

**LITHOLOGY AND DISTRIBUTION OF
THE SUWANNEE, OCALA AND AVON
PARK MEMBERS OF THE PORT
EVERGLADES FORMATION IN INDIAN
RIVER COUNTY, FLORIDA**

George O. Winston

Miami Geological Society
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ABSTRACT

Bermes (1958) reported the presence of "Oligocene", Ocala and Avon Park in Indian River County. He also reported Ocala fauna in the Avon Park and faulting along the coast, both of which I also observed. I reexamined a number of his wells to see if his report of these formations agreed with my recent lithologic redefinitions. Although we disagree on the unit boundaries, we agree that these three units are present. Two age dates from Brewster-Wingard (1997) indicate that what I am calling Suwannee is late Eocene in age. Interfingering and faunal discrepancies from their supposed formations characterize the subject rocks. In addition to occurring in Avon Park lithologies, Ocala foraminifera also occur in Suwannee lithology.

ACKNOWLEDGEMENTS

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INTRODUCTION

The report Bermes 1958 contains several water-well sample descriptions which include what he called Oligocene, Ocala and Avon Park in Indian River County. In order to establish whether these are the same lithologies I have seen in the southwestern Peninsula (Winston 1997), I examined 7 of these wells. The lithology of the units is the same in Indian River County as in the southwestern Peninsula section. As our units were not picked using the same criteria, our tops do not agree.

DATA BASE AND METHODS

Wells 1 through 7 are water wells. All water-well cuttings were sampled at 20-foot intervals except Well 7 which had 5-foot samples. The oil exploration Well 243 had 30-foot samples and injection Well 29 had 10-foot samples. These two wells I had examined previously.

Cuttings were examined wet with a 10x stereoscopic microscope. The cuttings appeared to be of good quality with a few short intervals of poor quality. Comparison data in the southwestern Peninsula consists of my own sample examinations of some 50 wells in the Suwannee-Ocala-Avon Park interval.

Pages 10 through 13 contain summaries of my Indian River sample descriptions. The Member terminology and lithologic character are from Winston 1997.

BASIC LITHOLOGIES

As set forth in Winston 1997, the Suwannee, Ocala and Avon Park are all members of the Port Everglades Formation. Two cross-sections (Figs. 3 & 4) show my lithologic determinations graphically. Summarized descriptions are also included.

Hawthorn Group There are six different lithologies which overlie the Suwannee. These are dolomite, sandy dolomite, shale, shells, sandy limestone and dolomitic sandstone.

Suwannee Member Bermes identified the Oligocene section based on its stratigraphic position between his Ocala and Hawthorn beds. In my examinations, I found the presence of two facies in this section. One a lower "normal" Suwannee Member facies consisting of cream to white-colored limestone with varying percentages of fine to medium-size rounded skeletal grains. This lithology is typical of the Suwannee Member in the southwestern Peninsula.

The other, a local upper facies, referred to herein as the Indian River facies consists of extremely fine-sized carbonate grains, in which is mixed silt-sized quartz and silt-sized glauconite. Chert is present in Well 6 (Fig. 4). The Indian River facies is confined to Wells 3 through 7 (Fig. 4), all of which lie within the fault block complex along the Atlantic coast. This Indian River facies must be a part of the Suwannee Member as in Well 6 it contains a 30-foot section of "normal" Suwannee lithology.

The thickness of the combined facies (Fig. 1a) ranges from 13 feet in Well 1 to over 165 feet in Well 7.

Ocala Member As was the custom in 1958, Bermes identified the Ocala by its fauna. As I used lithologic differences, our formation tops differ. Ocala lithology in the southwestern Peninsula consists of chalky to microgranular, cream-to-tan colored limestone (Winston 1997). In Indian River County the same lithologic character is exhibited by the Ocala Member.

Chert is present in Wells 6 and 7 (Fig. 4), both of which lie within the outermost block of the coastal faulted zone.

