

Geracia bahamensis, new genus and species, a Recent agglutinated foraminifer from the platform margin at San Salvador, Bahamas

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ABSTRACT: Described herein is a new living agglutinated foraminifer found at the shelf edge at the island of San Salvador, which is located on a small, isolated carbonate platform at the eastern margin of the Bahamas. All specimens come from the Doolittle's Grotto dive site on the southwestern tip of the island at Sandy Point and from one size fraction (0.5mm) of one sample, taken at 43.3m. Named *Geracia bahamensis* n. gen. n. sp. in honor of Dr. Donald and Kathy Gerace, founders of the island's Gerace Research Centre, and for the Bahamian islands, the species is an elongate, subtriangular, coarsely agglutinated form with tubular chambers in triloculine arrangement and having an oval aperture. The thin wall consists of carbonate sand and silt grains cemented by an organic matrix. The taxon is provisionally classified in the Family Trilocularenidae Mikhalevich and Kaminski 2008 but lacks a tooth or external flap.

INTRODUCTION

The outer margins of carbonate platforms have received relatively little research attention in actualistic studies of West Indies benthic foraminifera when compared to the many studies done in the shallow waters of the platform top (e.g., Bock 1971, Todd and Low 1971, Wantland 1974, Brasier 1975, Buzas et al. 1977, Hallock et al. 1986, Martin 1986, Martin and Liddell 1988, Culver 1990, Hallock and Peebles 1993, Fujita and Hallock 1999, and Wilson and Ramsook 2007). This is understandable given the logistical difficulties imposed by distant sites with relatively deep water and the fact that shore-to-shelf-edge transects used in distributional studies typically have only a few stations at the platform margin (e.g., Rose and Lidz 1977 and Gischler et al. 2003). A recent exception to the lack of research done in this zone is the submersible-based SETI program, which involves epibionts including encrusting foraminifera off Eleuthera Island, Bahamas (Walker et al. 2001, White 2002).

The present study is part of ongoing research at the platform margin (Lewis and Tichenor 2008a, 2008b) at San Salvador, a small, isolated platform located at the eastern edge of the Bahamian chain (text-fig. 1A). Here the shelf edge is readily accessible to direct observation via SCUBA because the "wall" at the platform margin typically begins in waters only 12-15m deep and is located as close to shore as 300m.

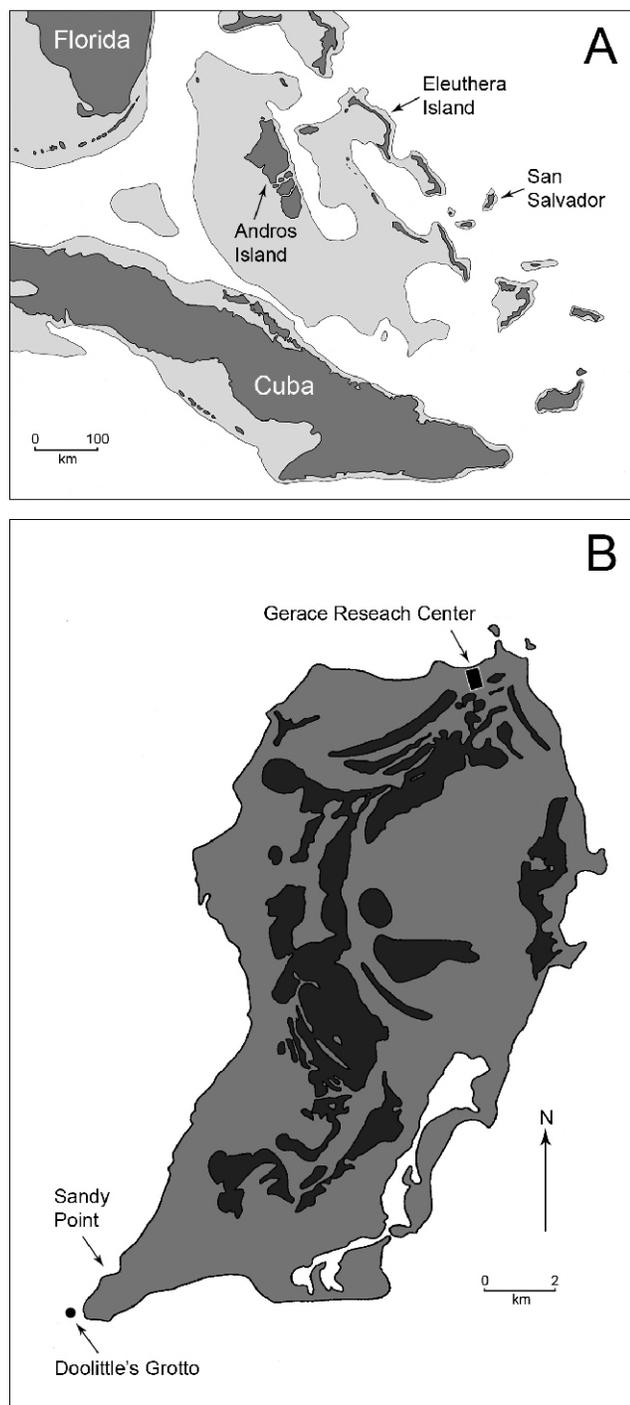
At San Salvador, as elsewhere (e.g., Rose and Lidz 1977, Hallock and Glenn 1986, Martin and Liddell 1991), agglutinates play a prominent role in foraminiferal assemblages at the platform margin. Prior research at the island (Lewis 2004, Lewis and Tichenor 2008a) has established the occurrence of some species previously reported in much deeper water: *Liebusella soldanii* (100m and 200m), *Reophax bermudezi* (100m), and *Dusenburyina* sp. (Hofker 1969). The purpose of

