Giant fossil coelacanths of the Late Cretaceous in the eastern United States

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ABSTRACT
Remains of giant fossil coelacanth fish are relatively common in Upper Cretaceous strata (late Santonian to early Campanian age) in Alabama and Georgia. These are a geologically widespread from any global location and ~135 m.y. younger than the last coelacanth fish reported from North America. A coelacanth coronoid fragment from New Jersey, apparently from the same taxon, is of latest Campanian or Maastrichtian age and is the oldest known definite coelacanth fossil. The species reconstructs to 3.5 m, which is as large as any known coelacanth. The name *Megalocoelacanthus dobiei* is proposed for this new coelacanth, which is also the last known member of the clade that includes the extant *Latimeria*.

INTRODUCTION
In autumn 1987, a large fossil bone mass was discovered in the bed of the North Fork of Cowikee Creek, northern Barbour County, Alabama (Fig. 1); the mass was spread over ~3 m² of silty sandstone of the Upper Cretaceous Blufftown Formation. The bone came from a single giant coelacanth fish that lived ~135 m.y. later than any other coelacanth reported from North America. The species represented is new; 1 subsequent to the first discovery, six additional specimens have been found in Alabama, western Georgia, and New Jersey, either collected in the field or identified in existing collections. The size of the new coelacanth is extraordinary, and the maximum length is estimated as 3.5 m. The size, combined with the apparent wide distribution and abundance, suggests that these coelacanths were important, previously unrecognized elements of the Late Cretaceous nearshore biota.

LATER FOSSIL RECORD OF COELACANTHS
Coelacanths are notable "living fossils" because a single species, *Latimeria chalumnae*, has survived to the Holocene following an apparent 80 m.y. hiatus in the fossil record of the Coelacanthiformes (Forsy, 1988). *Latimeria* is fished and observed only in bathyal waters of the southern Indian Ocean in the vicinity of the Comores Islands (Thompson, 1991), whereas the last reported fossil coelacanth remains come from shelfal marine chalks of the European Upper Cretaceous.

Coelacanths are a common and nearly globally in Devonian through Triassic strata, and represent taxa of moderate diversity and abundance in both marine and freshwater environments. During Jurassic and Cretaceous time, coelacanth diversity declined, their geographic range narrowed, and they almost disappeared from the non-marine realm. The fossil record of coelacanths as known appeared to end with the western European genus *Macropoma* in early Campanian time (Jukes-Browne, 1904). The fossil record in North America was assumed to show a much longer hiatus, the last coelacanth fossils coming from freshwater Newark basin deposits of latest Triassic or earliest Jurassic age (Schaeffer, 1941, 1952).

Coelacanths clearly did not become extinct during the Late Cretaceous, given the extant species, but the 80 m.y. gap in their fossil record is anomalous. A small bone fragment from the Paleocene of Denmark (Ørvig, 1986) is the only plausible post-Cretaceous coelacanth fossil reported; however, its identification is based solely on histological comparison with known coelacanth bone, which is of undetermined specificity.

The new species reported here extends the North American fossil record of coelacanths by 135 m.y., on the basis of six fossils from late Santonian and early Campanian deposits in Alabama and western Georgia. An additional fossil from the same or a similar coelacanth comes from younger Cretaceous marine strata (latest Campanian to middle Maastrichtian age: <75 Ma) from New Jersey, and is the world's youngest definite fossil coelacanth record.

SYSTEMATICS
Order Actinistia, Family Coelacanthidae
*Megalocoelacanthus* gen. nov.

Diagnosis. Very large marine coelacanth fish, length estimated to reach 3.5 m. Body form and postbranchial skeleton unknown.
Neurocranium known from partial basiopharynoid, which is very deep dorsoventrally. Palate with distinct flange extending from the ventral pterygoid margin immediately anterior to the quadrate; quadrate narrow and elongate in labial view. Mandibles relatively elongate posterior to the articular; articular fused to the angular. Lingual surfaces of the angular, pterygoquadrate, and coronoïd covered with small denticles. No marginal teeth are present in the mandible. Coronoïd large, with subcircular dorsal margin. External surfaces of angular bear eight large sensory pits and very faint longitudinal grooves on posterior. Gular and operculum lack external ornamentation; other dermal bones not identified certainly, but no additional bone surfaces show ornamentation. Operculum subhomboidal, with sharply angled anteroventral margin. Gulars diverge strongly along posterior midline.

