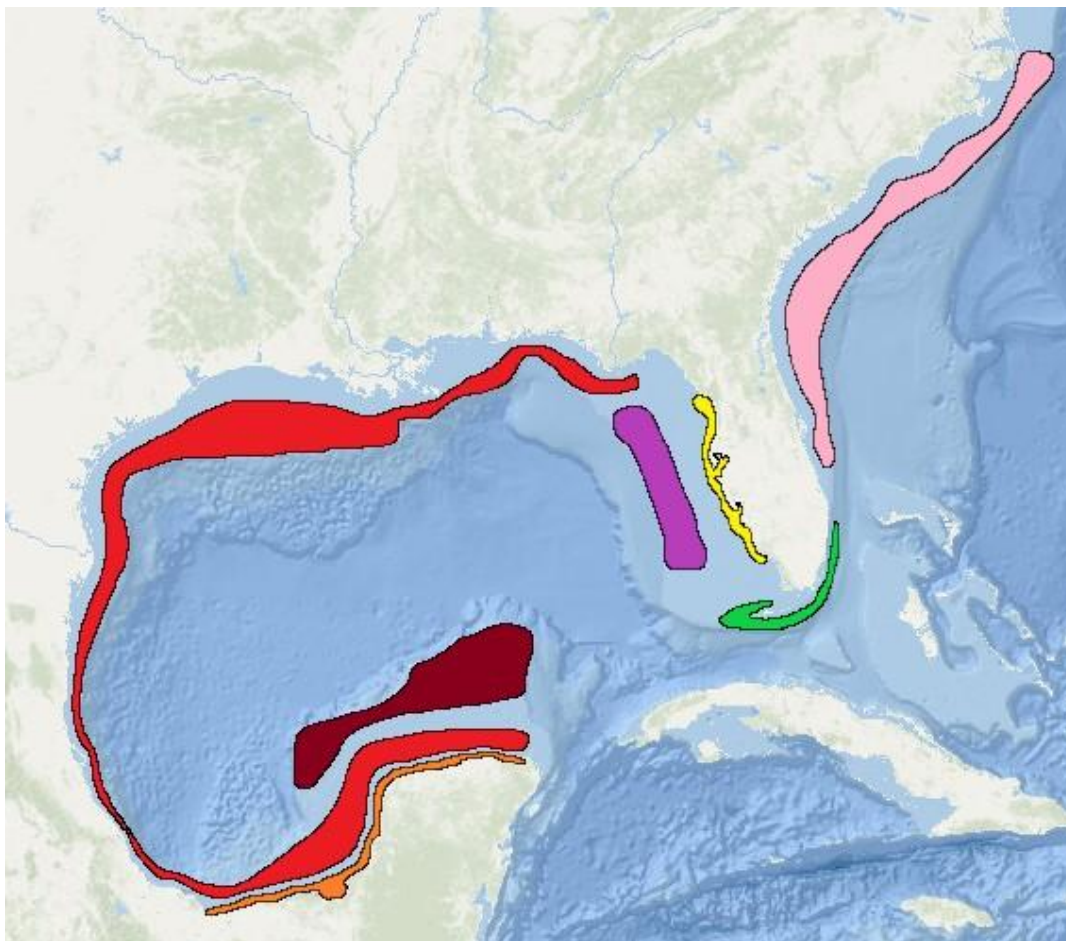


Figure 2. Geographical ranges of the *Gradiconus* Species in the Gulf of Mexico and Eastern United States.

Pink= Range of *Gradiconus alicae*; **Green**= Ranges of *Gradiconus patglicksteinae*, *G. burryae*, and *G. mazzolii*; **Yellow**= Range of *Gradiconus floridanus*; **Purple**= Range of *Gradiconus optabilis*; **Red**= Range of *Gradiconus largillierti*; **Orange**= Range of *Gradiconus maya*; **Burgundy**= Range of *Gradiconus sennottorum*. As shown here, *Gradiconus largillierti*, and the similar *G. alicae*, are widely separated geographically, with *largillierti* being confined to the northern and western Gulf of Mexico (Florida Panhandle, outer edge of the Texas and eastern Mexico continental shelves, the Bay of Campeche, and northern Yucatan), and with *G. alicae* being confined to the outer continental shelf along the eastern United States, from North Carolina to southern Florida). There is a northern form (which has larger and more spread-out dots and dashes), and the typical southern form (which has smaller and more closely-packed dots and dashes) of *G. largillierti*. The two forms segregate along the narrow continental shelf just south of Tampico, Mexico off Tecolutla.