Occurrence in Indian River County of a thick section of Ocala Member lithology is unique for the east coast of the Peninsula. This lithology does not appear in any of my control wells along the entire east coast of the Peninsula. Ocala lithology may be present elsewhere, but my regional control is confined to deep wells.

The thickness of the Ocala Member in Indian River County ranges from zero in Wells 29 and 243 to 200 feet in Well 7 (Fig. 1b).

Avon Park Member In the southwestern Peninsula, this unit consists of cream to tan-colored limestone with varying percentages of fine to medium-sized rounded skeletal grains (Winston 1997). In Indian River County, the Avon Park lithology is the same.

None of the 7 water wells in this study completely penetrated the Avon Park. In the two deep wells it is 1950 feet thick in Well 243 and 1935 feet thick in Well 29. The Oldsmar Member is lithologically unidentifiable in this area; its equivalent section is included in the Avon Park Member.

I have not had the opportunity to examine the core from the well Phred #1 (W-13958), located in Sec23-32S-39E. I have, however, looked over the core description (Scott 1982) available from the Florida Geological Survey. Using the criteria from Winston 1997, I find that Scott's Oligocene unit has the same sandy phosphatic limestone lithology as does the basal Hawthorn to the south, and what was called Ocala has Suwannee Member

lithology. The well did not fully penetrate the Suwannee and did not encounter Ocala lithology as exhibited elsewhere in the area (Fig. 1b). Using my Suwannee Member top, the thickness of the unit is 101+ feet which is in close agreement with the thickness of 119 feet in Well 5 to the south in the same fault block. The gamma-ray log as published in Scott 1988 did not reach the bottom of the well, nor did it penetrate my Suwannee Member.

With a background of nine sample descriptions, my interpretation of the Phred core description is as follows:

1. There is no Indian River facies present, or if there is, it is extremely thin.

2. I would place the Suwannee top at 374 feet where the first white limestone without sand or phosphate occurs. In none of my nine control wells does Suwannee lithology contain sand or phosphate grains.

3. From Brewster-Wingard (1997) one strontium isotope and one dinocist date (both at 375 feet) indicate a late Eocene age for my Suwannee Member, the top of which is at 374 feet.

EXOTIC LITHOLOGY DISTRIBUTIONS (Figs. 3 & 4)

"Normal" Suwannee lithology, in beds up to 40 feet thick, occurs within the Avon Park section in Wells 243, 2 and 29 (Fig. 3) and in Well 3 (Fig. 4). Ocala lithology occurs as very thin beds within the Avon Park in Well 29 (Fig. 3) and in Wells 6 and 7 (Fig. 4). A thin bed of Ocala lithology also occurs in the "normal" Suwannee section in Wells 4, 5 and 7 (Fig. 4). A 30-foot bed of Avon Park lithology is present within the "normal" Suwannee sections in Wells 29 (Fig. 3) and 7 (Fig. 4).

In Winston 1995b evidence was presented showing major

interfingering in eastern Hendry County (study area map on Fig. 3) of Suwannee and Ocala lithologies, as well as interfingering of the Ocala and Port Everglades Formation lithologies. It is not surprising, therefore, to find that in Indian River County these three lithologies also appear to be interfingering in a similar manner.

CONTACTS BETWEEN MAJOR LITHOLOGIC UNITS

"Normal" Suwannee lithology overlies the Avon Park Member in Wells 243 and 29 (Fig. 3), and in Wells 4, 5 and 7 (Fig. 4). It overlies the Ocala Member in Wells 1, and 2 (Fig. 3) and in Wells 3, 6 and 7 (Fig. 4). The Indian River facies of the Suwannee overlies Ocala Member in Wells 3 and 6 (Fig. 4). Ocala lithology overlies the Avon Park Member in Wells 1 and 2 (Fig. 3) and in Wells 3, 6 and 7 (Fig. 4).

It is likely that the Suwannee-Ocala-Avon Park contacts are all related to changes in facies.