**Megalocoelacanthus dobiei** sp. nov.

**Etymology.** Named for James L. Dobie of Auburn University.

**Type Series.** (See Figs. 2, A-J and 3, A-C; see Table 1 for collections and abbreviations). Holotype: CCK 88-2-1, 19 associated identified bones and unidentified bone fragments; paratypes: AUMP 3834, ten associated bones; referred material: FMNH P27524, left pterygoquadrate; CCK 93-6-1, and AUMP 3944, distal quadrate fragments; CCK 93-13-1, right angular fragment; AMNH 6643, left coronoïd fragment.

**Diagnosis.** The only known species; diagnosis as above.

**Age.** The type series is early Campanian age. Referred specimens are late Santonian to mid-Maastrichtian age (see Table 1). The holotype matrix contains *Calcities ovalis* and *C. obscurus* (W. G. Siesser, 1990, written commun.), delimiting occurrence within nanofossil zones 17–19 (Siessing, 1977). The matrix from paratype AUMP 3834 contains *Calcities ovalis* and *Aspidolithus parcus*, which delimit nanofossil zones 18–19 (W. G. Siesser, 1991, written commun.). AUMP 3944, from the subjacent Tombigbee Sand Member of the Eutaw Formation, is associated with late Santonian invertebrates and selachian fossils (G. R. Case, 1992, personal commun.), but the rock unit ranges into the early Campanian (Smith, 1989); thus, AUMP 3944 occurs within zones 16–17.

AMNH 6643 (Fig. 3, D–F) was collected by Gerard R. Case (AMNH collections data) from stream lags at Big Brook, New Jersey, which incorporate materials from the Marshalltown through Navesink Formations (Petters, 1976; Gallagher et al., 1986). The range of ages for this specimen is latest Campanian through middle Maastrichtian.

**Discussion**

Coelacanths, especially post-Triassic coelacanths, show a low rate of acquisition of new characters through time (Schaeffer, 1952; Forey, 1984; Cloutier, 1991). The taxonomy of such slowly evolving organisms must give considerable weight to subtle changes in morphology. Ideally, analysis of the taxonomic relations of this coelacanth fish would employ a suite of morphologies that have been evaluated in previous coelacanth systematic studies (e.g., Schaeffer, 1952; Bjerring, 1977; Maisey, 1986; Cloutier, 1991) to determine how many shared and novel characters are present. However, the coelacanth material here does not lend itself to such comparisons, largely due to the state and nature of the preservation, which in part reflects the very large size of the fish.

We have found excellent remains of the cranium, mandibles, pectoral girdles, and branchial skeletons, but thus far have not identified skull roofing bones. Furthermore, we have no knowledge of the squamation, and poor knowledge of the sensory system. In consequence, many characters used in recent analyses of coelacanth phylogeny (as above) are not useful for the materials at hand. Morphologies evident in the new coelacanth specimens in study, compared with the same characters in established genera of Cretaceous coelacanths and *Latimeria* (the latter based on examination of pre-
Phylogenetic known from partial basiphenoid, which is very deep dorsoventrally. Posteriorly, the neural arches extend from the ventral parietal margin immediately to the quadrate, quadrate narrow and elongate in labial view. Mandibles relatively elongate posterior to the articular, articular fused to the angular. Lateral surfaces of the angular, pterygoid, quadrate, and coronoid covered with small denticles. No marginal notch are present in the mandible. Crowned large, with suboval dorsal margin. External surfaces of angular bear right ligamentary pits and very fine longitudinal grooves on posterior. Gular and opercular lack external ornamentation; other dermal bones not identified certainly, but no additional bone surfaces show ornamentation. Operculum subquadrangular, with sharply angulated opercular margin. Gulars diverge strongly along posterior midline.

Megalacanthodontus dawsoni sp. nov.


Type Series. (See Figs. 2, 3, 7, 8, 10, and 11; see Table 1 for collections and abbreviations). Holotype: CCK 98-2-1, 19 associated identified bones and unidentified bone fragments, paratypes: AUMP 3834, two associated bones, extant material, FMNH P22524, left pterygoplaque; CCK 98-4-1, and AUMP 3944, distal quadrangular fragment; CCK 93-13-1, right angular fragment; AMNH 6943, left maxillary fragment.