Of the known Gulf of Mexico *Gradiconus* species, *G. alicae* is closest in appearance only to *G. largillierti* of the northern and western Gulf of Mexico (Plate 1, Figures E-H) and has erroneously been referred to by that name in several recent publications (e.g. Mosher *et.al.*, 2024). The new Atlantic species differs from its Gulf of Mexico congener in being consistently a narrower and more cylindrical shell and in having a more intense color pattern, composed of 15-16 prominent bands of brown dots and dashes over a bright orange or yellow-orange base color. The brown dots and dashes in the spiral bands of *G. alicae* are consistently larger and more prominent than those seen on the Gulf of Mexico *G. largillierti*, which are smaller and more closely packed together (as seen on the lectotype shown here on Plate 2, Figures G-H).

Due to the extreme variability of shell color and shape seen in the Carolinian *Gradiconus* species, and also due to nebulous locality data for individual specimens for many of the holotypes, the *Gradiconus* species complex of the Carolinian Province has been in a state of confusion for several decades. This was exacerbated by several commercial shell dealers, who were using incorrect names for sales specimens, or who provided incorrect locality data (e.g. mislabeling and selling the Caribbean Panama endemic species, *Gradiconus ernesti* (Petuch, 1990), as “*Conus philippi*”). It must be noted that *G. philippi* is either a synonym of the endemic the Gulf of Mexico *G. largillierti*, or instead should be more appropriately recognized as the northern variant of that species. Relying on dubious locality information, we also fell victim to this taxonomic confusion, and this resulted in us erroneously illustrating a *G. largillierti* specimen on a plate of *G. maya* (Petuch and Berschauer, 2025, illustrated as figures 6.21A, B). As can be seen on that figure, *Gradiconus*

maya is a smaller, slenderer, and more colorful shell with a higher spire, and is very different from the larger, broader, and less-colorful *G. largillierti* shown on the same plate. The discovery of *G. alicae* has allowed for a clarification of the biogeographic and oceanographic patterns seen within the Carolinian *Gradiconus* complex.

ACKNOWLEDGMENTS

We thank Dr. Ellen Strong, Division of Mollusks, National Museum of Natural History (Smithsonian Institution), for her invaluable help in selecting and photographing the holotype and a set of paratypes from the museum collection. The authors thank Stephanie Howard for reviewing the paper as a regional expert, and Bill Fenzan for providing measurements of the syntypes of *Gradiconus largillierti* from his studies of type specimens. Special thanks also go to Dr. Marvin Glickstein and his daughter, Linda Glickstein, for the generous donation of a Florida specimen of the new species.