DISTRIBUTION OF FORAMINIFERA

Specimens of the genus Dictyoconus (principally (Dictyoconus cookei) are present in the Avon Park Member in Wells 2, 29 and 243 (Fig. 3), and in Suwannee lithology, which is interbedded with Avon Park lithology, in Wells 2 and 29 (Fig. 3).

Specimens of the genus Lepidocyclina and Operculinoides are conventionally used to define the Ocala. Bermes (1958 p. 50) was the first investigator to report their presence in the Avon Park;

"Occurrence of fauna typical of the upper part of the Ocala Group [and] below the upper part of the Ocala Group [in the

Avon Park] may be caving, although E. W. Bishop....and M. C. Schroeder (personal communication 1953) have noted similar occurrences in the cuttings from wells in other parts of southern Florida."

These observations were totally ignored.

In Winston 1995a, I published data showing the same occurrence of these foraminifera in the Avon Park, unaware that this phenomenon had been observed some thirty-five years previously. In 20% of the 150 wells I have examined throughout the Peninsula, I have seen the same phenomenon. Although a few of these occurrences might be attributed to caving, the numerous observations suggest that caving in most cases is not the explanation. Robert Caughey (personal communication) and Duncan et al. (in review) have also observed the same phenomenon.

In Indian River County these same "Ocala" foraminifera are present above the Ocala Member in "normal" Suwannee lithology in Wells 243 and 29 (Fig. 3) and in Wells 4 and 5 (Fig. 4). These foraminifera occur in Avon Park lithology in all wells except 243.

STRUCTURE

Due to interfingering of Ocala and Avon Park Members the structure map on the Avon Park (Fig. 2b) is of doubtful validity, as is structure on the unconformable Hawthorn-Suwannee contact (Fig. 2a). The most lithologically consistent horizon is the unconformable base of the overlying phosphatic Hawthorn Group beds. Structure on this horizon (Fig. 2a) conforms in general to structure on the Avon Park Member (Fig. 2b) in spite of the previous statement.

Both structure maps show that the western two-thirds of

Indian River County is virtually flat. There is only a 100-foot difference (roughly 3 feet per mile) in 18 miles between Wells 1 and 29 (Figs 2a & b). Near the coast the apparent dip increases to 50 feet per mile with a structural difference, as measured in right angles to the faults, of some 300 feet in six miles between Wells 3 & 7 (Fig. 2). This drastic change in dip near the coast, in addition to the greatly thickened Suwannee and Ocala Members there, was accounted for by Bermes with a series of normal faults. My contouring (Figs. 1 & 2) also shows faults, which produce a series of alternating horsts and grabens, a somewhat different interpretation than that of Bermes.

The fault between Wells 243 and 1 (Figs. 1 & 2) was originally proposed by Vernon (1951).

REFERENCES

Bernes, B.J., 1958, "Interim report on geology and ground water resources of Indian River County, Florida", Fla. Geol. Surv. IC 18, 74 p.

Brewster-Wingard, G.L., Scott, T.M., Edwards, L.E., Weedman, S.D., and Simmons, K.R., 1997, "Reinterpretation of the Peninsular Florida Oligocene: An integrated stratigraphic approach", Sedimentary Geology 108, p. 207-28.

Scott, T.M., 1982, Core description of Well W-13958, Fla. Geol. Surv., open file, 11 p.

Scott, T.M., 1988, "The lithostratigraphy of the Hawthorn Group (Miocene) of Florida", Fla. Geol. Surv. Bull. 59, 148 p.

Vernon, R.O., 1951, "Geology of Citrus and Levy Counties, Florida", Fla. Geol. Surv. Bull. 33, 256 p.

Weedman, S.D., Scott, T.M., Edwards, L.E., Brewster-Wingard, G.L. & Libarkin, J.C., 1945, "Preliminary analysis of integrated stratigraphic data from the Phred #1 core hole, Indian River County, Florida", USGS Open File 95-824, 63 p.