the present paper is to formally describe a new genus and species, found to date only in relatively deep water at the platform margin.

COLLECTING SITE, METHODS, AND FAUNAL CONTEXT

All known specimens of the new taxon are from a dive site at the southwestern tip of the island known as Doolittle's Grotto (text-fig. 1B). At this site, the platform edge is a gradual slope from a depth of 9m to 43m with two, shore-parallel coral-reef ridges beginning at a water depth of approximately 21 meters. Although dissected by crevasses and tunnels, the reef ridges act as a partial barrier to shelf-sediment transport, so that indigenous foraminifera can be sampled at the reefs and in the slope below. Seafloor sediment samples were recovered at depths of 12.2m (above the reefs), at 39.6m, and at 43.3m by SCUBA in June 2006. Sediment samples were fixed in buffered formalin for return to Auburn University, where they were rinsed with tap water, air dried, and sieved at 1 phi intervals. Foraminifera were picked from the 1mm, 0.5mm, and 0.25mm fractions.

The sample from 43.3m had the highest abundance of well-preserved foraminifera. The foraminiferal assemblage, derived in part from the reef ridge above, includes abundant and well preserved *Amphistigina gibbosa* and *Planorbulina* sp., and a diverse assemblage of agglutinates. *Valvulina oviedoiana*, *Reophax bermudezi*, and *Liebusella soldanii* dominate the agglutinates, with lesser amounts of *Geracia bahamensis*, *Placopsilina* sp., *Textularia agglutinans*, and *Bigenerina* sp. All known specimens of *Geracia bahamensis* were found in the 0.5mm fraction at this site. Even here, the species was rare, accounting for only approximately 2% of total tests recovered from the fraction. Tests were coated with gold and examined with a Zeiss EVO 50 variable-pressure scanning electron microscope. In addition to standard thin-sections with tests impreg-



TEXT-FIGURE 1
 A. The island of San Salvador on the eastern edge of the Bahamas. Platforms (gray) are less than 200 m below sea level.
 B. Doolittle's Grotto located off the western tip of Sandy Point.

nated with Spurr's resin (Spectrum Petrographics, Inc, Vancouver, Washington), additional oriented tests were impregnated using Spurr's resin (at low vacuum), sectioned by the author, and examined using a Leica Z16 Imaging System. The suprageneric classification used below is that of Mikhalevich and Kaminski 2008.

SYSTEMATIC DESCRIPTION

Subclass MILIAMMINANA Mikhalevich 1980
 Order SCHLUMBERGERINIDA Mikhalevich 1980
 Family TRILOCULARENIDAE Mikhalevich and Kaminski 2008

Genus *Geracia* Lewis n. gen.

Type species: Geracia bahamensis Lewis n. sp.

Diagnosis: Test flask-shaped (subtriangular), typically with a bilobed base and slightly convex sides. Wall coarsely agglutinated, one to a few grains in thickness, and bound by an organic matrix. Tubular chambers in triloculine arrangement; aperture an elongate oval lacking an internal tooth or external flap and located at the end of the last-formed chamber.