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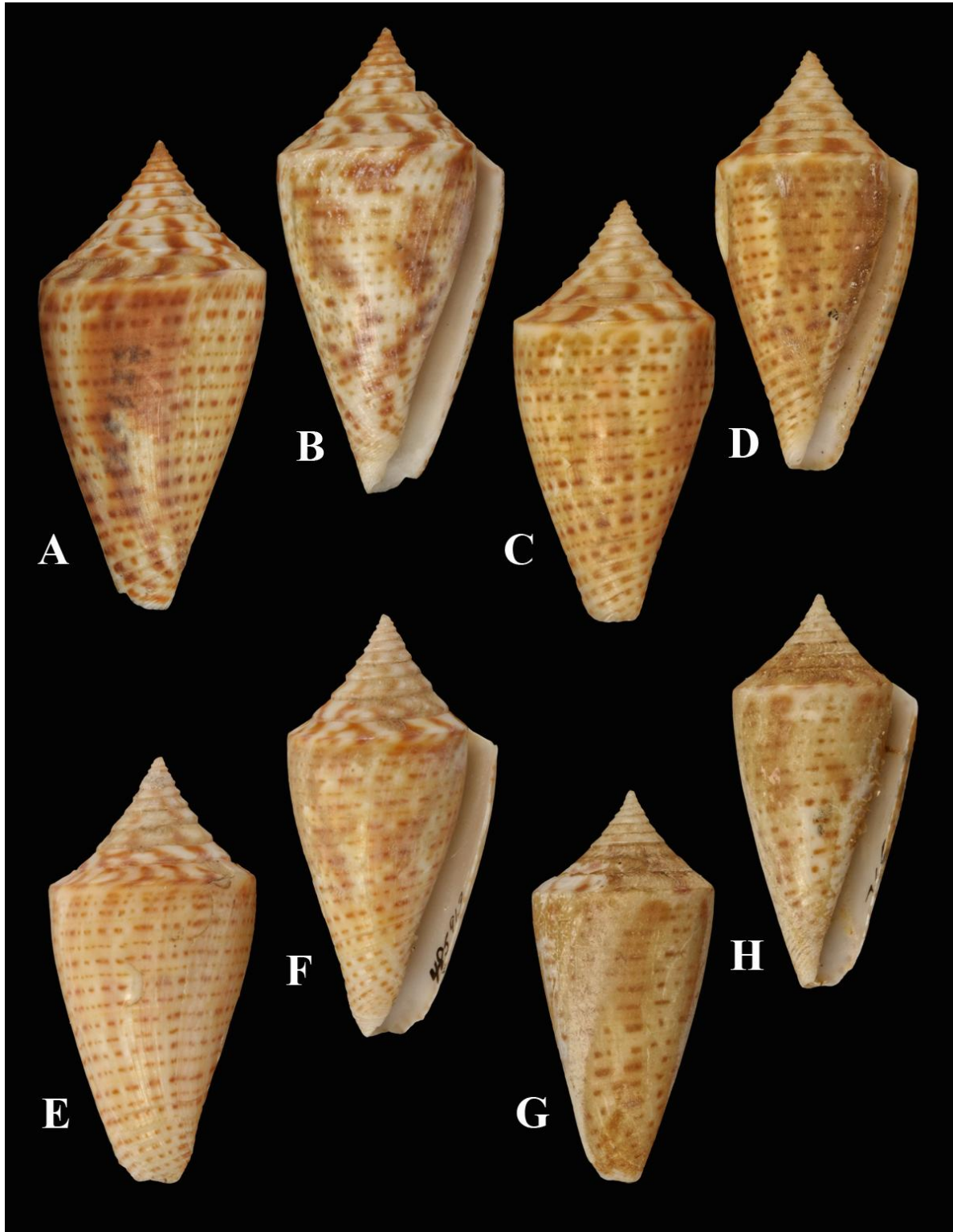


Plate 1. *Gradiconus alicae* Petuch and Berschauer, new species.

A, B= holotype (USNM 83854), length 37.5 mm; C, D= paratype 1, USNM 485884, length 33.5 mm; E, F= paratype 2, USNM 48593, length 34.9 mm; G, H= paratype 3, USNM 765746, length 33.3 mm. The dull appearance to the surfaces of these specimens is due to them all retaining their original periostracum, which is a common practice in some museum collections.

