

Middle Devonian (Emsian-Eifelian) mixed terrestrial, estuarine, and marine-invertebrate assemblages from the Trout Valley Formation, Baxter State Park, Maine



CHARSKY, Alyssa, BELTRAN, James, KNIGHT, Cassi, LANPHER, Henry W., MALICK, Geoffrey T., MATHES, Samuel B., MCCARTHY, Andrew L., OAKES, Jeffery A., SCHWARZ, Jacob J., and GASTALDO, Robert A., Department of Geology, Colby College, 5807 Mayflower Hill Drive, Waterville, ME 04901, acharsky@colby.edu

ABSTRACT

The Trout Valley Formation hosts early land plants preserved primarily in parautochthonous and allochthonous assemblages in a foreland basin formed during the last phases of Acadian orogenesis. Fullier reports have been published on outcrops along the northern and southern flanks of Baxter State Park, Maine. The formation is situated in the northern part of the estuarine (interfluvial) sequence is documented. The construction of Wadleigh Road within the Scientific Forest Management Area north of Trout Brook has unearthed pavement exposures in which both terrestrial plant and nearshore invertebrate assemblages occur in fine-grained siliclastic deposits.

Fossiliferous lithologies range from moderately sorted, olive gray (5Y 4/1) silty sandstone, with occasional rippled beds, to olive and dark gray (N3) sandy siltstone. Tidal channels occur sporadically, as indicated by laminated rhythmic states ranging from minimal degradation where fine structures are discernible to unidentifiable axial remains. Taxa include: the trimerophytes *Pertica quadrifaria*, *Psilophyton forbesii*, and *P. dapsile*; the zosterophylloids *Serrulacaulis furcatus*; and lycophytes of unidentified generic affinity. These occur either in heteromeric plant-fossil assemblages or in assemblages interspersed with invertebrates.

Invertebrates are reported from along Trout Brook and include the bivalve *Phytocia seiffertsi*, small spiral and planispiral gastropods, and a lenticular eurypterid of *Paralutimillera*. New invertebrate collections from Wadleigh Road include concentrated shelly assemblages of the bivalve *Modiomorpha concentrica*, isolated bivalves assigned to *Nuculites corrugatus*, and a scale impression of the eurypterid *Pterygotus* sp. all of which are interpreted as having inhabited estuarine conditions. The first open-marine brachiopod taxon, assigned to *Coleospira* sp., also was collected from the formation. This is represented by a single specimen assumed to be *P. scrofrons* in the sequence. These new collections extend our knowledge of Middle Devonian biodiversity in both the continental and marine realms.

INTRODUCTION

* Trout Valley Formation is an Emsian to Eifelian siliclastic succession deposited in response to erosion of a foreland basin northwest of the Acadian orogen

* Classical locality in which Devonian terrestrial plant assemblages are preserved, providing evidence for terrestrial colonization