Discussion.

Coeccalacanthians, especially post-Triasic coecalacanths, show a low rate of acquisition of new characters through time (Shraedy, 1982; Forey, 1984; Chatterjee, 1991). The taxonomy of such slowly evolving organisms must give considerable weight to subtle changes in morphology. Ideally, asphyxiation of the taxonomic relations of this coecalacanth fish would require a suite of morphological characters that have been evaluated at previous coecalacanth systematic studies (e.g., Schaeffer, 1987; Berling, 1977; Maisey, 1984; Chatterjee, 1991) to determine how many shared and novel characters are present. However, the coecalacanth material here does not lend itself to such comparisons, largely due to the state and nature of the preservation, which in part reflects the very large size of the fish.

We have found excellent remains of the caudal, mandibles, pectoral girdles, and branchial sinuses, but thus far have not identified skull vaulting bones. Furthermore, we have no knowledge of the squamation, and poor knowledge of the sensory system. In consequence, many characteristics of recent analyses of coecalacanth phylogeny (as above) are not useful for the materials at hand. Morphologies evident in the new coecalacanth specimens in study, compared with the same characters in established genera of Cretaceous coecalacanths and Latimeria (the latter based on examination of pre-

Figure 2. Megalacanthodontus dawsoni, new species: holotype and paratype specimens. A-C, partial basiphenoid: A, posterior; B, anterior; and C, lateral view; scale indicated by upper right scale bar. D-E, D, right operculum, posterior view; E, dorsal fin spine, anterior view; scale of F-M indicated by lower right scale bar. F, right parietal, posterior view; G, left operculum, lateral view; H, left mandible, medial and external views; I, right urostyle, ventral view; J, right preopercle, lateral view; K, left coracoid, ventral view; L, right cleithrum-axial view, lateral view. All materials shown from holotype CCK 98-2-1, except G, H, and I, which are from paratype AUMP 3834.
paleoent material, including AMNH 56150, are presented in Table 2.

Mathematical analysis of Table 2 would be trivial, given the few characters available for comparison, but it is apparent that sufficiently high supervariphil apomorphies (e.g., ventral postphygial range, plan size, submedian conoid, absence of marginal dentition) are present to separate Megaloceratoceratops from all other genera; the data also indicate that Luttermoseria and Macroceranops are closest morphologically to Megaloceratoceratops.

Overall size is a notable feature in animals, but it is clear that Megaloceratoceratops was very large. The skull size is extrapolated from measured dimensions of the holotype left mandible (502 mm length and right pata (395 mm anteroposteriorly), the postorbital complete right jugular (641 mm length), and other bones, all compared with the corresponding bones in larger specimens of Lutternseria (e.g., AMNH 56150 and Macroceranops (AMNH 12117, 12116). Allowing for some allometry and individual variability, an overall length is estimated for the holotype specimen (Fig. 4). The additional six specimens recovered here are of similar size, and certainly no less than 3.5 m long. This extremely large size appears to have evolved in Megaloceratoceratops independently of comparable maximum size (3.5 m lengths) in the species of Macroceranops (Wright, 1988, 1991; Maser, 1985, 1991), which is a mid-Cretaceous (Albian-Turonian) genus from Brazil and South Africa. Macroceranops belongs to a monophyletic group that includes Papithere, Chasmatosaurus, and Acretodorstacceleytre (Perry, 1988; Maser, 1991) but does not include Lutternseria.

Lutternseria attains lengths of ~1.5 m (Bentor and Conto, 1991), nearly dou-

Figure 3. Ceratopsid of Megaloceratoceratops. Top row: Right coronoid of Megaloceratoceratops holotype AMNH 3803 in medial view (A), lateral view (B), and ventral view (C). Bottom row: left coronoid fragment AMNH 6643 in medial view (D), ventral view (E), and lateral view (F). Scale bar is for all figures.

