

Inventory of Paleozoic Fossils in Cades Cove, Great Smoky Mountains National Park, Tennessee

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Abstract—Carbonate rocks of marine origin form the bedrock of Cades Cove, in the western part of Great Smoky Mountains National Park. Some of these limestones and dolostones contain fossils. All of the faunas known to date indicate a medial Early Ordovician age and correlation with the middle part of the upper Knox Group and with the Jonesboro Limestone in eastern Tennessee outside of the Park. An inventory of known Paleozoic fossils from Cades Cove is presented herein; the faunas include conodonts, brachiopods, mollusks, and trilobites.

Introduction

Nearly all of the bedrock in Great Smoky Mountains National Park, North Carolina and Tennessee, is barren of fossils. However, the bedrock in Cades Cove, in the western part of the Park (Figure 1), consists chiefly of fossiliferous carbonate sedimentary rock of marine origin. These lower Paleozoic carbonate rocks, assigned to the Jonesboro Limestone of the Knox Group (Upper Cambrian and Lower Ordovician), contain the fossilized remains of several groups of marine animals. Fossils are common in these rocks; however, they are either small and easily overlooked or so small that they require a microscope for examination. The limestones and dolostones of Cades Cove have received very little paleontological study. Most of the previous collecting was related to earlier mapping in the Park and to studies related to regional geologic structure and Appalachian basin geologic history. Current geologic research in the Park includes additional paleontological studies in Cades Cove. This report is a preliminary summary of the fossils currently known from Cades Cove.

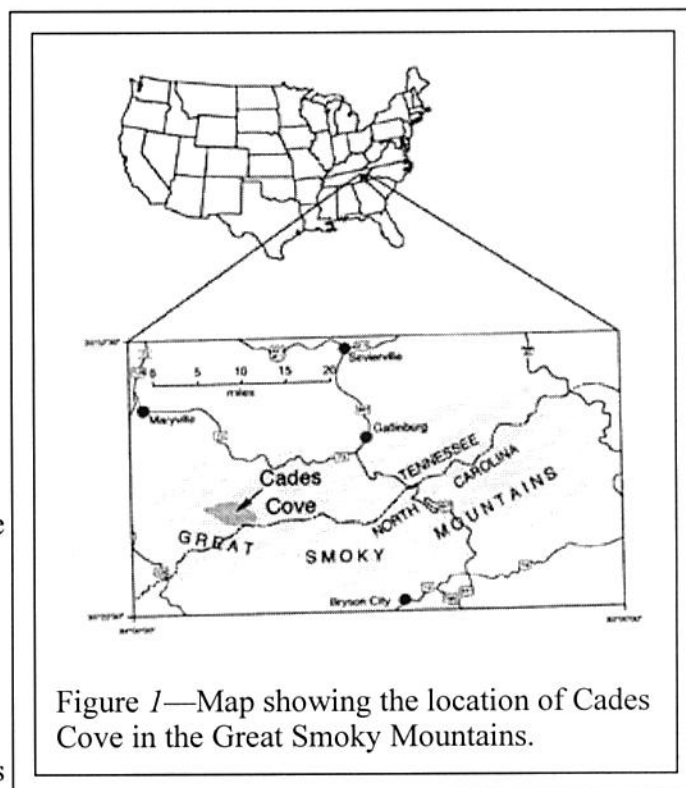


Figure 1—Map showing the location of Cades Cove in the Great Smoky Mountains.

As with artifacts and living plants and animals, the fossils of this and all other National Parks can be collected only with formal permission from the appropriate Park Superintendent.

Microfossils

Conodonts are tiny (generally 0.1 to 1 mm), calcium phosphate, tooth-shaped microfossils that were the only hard parts of a group of extinct marine animals. These animals, also called conodonts, were common to abundant in most marine environments from the Late Cambrian through the Triassic Periods, that is from about 510 million to about 205 million years ago. Conodonts are known from five

samples of the Jonesboro Limestone in Cades Cove.

Sample SOCC-25 [USGS fossil locality 10448-CO].—Collected by A.P. Schultz & R.C. Orndorff; locality published in Orndorff and others (1988). This sample, as well as SOCC-26 and SOCC-27, were processed and the faunas initially analyzed by Orndorff and A.G. Harris in USGS internal report (E & R) O&G-86-4; the faunas were re-analyzed for the present report. *Colaptoconus quadraplicatus* (Branson & Mehl) (Figure 2C_D)

3 quadraplicatiform elements

46 triplicatiform els.