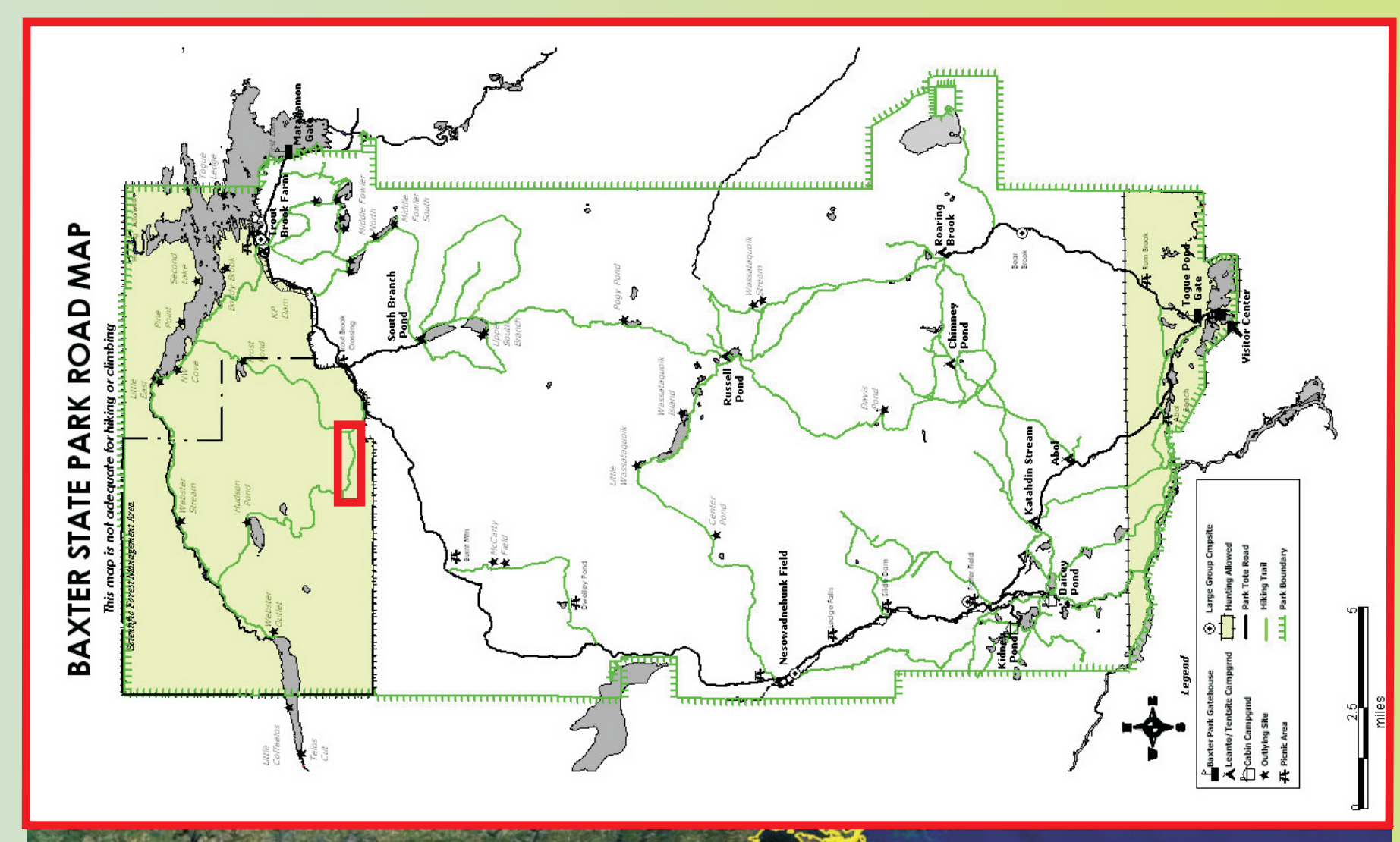
* Previous studies identified continental and estuarine fossil assemblages consisting of macroinvertebrates in association with plant debris from exposures along Trout Brook and South Branch Ponds Brook outcrops

* Discovery of newly excavated pavement outcrops along Wadleigh Road is special opportunity as few macrofaunal assemblages have been recovered from transitional and/or estuarine settings

* Purpose of study was a reconnaissance survey to enhance and expand lithologic and taxonomic understanding of the Trout Brook Region for Baxter State Park Authority

* Study hopes to provides further insight into Devonian invertebrate assemblages in the Maritimes and northern New England

LOCALITY



* Collections taken from along Wadleigh Road in the Forest Management Area of Baxter State Park, northern Maine

* Wadleigh Road was constructed in 2004, exposing pavement outcrops

* Bulldozed road is lined with scattered broken pavement outcrop with minimal displacement

* Colby College has exclusive permission to collect fossil materials in Baxter State Park

RESULTS

* Fossiliferous lithologies range from moderately sorted, olive gray (5Y 4/1) silty sandstone, with

* Symmetrical ripples defining bed contacts, to olive and dark gray (N3) sandy siltstone