| Table 1: Location, Age, and Composition of Cretaceous Ceratopsid Fossils of the Eastern United States |
|---|---|---|---|
| No. | Locality | Stratum | Age | Material |
| CJK 33-3-1 | Barbour Co., Ala. | Plains Wood | Early Cenomanian | Right and left parzygophyseal, mandibular and postorbital girdle, left premaxilla, right zygodentale, maxilla, and nasal; left maxilla, frontal, and teeth. |
| CJK 33-3-1 | Russell Co., Ala. | Plains Wood | Early Cenomanian | Right and left parzygophyseal, mandibular and postorbital girdle, left premaxilla, right zygodentale, maxilla, and nasal; left maxilla, frontal, and teeth. |
| CJK 33-15-1 | Sumter Co., Ga. | Plains Wood | Early Cenomanian | Right and left parzygophyseal, mandibular and postorbital girdle, left premaxilla, right zygodentale, maxilla, and nasal; left maxilla, frontal, and teeth. |
| ALMP 3824 | Dallas Co., Ark. | Macon Wood | Early Cenomanian | Right and left parzygophyseal, mandibular and postorbital girdle, left premaxilla, right zygodentale, maxilla, and nasal; left maxilla, frontal, and teeth. |
| fMNH P7528 | Dallas Co., Ark. | Macon Wood | Early Cenomanian | Right and left parzygophyseal, mandibular and postorbital girdle, left premaxilla, right zygodentale, maxilla, and nasal; left maxilla, frontal, and teeth. |
| ALMP 3904 | Montgomery Co., Ark. | Macon Wood | Early Cenomanian | Right and left parzygophyseal, mandibular and postorbital girdle, left premaxilla, right zygodentale, maxilla, and nasal; left maxilla, frontal, and teeth. |
| AMNH 6643 | Montrose, N.D. | Madisonian | Early Cenomanian | Right and left parzygophyseal, mandibular and postorbital girdle, left premaxilla, right zygodentale, maxilla, and nasal; left maxilla, frontal, and teeth. |
| Note: CJK = Colter State College; ALMP = American Museum of Natural History. |

Table 2: Comparison of Skeletal Characteristics of Jurassic Ceratopsid and Holoceratid Ceratopsid Genera |
<table>
<thead>
<tr>
<th>Ceratopsid Genera</th>
<th>Prezygophyseal</th>
<th>Maxilla</th>
<th>Dinosaur</th>
<th>Zygomatic</th>
<th>Material</th>
<th>Crown Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mezloceratoceratops</td>
<td>Flanged</td>
<td>Quadrate</td>
<td>Very high</td>
<td>Absent</td>
<td>Osteoderm</td>
<td>Subacrocoronal</td>
</tr>
<tr>
<td>Lutternseria</td>
<td>Flanged</td>
<td>Quadrate</td>
<td>High</td>
<td>Present</td>
<td>Large</td>
<td>Subcoronal</td>
</tr>
<tr>
<td>Macroceranops</td>
<td>Flanged</td>
<td>Quadrate</td>
<td>High</td>
<td>Present</td>
<td>Medium</td>
<td>Subcoronal</td>
</tr>
<tr>
<td>Holoceratops</td>
<td>Flanged</td>
<td>Quadrate</td>
<td>High</td>
<td>Present</td>
<td>Medium</td>
<td>Subcoronal</td>
</tr>
<tr>
<td>Macroceranops</td>
<td>Flanged</td>
<td>Quadrate</td>
<td>Low</td>
<td>Absent</td>
<td>Osteoderm</td>
<td>Subacrocoronal</td>
</tr>
<tr>
<td>Turidoceratops</td>
<td>Straight</td>
<td>Triangular</td>
<td>Low</td>
<td>Absent</td>
<td>Osteoderm</td>
<td>Subacrocoronal</td>
</tr>
<tr>
<td>Ceratopsia</td>
<td>Straight</td>
<td>Triangular</td>
<td>Low</td>
<td>Absent</td>
<td>Osteoderm</td>
<td>Subacrocoronal</td>
</tr>
</tbody>
</table>

Note: Ceratopsia is a clade of ceratopsids. | Original height | Original height | Original height |
<table>
<thead>
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<th></th>
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<tbody>
<tr>
<td>905</td>
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<td>905</td>
</tr>
</tbody>
</table>

Geology, June 1984
pared material, including AMNH 56150, are presented in Table 2.

Mathematical analysis of Table 2 would be trivial, given the few characters available for comparison, but it is apparent that sufficient apomorphies (e.g., ventral pterygoid flange, giant size, subcircular coronid, absence of marginal dentition) are present to separate Megalocoelacanthus from all other genera; the data also indicate that Latineria and Macronpora are closest morphologically to Megalocoelacanthus.