29 *Drepanoistodus concavus* (Branson & Mehl)

6 *Eucharodus parallelus* (Branson & Mehl)

1 *E. toomeyi* (Ethington & Clark)

5 aff. *E. parallelus*

9 cf. *Laurentoscandodus triangularis* (Furnish) (Figure 2A)

16 *Macerodus diana*e Fahraeus & Nowlan (Figure 2A)

Rossodus? n. sp. (Figure 2B)

38 coniform elements

9 oistodontiform els.

1 "*Scolopodus*" *acantiodiformis* Repetski

5 "*S.*" *filosus* Ethington & Clark

88 *Striatodontus?* *prolificus* Ji & Barnes (Figure 2E_G)

1 *Ulrichodina abnormalis* (Branson & Mehl)

18 Genus & species undetermined

1 unassigned oistodontiform element

11 indeterminate coniform elements

Age.—Early Ordovician; early middle Ibexian; *Macerodus diana*e Zone.

Sample SOCC-26 [USGS foss. loc. no. 10449-CO].—Collected by A.P. Schultz & R.C. Orndorff; locality published in Orndorff and others (1988).

1 *Colaptoconus quadraplicatus* (Branson & Mehl) (Figure 2C_D)

1 *Striatodontus? prolificus* Ji & Barnes (Figure 2E_G)

1 indeterminate fragment

Age.—Early Ordovician; early middle Ibexian; "Low Diversity Interval" to *Macerodus diana* Zone.

Sample SOCC-27 [USGS foss. loc. no. 10450-CO].—Collected by A.P. Schultz & R.C. Orndorff.

1 *Colaptoconus quadraplicatus* (Branson & Mehl);

triplicatiform element

1 cf. *Eucharodus parallelus* (Branson & Mehl)

5 indeterminate fragments

Age.—Early Ordovician; middle or late Ibexian; "Low Diversity Interval" to *Reutterodus andinus* Zone.

Sample RBN-1941-1 [USGS fossil locality number 11493-CO].—Collected by R.B. Neuman, in 1941. Sample represents matrix from sample collected for macrofossils; processed by Repetski.

Colaptoconus quadraplicatus (Branson & Mehl)

6 quadraplicatiform elements

5 triplicatiform elements

4 *Drepanoistodus concavus* (Branson & Mehl);

drepanodontiform els.

3 cf. *Eucharodus toomeyi* (Ethington & Clark)

Rossodus? aff. R. manitouensis Repetski & Ethington

1 coniform element

3 "*Scolopodus*" *filosus* Ethington & Clark

1 *Striatodontus? prolificus* Ji & Barnes

1 *Ulrichodina deflexa* Furnish

1 unassigned drepanodontiform element

2 unassigned scandodontiform els.

Age.—Early Ordovician; early middle Ibexian; *Macerodus diana*e to lower part of *Acodus deltatus*-*Oneotodus costatus* Zone.

Sample Cades Cove block 97-1 [USGS fossil locality number 11494-CO].—Collected by C.S. Southworth (USGS), 1997; sample was a block of silicified-brachiopod-rich lime wackestone. Sample was processed by Repetski in acetic acid as a single block to recover the brachiopods, as well as the acid-insoluble conodonts and possibly other microfossils. About one-third to one-half of the block was dissolved before neutralization of the acid bath, so that many of the brachiopods are partially exposed from the etched block. Conodonts are listed below.

Colaptoconus quadraplicatus
(Branson & Mehl)

15 quadraplicatiform elements

24 triplicatiform elements

2 *Drepanodus* sp. cf. *D. arcuatus*
Pander;

drepanodontiform element

7 *Drepanoistodus* sp., aff. *D. concavus* (Branson & Mehl)

11 *Eucharodus parallelus*
(Branson & Mehl)

2 *Eucharodus* sp.

2 *Eucharodus*? sp.

2 *Paroistodus*? n. sp.

4 *Scalpellodus*? sp.

Utahconus? n. sp.