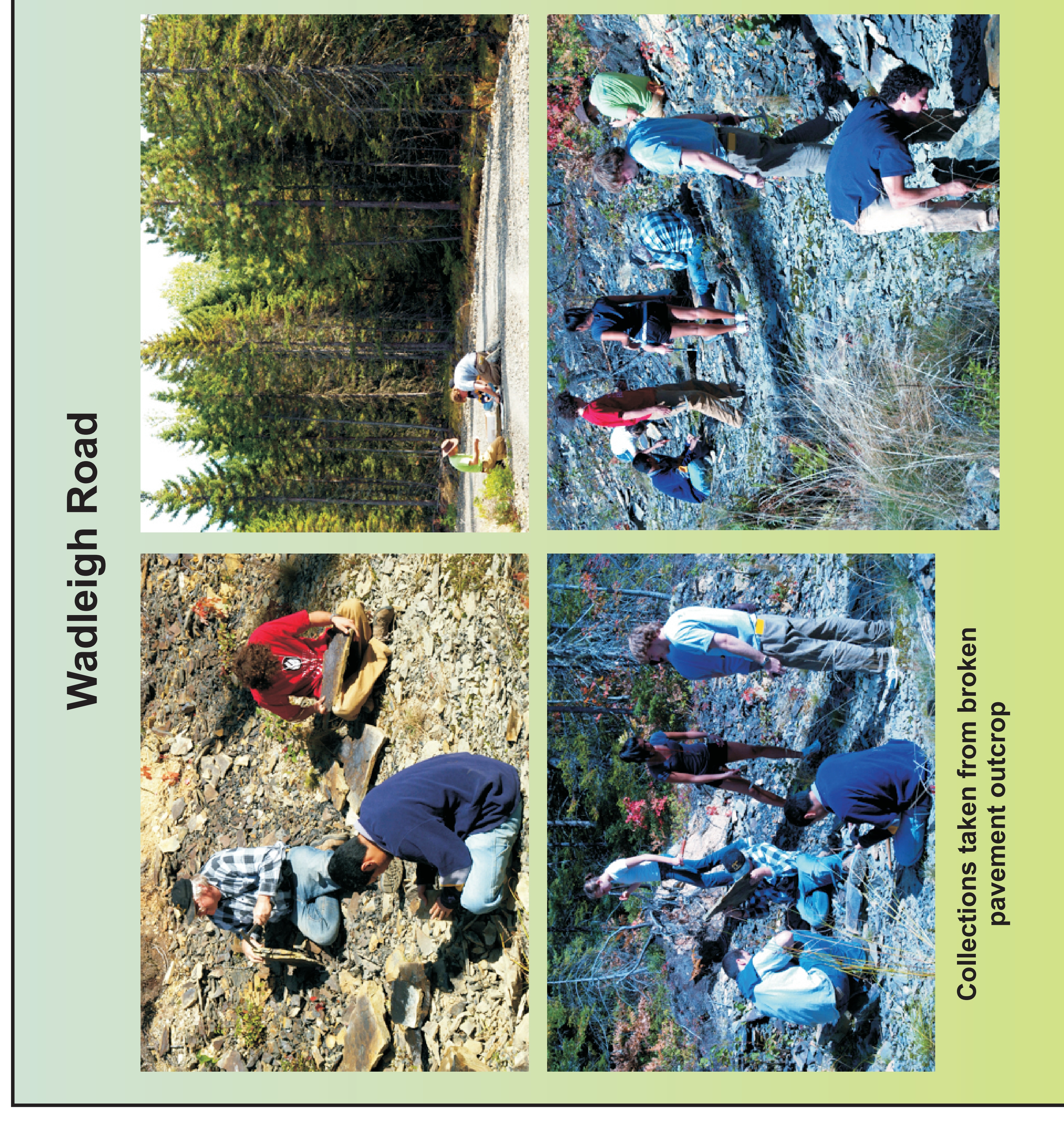
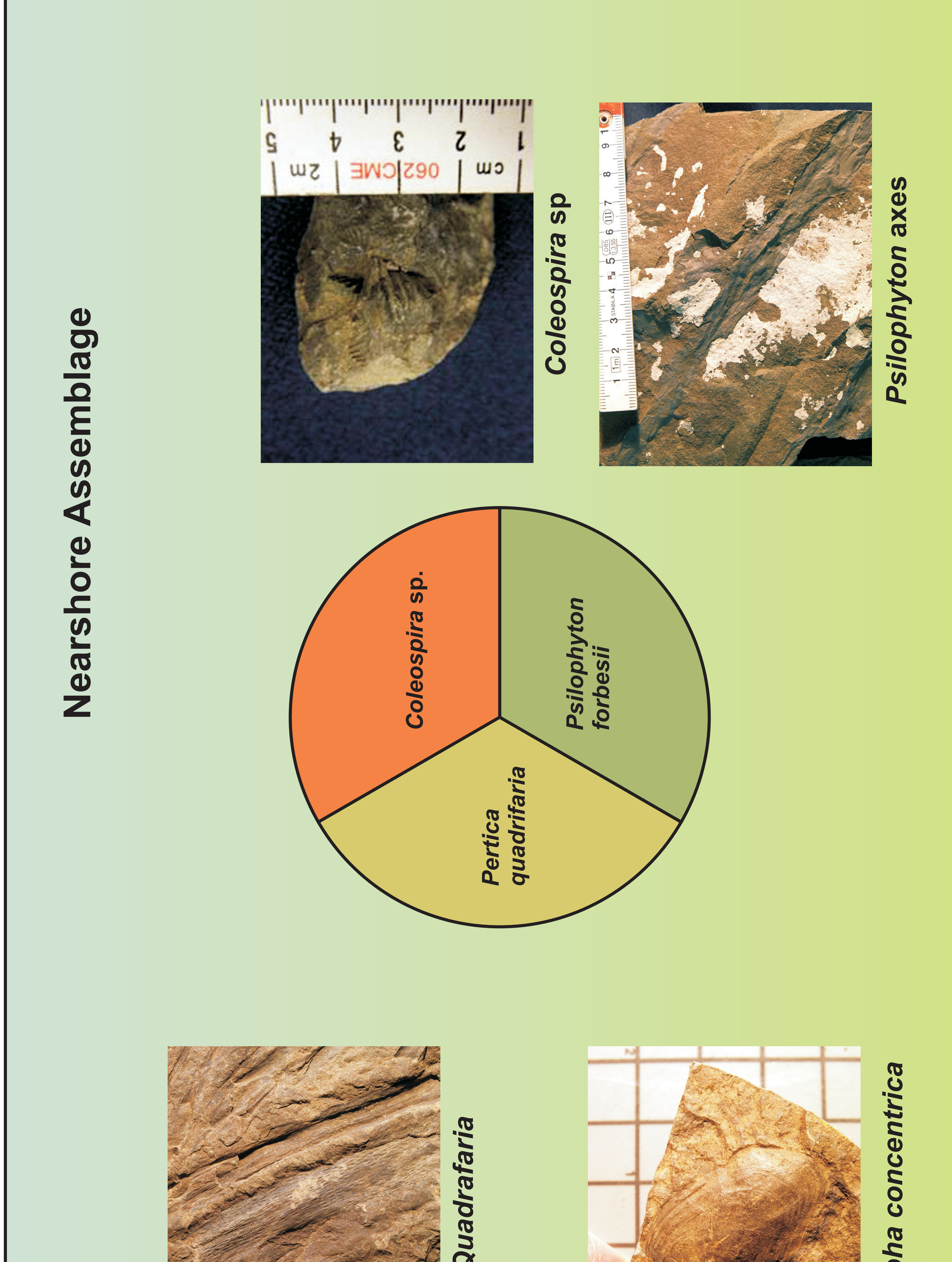