Remarks: The Family Trilocularenidae was established by Mikhalevich and Kaminski 2008 for schlumbergerinids with triloculine coiling as in *Triloculina*. The two included genera, *Trilocularenida* Loeblich and Tappan 1995 and *Falsagglutinella* Loeblich and Tappan 1994, both have an apertural tooth of some kind, although in the case of *Triloculina* the tooth is formed by an external fold of the body wall. As the presence or absence of a tooth varies within families (Mikhalevich and Kaminski 2008), inclusion of *Geracia* in this family is warranted based on its triloculine chamber arrangement.

Externally, *Geracia* resembles *Nouria* Heron-Allen and Earland 1914, but the latter has a chamber arrangement characterized by an early polymorphine spiral followed by a biserial phase with alternating chambers approximately one-half the length of the test.

Occurrence: Holocene; Bahamas.

Derivation of name: The genus name is in honor of Dr. Donald and Kathy Gerace, founders of the Gerace Research Centre, San Salvador, Bahamas, as a tribute to their three-plus decades of service to the research community.

Geracia bahamensis Lewis n. sp.
 Text-Figure 2; Plate 1, figures 1-9.

Diagnosis: Monotypic: see diagnosis for genus.

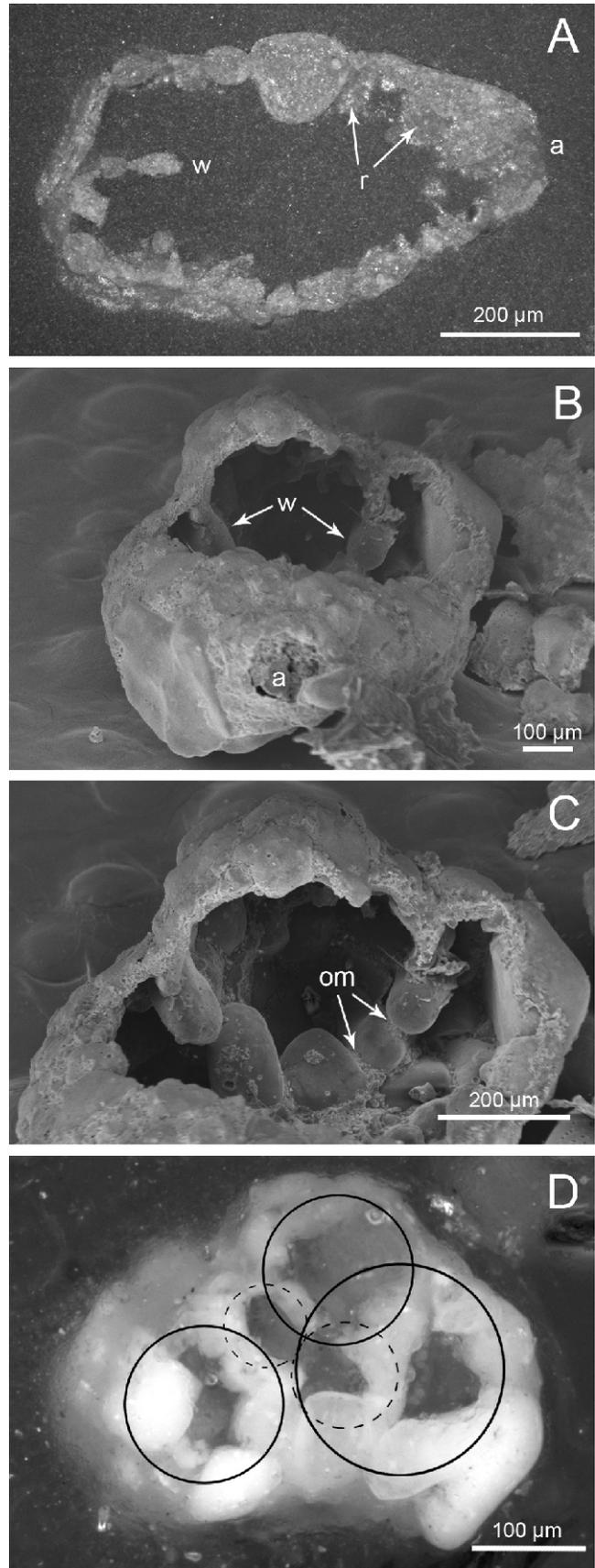
Material: The original hypodigm consisted of over 60 complete tests and a few test fragments; approximately 20 tests were sacrificed during examination. All individuals were recovered from the 0.5mm-size fraction in spite of efforts to find smaller specimens in the 0.25mm and 0.125mm fractions. All complete tests are well preserved and were apparently live at the time of collection or had died recently, as all have intact organic material.

Type locality: Doolittle's Grotto dive site, near Sandy Point, San Salvador, Bahamas, 23° 56.742' N, 074° 34.336' W. Seafloor sediment at a water depth of 43.3m.