9 coniform elements 4

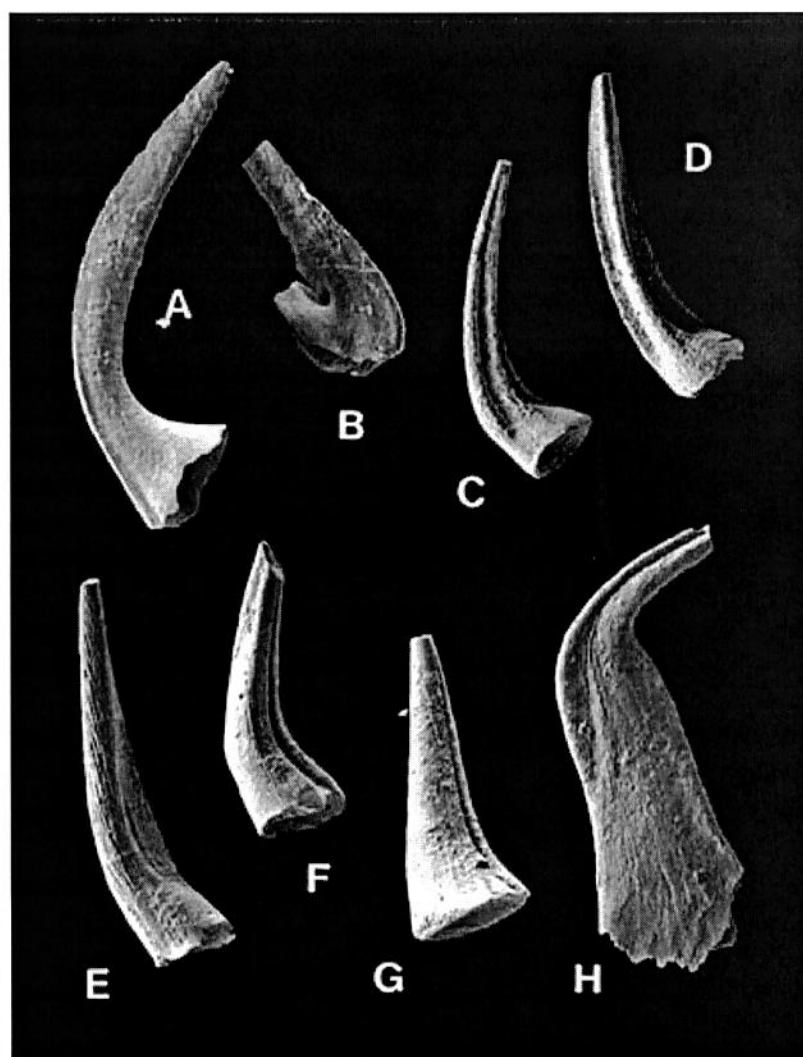


Figure 2—Scanning electron microscope (SEM) photomicrographs of some representative conodont elements from Cades Cove, Great Smoky Mountains National Park, Tennessee. All are from USGS fossil collection locality 10448-CO. These specimens are reposit in the type collections of the Paleobiology Department, U.S. National Museum (USNM), Washington, D.C. 20560. *A*, cf. *Laurentoscandodus triangularis* (Furnish); inner lateral view of tall-based drepanodontiform element, X80, USNM 498189. *B*, *Rossodus*? new species; inner lateral view of oistodontiform element, X120, USNM 498190. *C–D*, *Colaptoconus quadraplicatus* (Branson and Mehl); posterolateral views of quadraplicatiform and triplicatiform elements, respectively, X150, USNM 498191 and 498192. *E–G*, *Striatodontus? prolificus* Ji and Barnes; posterolateral

scandodontiform els.

5 *Ulrichodina deflexa* Furnish

1 unassigned drepanodontiform element

views, X150 (E, F) and X120 (G), USNM 498193-195. *H. Macerodus diana*e F&Ehraeus and Nowlan; lateral view, X 160, USNM 498196.

1 Genus & species indeterminate

14 indeterminate coniform elements

Age.—Early Ordovician; early middle Ibexian; *Macerodus diana*e to lower part of *Acodus deltatus*-*Oneotodus costatus* Zone.

Macrofossils

Brachiopods are the most common of the known shelly macrofossils in the Jonesboro Limestone of Cades Cove, followed by rare mollusks (including gastropods and nautiloid cephalopods) and trilobites. Neuman (1947) collected the only known published macrofauna; the identifications were made by G.A. Cooper of the Smithsonian Institution, Washington, D.C.

Brachiopods.—*Diaphelasma pennsylvanicum* Ulrich & Cooper; (locality 1 in Neuman, 1947). *Finkelburgia virginica* Ulrich & Cooper; (locality 1 in Neuman, 1947). *Xenelasma syntrophioides* Ulrich & Cooper; (locality 3 and several other exposures perhaps of one bed, spottily exposed over about a mile, in Neuman, 1947).