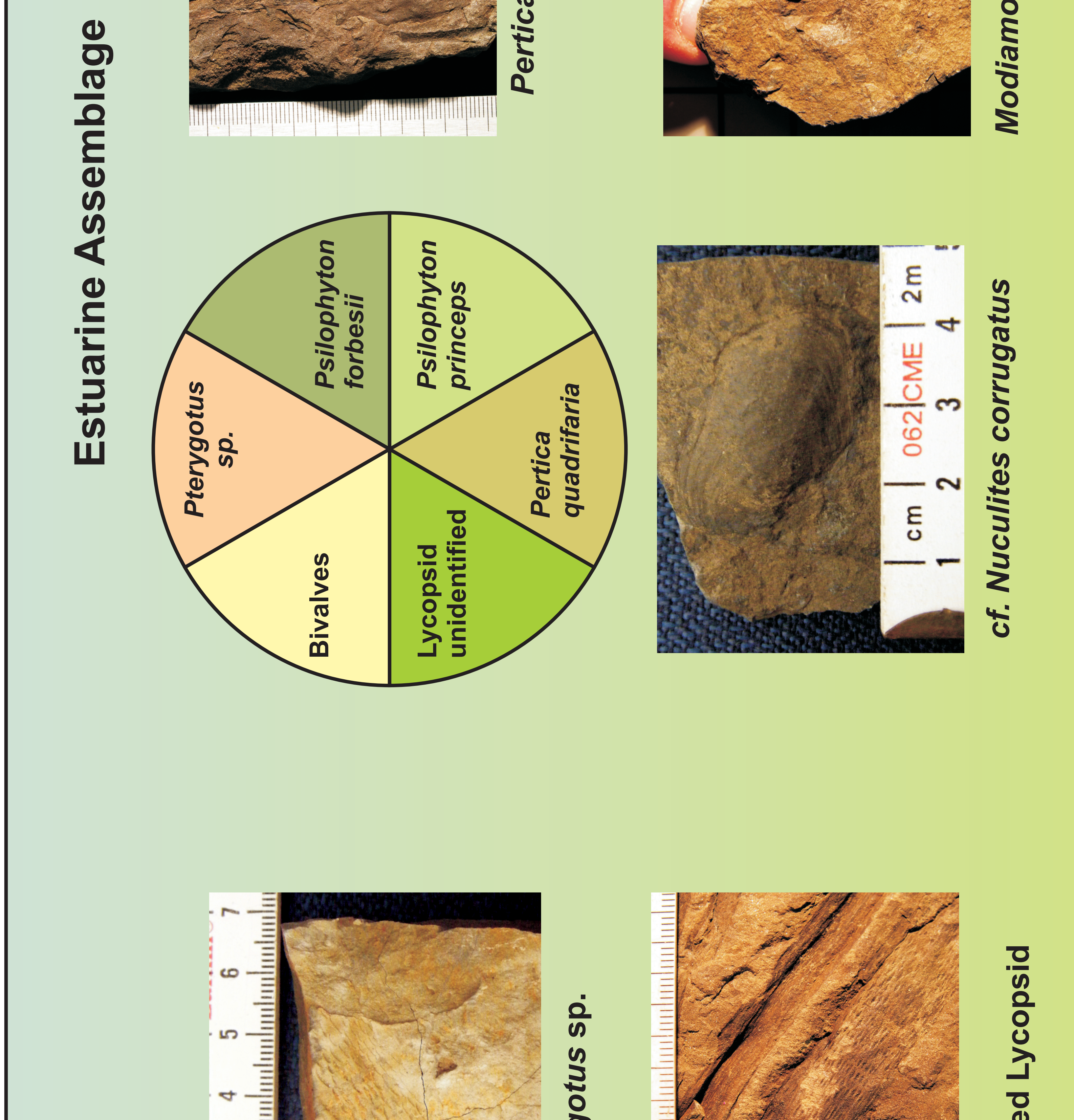
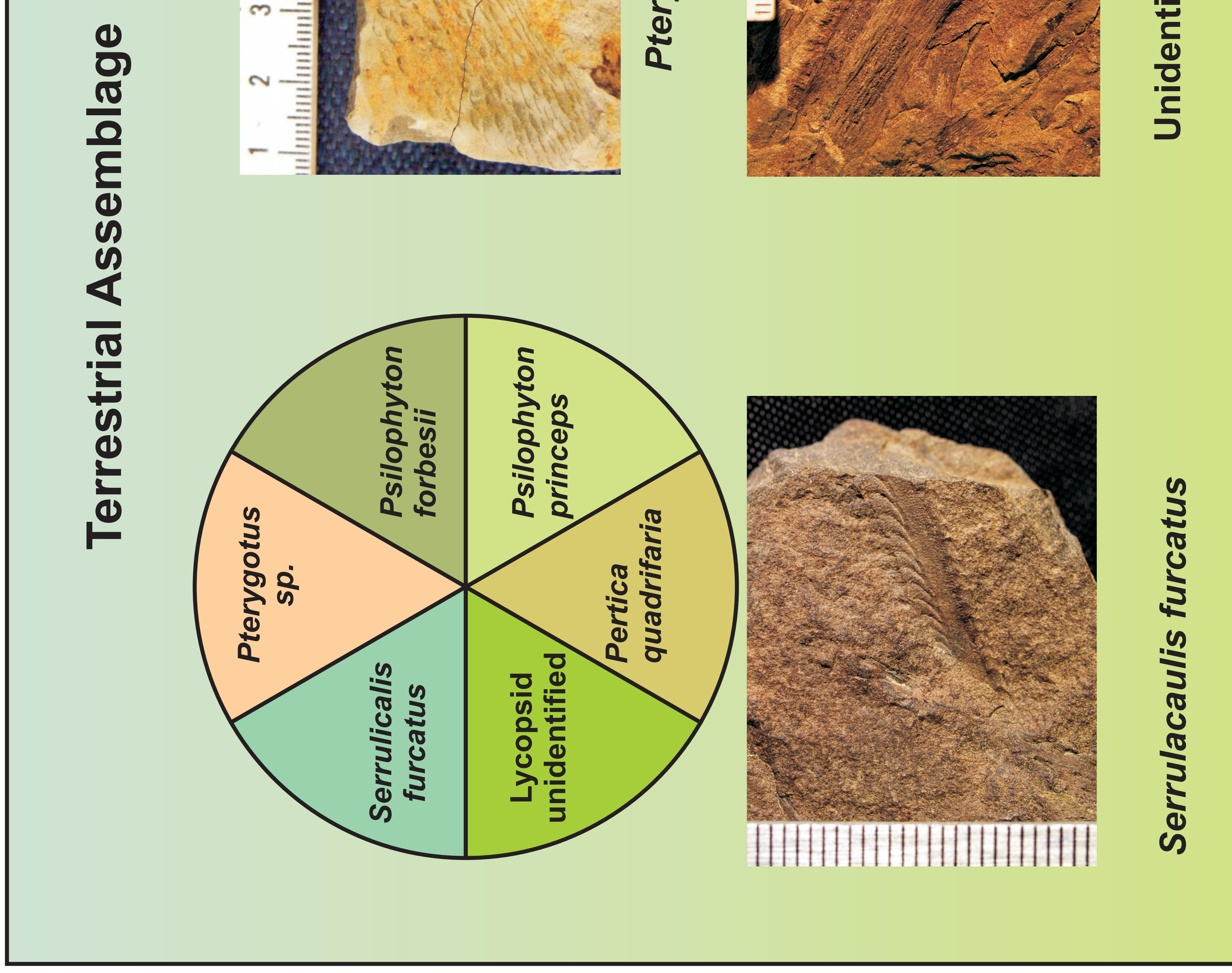