Type specimens: Holotype (USNM 538748) and paratypes (USNM 538749-538758) are deposited in the micropalaeontological collections of the United States National Museum of Natural History, Washington, D.C. Additional paratypes, not figured, are deposited at the Natural History Museum, London.

Description: Test free, elongate (length at least twice maximum width); size ranges from approximately 700µm to 1400µm in length. Test outline in lateral view is flask-shaped (sub-triangular), tapering from base to aperture, typically with slightly convex sides, and without a neck in larger specimens (Pl. 1, figs. 4, 9); smaller tests may have a more distinct neck (Pl. 1, figs. 2, 8). Base is typically bilobed or flat but may be rounded, especially in smaller individuals. Transverse outline is conspicuously to subtly trilobed. Chambers are tubular, round to oval in cross section, with new chambers overlapping previous ones. Sutures between chambers are obscure. Chamber arrangement is triloculine with the final three chambers visible on the exterior; the axis of each chamber is located 120-degrees from the adjacent chamber (text-fig. 2). Dissected and sectioned tests show walls in the interior of the test, but the exact configuration of early formed chambers is unclear (text-figure 2D). Wall is coarsely agglutinated, with the larger grains consisting of rounded, fine to very-fine carbonate sand. These large grains stand in high relief, with intervening, lower-elevation spaces occupied by very-fine sand and silt. Wall is only one large grain or a few small grains thick, with grains cemented by an organic matrix. Aperture is an elongate oval at the end of the last-formed chamber. The aperture's edge lacks denticles or a tooth. The long axis of the aperture is typically at an angle to the plane intersecting the largest two chambers.

Remarks: The thin, poorly cemented nature of the wall makes *Geracia bahamensis* a fragile foraminifer; many specimens were broken by handling with a wet brush during examination and mounting on SEM stubs. Immersion of a test in a 1:4 solution of sodium hypochlorite (Clorox) and distilled water resulted in a nearly complete dissociation of the component grains within 45 minutes. This and petrographic thin-section study indicate that the cement is predominantly or wholly organic. Efforts to examine the test interior by dissection usually resulted in extensive disintegration of the test. However, partial interior walls were seen along the lateral sides at the junction of the two largest chambers and were particularly well preserved in the basal area of the test. Sectioning of tests following impregnation by Spurr's resin reveals interior walls of the 3 large chambers and additional test walls in the center, which suggest prior triloculine arrangement (text-figure 2D). Thus, growth of the species involves more than the three chambers visible in the exterior. Although the detailed architecture of the earliest formed test is not clear at present, the fact that known tests display 3 visible chambers throughout a substantial size range sug-



TEXT-FIGURE 2

A. Longitudinal thin-section (crossed nichols) showing the thin wall with grains cemented by an organic matrix. Aperture (a) at right. Note organic residue (r) inside the test and partial interior wall (w) at base (left).

B. Oblique view of dissected specimen (Paratype USNM 538755), showing trilobed outline and interior chamber walls (w) at arrows. Aperture (a) is in foreground.

C. Detail of previous figure. Note wall made up of single grains weakly cemented together by organic matrix (om).

D. Transverse section of the base of a test impregnated in a Spurr's resin stub and ground from the base such that view is toward aperture. Solid circles suggest the 3 chambers visible from the outside of the test, and dashed circles indicate smaller, earlier formed chambers.

gests that growth continues in triloculine arrangement following the formation of the proloculus, as it does in *Trilocularena*. The new taxon is distinct from *Trilocularena* and *Falsagglutinella*, as indicated by its flask-like shape and coarse grains as well as the lack of a tooth or external flap. Although it resembles *Nouria* in lateral outline and grain size, the two genera differ in chamber arrangement.

Occurrence: Holocene; Bahamas.

Derivation of name: The species name *bahamensis* refers to the Bahamian islands, the only known location of the species at present.