Overall size is a labile feature in animals, but it is clear that Megalocoelacanthus was very large. The gross size is extrapolated from measured dimensions of the holotype (502 mm length) and right palate (395 mm dorsoventrally, 330 mm antero-posteriorly), the paratype complete right gular (481 mm length), and other bones, all compared with the corresponding bones in larger specimens of Latineria (e.g., AMNH 56150) and Mawsonia (AMNH 12217, 12216). Allowing for some allometry and individual variability, an overall length of 3.5 m is estimated for the holotype specimen (Fig. 4). The additional six specimens reported here are of similar size, and certainly no less than 3.0 m long. This extremely large size appears to have evolved in Megalocoelacanthus independently of comparable maximum size (3.5 m lengths) in species of Mawsonia (Wenz, 1980, 1981; Maisey, 1986, 1991), which is a mid-Cretaceous (Albian-Turonian) genus from Brazil and North Africa. Mawsonia belongs to a monophyletic group that includes Diploites, Chinlea, and Axelrodichthys (Foreray, 1988; Maisey, 1991) but does not include Latineria.

Latineria attains lengths of −180 cm (Bruton and Coutouvidis, 1991), nearly dou-

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**Figure 3. Coronoids of Megalocoelacanthus.** Top row: Right coronoid of Megalocoelacanthus dubiel paratype AJMP 3834 in medial view (A), lateral view (B), and ventral view (C). Bottom row: left coronoid fragment AMNH 6643 in medial view (D), ventral view (E), and lateral view (F). Scale bar is for all figures.

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**Table 1.** Location, Age, and Composition of Cretaceous Coelacanth Fossils of the Eastern United States

<table>
<thead>
<tr>
<th>No.</th>
<th>Locality</th>
<th>Stratum</th>
<th>Age</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCK 88-2-1</td>
<td>Barbour Co., Ala., N. Fork Cowhee Ck.</td>
<td>Bluffton Fm.</td>
<td>Early Campanian</td>
<td>Right and left pterygoquadrate, mandibles, and pectoral girdles; left operculum, zygol plate, many branchial elements, dorsal fin spine, many unidentified bones</td>
</tr>
<tr>
<td>CCK 93-6-1</td>
<td>Russell Co., Ala., High Log Ck.</td>
<td>Bluffton Fm.</td>
<td>Early Campanian</td>
<td>Right angular fragment</td>
</tr>
<tr>
<td>CCK 93-13-1</td>
<td>Stewart Co., Ga., Hannahbachee Ck.</td>
<td>Bluffton Fm.</td>
<td>Early Campanian</td>
<td>Right angular fragment</td>
</tr>
<tr>
<td>AUMP 3834</td>
<td>Dallas Co., Ala., Harrell Station</td>
<td>Mooreville Fm.</td>
<td>Early Campanian</td>
<td>Right mandible, right coronid, right and left pterygoquadrate and (free) metapterygoid, right gular, left operculum, right ceratohyal, single indeterminate branchial</td>
</tr>
<tr>
<td>FMNH P27524</td>
<td>Dallas Co., Ala., Harrell Station</td>
<td>Mooreville Fm.</td>
<td>Early Campanian</td>
<td>Right pterygoquadrate</td>
</tr>
<tr>
<td>AUMP 3944</td>
<td>Montgomery Co., Ala., Catoma Ck.</td>
<td>Tombigbee Mbr. of Etaw Fm.</td>
<td>Late Santonian-Early Campanian</td>
<td>Right pterygoquadrate</td>
</tr>
<tr>
<td>AMNH 6643</td>
<td>Marlboro, N.J., Big Brook</td>
<td>Marshalltown to Navesink Fms.</td>
<td>Late Campanian-Early Campanian</td>
<td>Ventral coronid fragment</td>
</tr>
</tbody>
</table>

Note: CCK—Columbus (Georgia) College; AUMP—Auburn (Alabama) University Museum of Paleontology; FMNH—Field Museum of Natural History (Chicago); AMNH—American Museum of Natural History (New York).