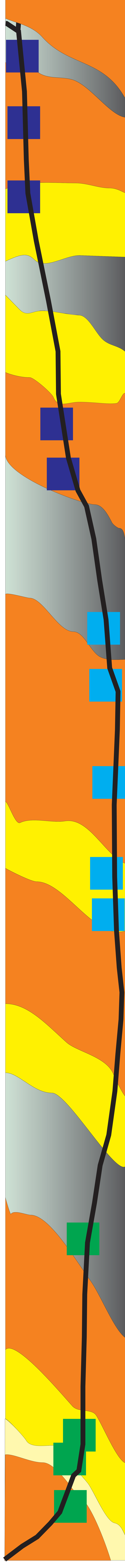
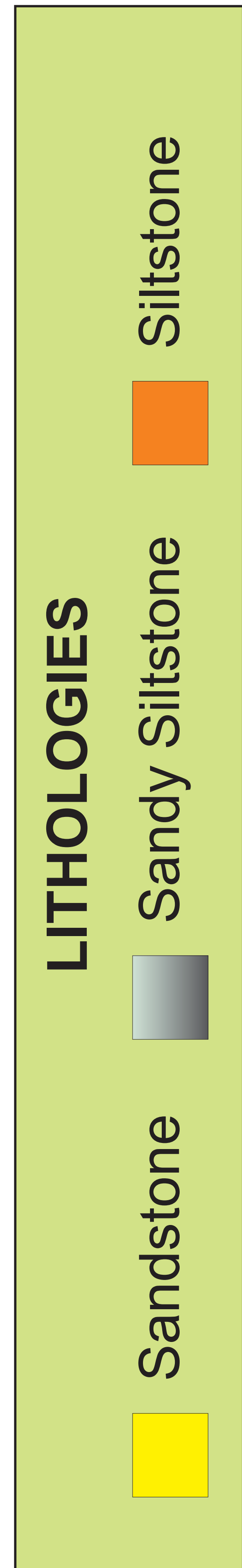
* Tidal channels occur sporadically, as indicated by laminated rhythmic