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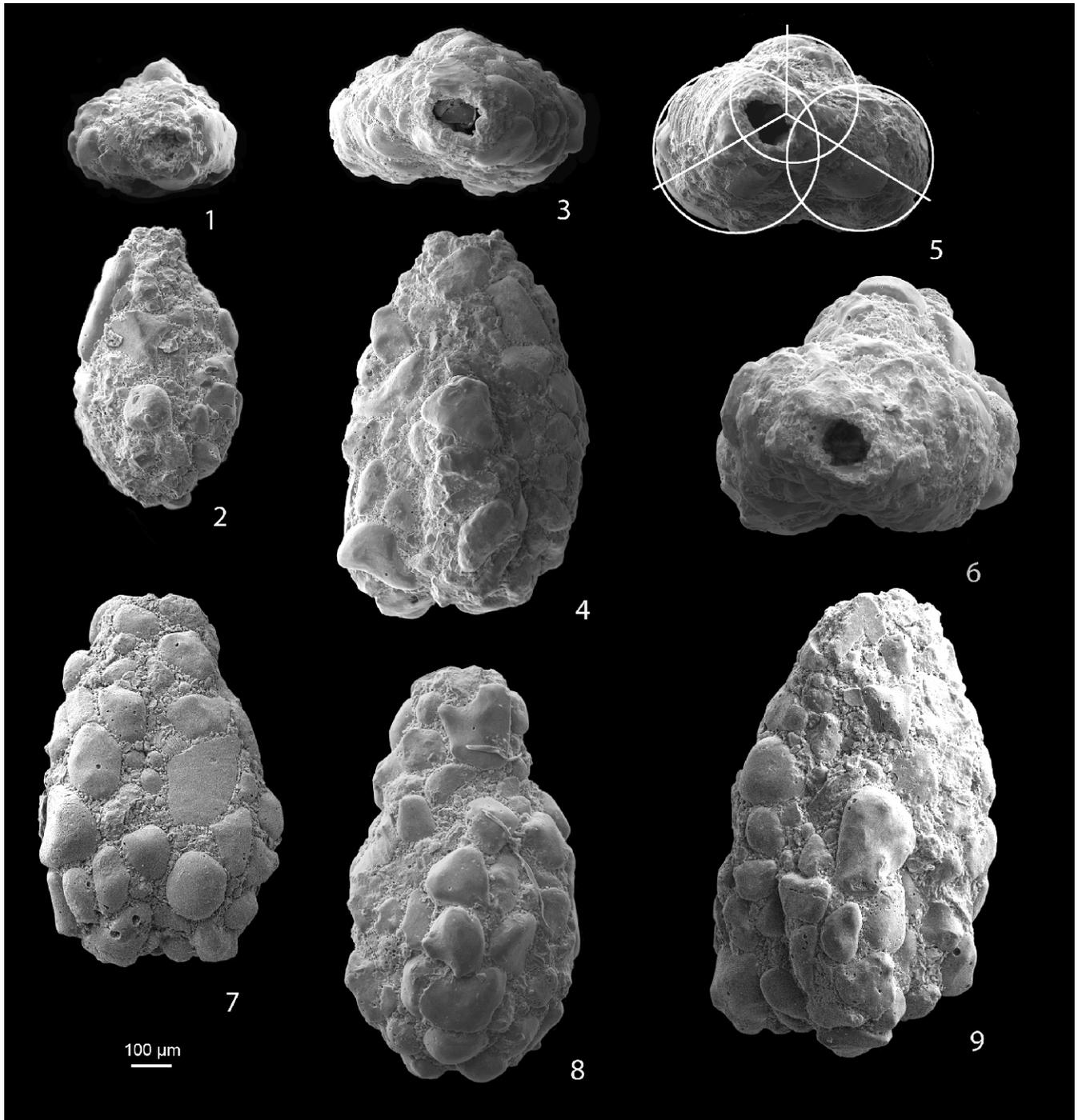
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PLATE 1

Geracia bahamensis n. g. and n. sp. Scale applies to all figures.

- 1-2 Smallest known specimen, Paratype USNM 538749. 1. Apertural view. 2. Lateral view, showing convex sides, rounded base, and neck.
- 3-4 Holotype specimen, USNM 538748. 3. Apertural view with slight rise (top), formed by smallest chamber, and oval aperture. 4. Lateral view showing outline typical for the species; note lack of distinct sutures between chambers and slightly bilobed base.
- 5 Paratype USNM 538750. Apertural view shows distinct triloculine outline and canted, oval aperture. Superimposed circles and lines show how well chamber addition can be modeled by 3, tubular chambers added at 120 degrees to each other.
- 6 Apertural view of Paratype USNM 538751, with very distinct 3-lobed outline caused by unusually large chamber at top.
- 7 Relatively small specimen (Paratype USNM 538752) showing lateral view of 2-chambered side. Note slightly bilobed base and short neck.
- 8 Paratype USNM 538753, which is unusual in its rounded outline and distinct neck.
- 9 Lateral view of a relatively large specimen (Paratype USNM 538754) with the subtriangular outline displayed by the vast majority of known specimens.



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