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**Table 2.** Comparison of Skeletal Characteristics of Jurassic, Cretaceous, and Holocene Coelacanth Genera

<table>
<thead>
<tr>
<th></th>
<th>Pterygoid*</th>
<th>Operculum shape</th>
<th>Basiphenoid*</th>
<th>Dentition</th>
<th>Sizes1</th>
<th>Habitat</th>
<th>Coroind shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Megalocoelacanthus</td>
<td>Flanged</td>
<td>Quadrilateral</td>
<td>Very high</td>
<td>Absent</td>
<td>Giant</td>
<td>Marine</td>
<td>Subbround</td>
</tr>
<tr>
<td>Latineria</td>
<td>Flanged</td>
<td>Quadrilateral</td>
<td>High</td>
<td>Present</td>
<td>Large</td>
<td>Marine</td>
<td>Subbquadangular</td>
</tr>
<tr>
<td>Macronpora</td>
<td>Flanged</td>
<td>Quadrilateral</td>
<td>High</td>
<td>Present</td>
<td>Medium</td>
<td>Marine</td>
<td>Subtriangular</td>
</tr>
<tr>
<td>Holophagus</td>
<td>Partial</td>
<td>Quadrilateral</td>
<td>High</td>
<td>Present</td>
<td>Medium</td>
<td>Marine</td>
<td>Subtriangular</td>
</tr>
<tr>
<td>Mawsonia</td>
<td>Straight</td>
<td>Triangular</td>
<td>Low</td>
<td>Absent</td>
<td>Large</td>
<td>Nonmarine?</td>
<td>Subtriangular</td>
</tr>
<tr>
<td>Axelrodichthys</td>
<td>Straight</td>
<td>Triangular</td>
<td>Low</td>
<td>Absent</td>
<td>Medium</td>
<td>Nonmarine?</td>
<td>Subtriangular</td>
</tr>
<tr>
<td>Diploites</td>
<td>Straight</td>
<td>Quadrilateral</td>
<td>Low</td>
<td>Intermiate</td>
<td>Small</td>
<td>Nonmarine</td>
<td>Subtriangular</td>
</tr>
</tbody>
</table>

*Ventral margin—straight, partial, or fully flanged.

1Relative dorsoventral height.

1Small: <25 cm; medium: 25-100 cm; large: 100-250 cm; giant: >250 cm.

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GEOLOGY, June 1994
ble the size of *Macropoma*, previously thought to be its closest relative (Forey, 1984, 1988). The larger size of *Latimeria* compared with other genera in the clade, as well as the relatively young age of *Megalocoelacanthus*, suggests that the latter may be the proximal ancestor of the living coelacanth.

The left coroid fragment AMNH 6643 (Fig. 3, D–F) is essentially indistinguishable from, although slightly larger than, the corresponding region on the well-preserved right coroid of AUMP 3834 (Fig. 3, A–C). AMNH 6643 derives with certainty from a giant coelacanth with a coroid indistinguishable from that of *Megalocoelacanthus*, but we hesitate to firmly assign the New Jersey specimen to *M. dobiei* on the basis of this single bone comparison. Nevertheless, AMNH 6643 is the youngest definite fossil coelacanth found so far.

CONCLUSIONS

Most of the giant coelacanth specimens were collected recently, but three were found misidentified in existing museum collections. The substantial amount of material known from *Megalocoelacanthus dobiei* in the southeastern U.S. Coastal Plain suggests that the fish were common in the nearshore marine biota, and the New Jersey specimen suggests that they ranged widely. The sedimentary environments of the species occurrences include the open-marine carbonate shelf for the Mooreville Formation in western Alabama (Applegate, 1970), and nearshore, back-barrier, and estuarine environments for the Eutaw and Bluffton Formations in central and eastern Alabama, and western Georgia (Schwimmer, 1986; Case and Schwimmer, 1988). Thus, it is evident that these Late Cretaceous coelacanths favored marine environments similar to the habitats of the latest European coelacanth genus *Macropoma*, which is found in the Upper Cretaceous chalks of England (Woodward, 1909).

Although it seems odd that bones of such large creatures were unrecognized until recently, the sizeable sample now identified indicates that additional Late Cretaceous (and perhaps younger) coelacanth fossils are probably present but identified incorrectly in existing collections. The very large size of these coelacanth materials may have disguised their nature: indeed, the fossils could be mistaken for dinosaur or mosasaur bones. The presence of such large and apparently common fish in the marine shelf fauna requires reinterpretation of contemporary food webs in the Late Cretaceous nearshore biota of the eastern U.S. Coastal Plain.

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