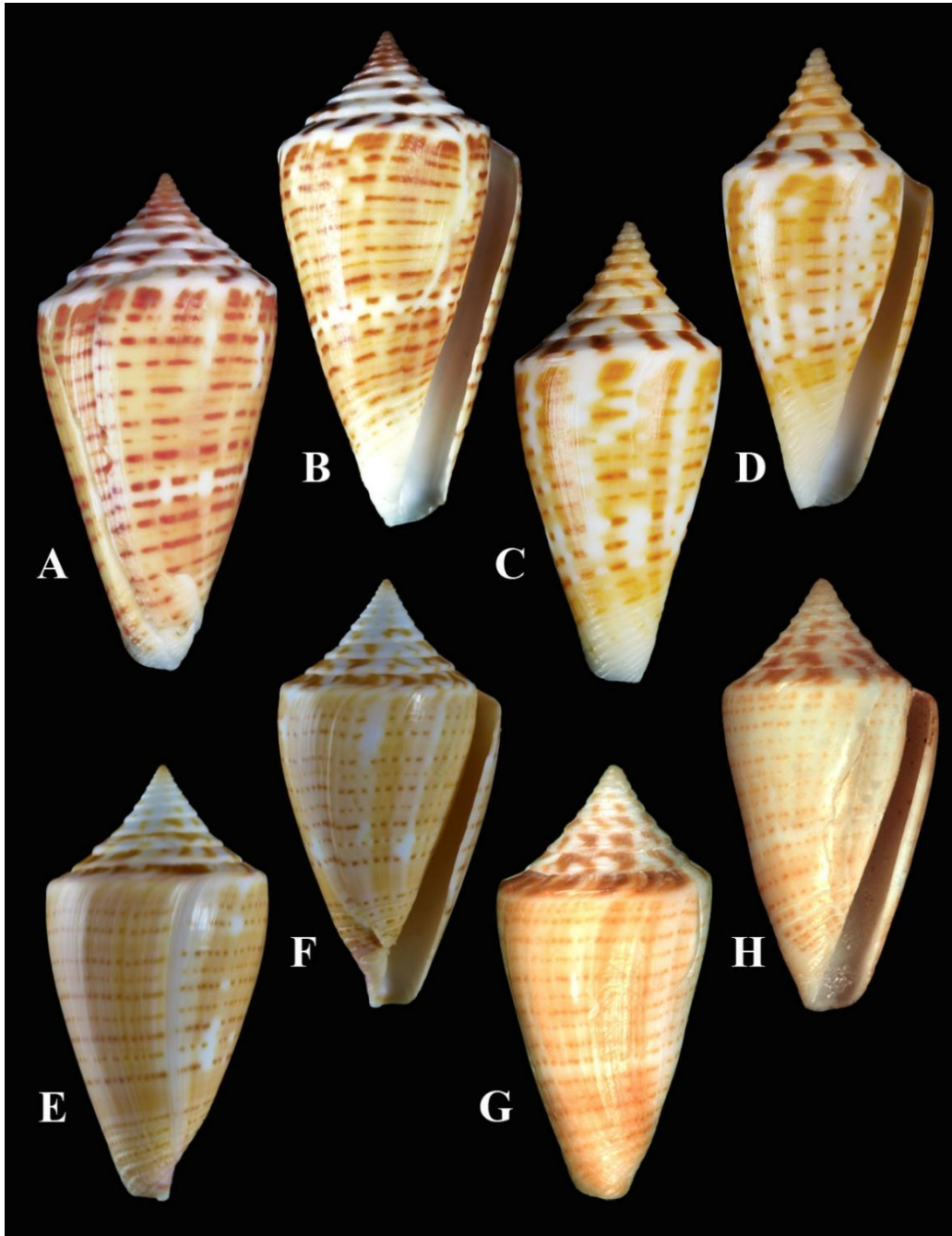


Plate 2. Two Closely-Related Endemic Carolinian Province Species; *Gradiconus alicae* Petuch and Berschauer, new species and *Gradiconus largillierti* (Kiener, 1847).

A, B= *Gradiconus alicae* Petuch and Berschauer, new species, length 56.0 mm, paratype 4, large yellow color form trawled by a commercial scallop boat north of Cape Canaveral, Brevard County, Florida, in the Petuch research collection; **C, D= *Gradiconus alicae*** Petuch and Berschauer, new species, length 33.0 mm, paratype 5, trawled by a commercial scallop boat from 30 meters depth off of the barrier island of Shackleford banks, Carteret County, North Carolina, in the Berschauer research collection; **E, F= *Gradiconus largillierti*** (Kiener, 1847), length 46.0 mm, a classic specimen that was collected off Holbox, Isla Holbox, Quintana Roo State, Yucatan Peninsula, Mexico (this specimen was mistakenly identified as “*Gradiconus maya*” by Petuch and Berschauer, 2025, illustrated therein in figure 6.21 on p. 185); **G, H= *Gradiconus largillierti*** (Kiener, 1847), the first specimen of two syntypes (which are 32.5 mm and 29.3 mm in length respectively) is herein designated as the lectotype, measuring 32.5 mm in length, and 16.2 mm in width, from “Côtes du Mexique” (“Coast of Mexico”, most likely the Yucatan Peninsula or Bay of Campeche), MNHN-IM-2000-3310 (National Museum of Natural History, Paris, France). *Gradiconus philippii* (Kiener, 1847), also named from “Côtes du Mexique”, named for colorful specimens with a more pyriform shape, appears to be a synonym of *G. largillierti*.