* Flora includes: Trimerophytes – *Pertica quadrifaria*, *Psilophyton forbesii*, *P. dapsile*, and *P. princeps*; the Zosterophylloids – *Serrulacaulis furcatus*; and unidentified Lycophytes

* Marine invertebrate taxa include: *Pterygotus* sp., *Modiomorpha concentrica*, cf. *Nuculites corrugatus*, and *Coleospira* sp.

* Near and offshore species predominate in the east; estuarine taxa predominate in the west

* Broken and disarticulate terrestrial plant fossils ranging from minimal degradation where fine structures are discernible to unidentifiable axial remains occur at all collection sites; diversity and sample count increases from east to west



Discussion & Conclusions

* Fossils and lithologies indicate fluvial to tidally influenced estuarine sequence from West to East

* Sediment and assemblages grade from terrestrial and nearshore, through estuarine with evidence of open-marine allochthonous elements capped in the East by fully terrestrial conditions

* Assemblages interpreted as parautochthonous (plant debris, *Modiomorpha* bedding plane concentrations) and allochthonous (*Coleospira*)

* Parautochthonous bivalves and eurypterid are thought to have inhabited estuarine conditions

* Open-marine brachiopod taxon assumed to be single specimen likely transported shoreward during storm activity

* Plant taxa transported down fluvial and tidal channels from original ecosystem

This study extends our scope and resolution of knowledge of Early to Middle Devonian biodiversity in the marine-terrestrial transitional environment

ACKNOWLEDGEMENTS

* This project was undertaken as original research in GE 251 – Record of Life, Fall 2008

* We would like to express our thanks to the Baxter State Park Authority, as well as Steven Rowe (Maine Attorney General), Roland D. Martin (Commissioner of Inland Fisheries & Wildlife), and Alec Giffen, (Director of Maine Forest Service) for allowing Colby College Geology Department students and faculty the privilege and opportunity to work in such a pristine, undisturbed, and unstudied environment.

* Our thanks also extends to Dr. Carlton Brett, Professor, Department of Geology, University of Cincinnati, for all of his help, wealth of knowledge, inspiration, and mentorship during our field work at Wadleigh Road.

* Funding for this project came from the Department of Geology Endowment Funds and the Dean of Faculty's Office, Colby College