Mollusks.—cf. *Orthoceras* (nautiloid cephalopod); (locality 2 in Neuman, 1947). *Hormotoma* sp. (gastropod); (locality 1 in Neuman, 1947). *Lecanospira* sp. (gastropod); ((locality 2 and at several other sites, presumably in several stratigraphic horizons, according to Neuman, 1947)

Trilobites.—*Hystricurus*(?) sp.; (locality 1 in Neuman, 1947)

The three species of brachiopod reported by Neuman (1947) are represented by approximately ten valves of each species. These are loose silicified specimens and are repositied in the collections of the Paleobiology Department of the U.S. National Museum of Natural History, Washington, D.C. They are small and extremely delicate. There is no record of any of the cephalopods or gastropods being repositied in the collections. According to Neuman's recollections (oral commun., 1997), some of the identifications of the mollusks were field identifications, with the specimens not collected. This is the case with the trilobite as well; apparently this record is based on one specimen exposed on a pinnacle of limestone, which was not collected.

Additional brachiopods were freed from the block (97-1) collected by Southworth (mentioned above in conodont section). Several dozen specimens were recovered in the acidizing process. These also are small and fragile; preservational quality varies widely. These specimens most likely represent the same species identified by Cooper for Neuman. More could be extracted rather routinely from the appropriately silicified horizon(s).

Biostratigraphy and Correlation

The macro- and microfossils are consistent in

indicating a lower middle Ibexian (Lower Ordovician) stratigraphic assignment for their host rocks. The fossils and rocks are totally consistent with their deposition on the carbonate continental shelf or ramp in tropical or semi-tropical latitudes on the Iapetus (proto-Atlantic) Ocean-facing edge of the Laurentian (including present North America) paleocontinent (Figure 3). The best correlation with Knox Group rocks in eastern Tennessee, which comprise shallower paleoenvironments on this part of the continental shelf, is with the uppermost part of the Chepultepec Dolomite, the Kingsport Formation, to the lower, probably lowermost, part of the Mascot Dolomite in sections west of the Saltville fault (e.g., see Repetski, 1985). This interval is approximately equivalent to that of the Longview-Kingsport interval of the Knox Group of older literature. To the northeast of the Great Smoky Mountains National Park, and in the eastern thrust belts of East Tennessee, the equivalent interval would be at some level in the Jonesboro Limestone. Systematically collected fossils from the Jonesboro are needed for precise correlation. Figure 4 shows the total possible stratigraphic ranges in the Ordovician of all of the fossil collections treated in this report.

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Figure 3—Paleogeographic reconstruction of North America for Early Ordovician time, showing relative location of Cades Cove.

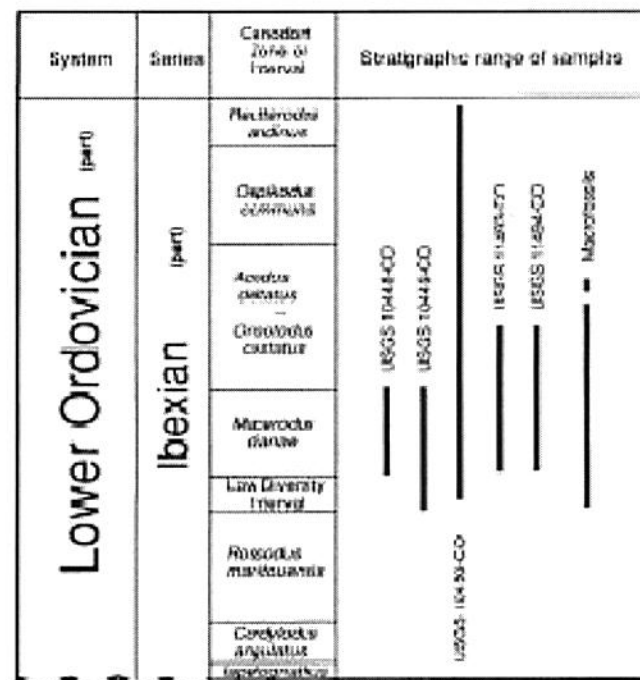


Figure 4—Diagram showing stratigraphic range in the Lower Ordovician of fossils known from

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Cades Cove.

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