Winston, G.O., 1995a, "Evidence for the Interfingering of Ocala and Avon Park lithologies in southeastern Florida", Miami Geol. Soc. SC 3, 2p.

Winston, G.O., 1995b, "Evidence for the Interfingering of Suwannee, Ocala and Avon Park lithologies in northeastern Hendry County, Florida", Miami Geol. Soc. SC 7, 2p.

Winston, G.O., 1997, "Nomenclatural revision and lithologic definition of some middle Cenozoic units in Peninsular Florida", Miami Geol. Soc., in review.

Appendix

SAMPLE DESCRIPTIONS

Well 243 (oil test)

Location: 28-31S-35E

Hawthorn base 310 feet: dolomite, euhedral, orange/tan,
very fine crystalline, trace phosphate

Suwannee 310-400 feet (90)

lithology - limestone, grainstone & packstone, white & cream,
rounded very fine to medium skeletal grains

fauna - *Lepidocyclus*, *Operculinoides*

Ocala absent

Avon Park 400-800 feet (TD)

lithology - (400-600 feet) limestone, packstone, grainstone,
& wackestone, cream & white, rounded very fine to
skeletal grains

fauna - cones

Well 1 (Bermes water well 202, W-3021)

Location: 18-33S-36E

Hawthorn base 377 feet: limestone, white, shell fragments
cemented with chalky micrite, phosphatic

Suwannee 377-390 feet (13)

lithology - limestone, grainstone & wackestone, cream, rounded
very fine to fine skeletal grains

fauna - none

Ocala 390-440 feet (50)

lithology - limestone, chalky, cream

fauna - *Lepidocyclus* & *Operculinoides*

Avon Park 440-700 feet (TD)

lithology - (upper 80 feet) limestone, grainstone, cream,
rounded fine skeletal grains

fauna - *Lepidocyclus* & *Operculinoides*

Well 2 (Bermes water well 203, W-3017)

Location: 33-31S-37E

Hawthorn base 400 feet: sandy dolomite, orange/tan with very
fine grain sand, phosphatic

Suwannee 4010-20 feet (20)

lithology - limestone, wackestone, white with rounded, gray,
fine to medium skeletal grains (Bermes reports
glauconite)

fauna - none

Ocala 402-51 feet (31)

lithology - limestone, chalky, cream

fauna: *Lepidocyclus*, *Operculinoides* & *Camerina*

Avon Park 451-594 feet (TD)

lithology - limestone, grainstone, packstone & wackestone
cream interbedded with light gray, rounded very
fine to fine skeletal grains

fauna - *Lepidocyclus* & *Operculinoides* (both loose & imbedded
in grainstone) & cones

Well 29 (injection well)

Location: 25-33S-38E

Hawthorn base 470 feet: limestone, wackestone, tan, very fine rounded skeletal grains, phosphatic

Suwannee 470-560 feet (90)

lithology - limestone, grainstone & packstone, white & cream, rounded very fine to medium skeletal grains

fauna - *Lepidocyclina*, *Operculinoides*

Ocala absent

Avon Park 560-2400 feet

lithology - (560-820 feet) limestone, grainstone, packstone & wackestone, tan & cream, rounded very fine to medium skeletal grains. Thin interbeds of light gray & white chalky limestone & one 5-foot bed of tan & cream chalky "Ocala"-type limestone

fauna - *Lepidocyclina*, *Operculinoides*, cones, *Dictyoconus americanus*, *D. gunteri* & unidentified foraminifera

Well 3 (Bermes water well 44, W-2023)

Location: 3-34S-39E

Hawthorn base 395 feet: dolosilt, brown, loose grains, no phosphate

Suwannee 395-445 feet (50)

lithology - limestone, grainstone, silty, gray/cream, rounded very fine skeletal grains with imbedded shell fragments, silt-size glauconite

fauna: *Globulina*

Ocala 445-463 feet (18)

lithology - limestone coquina of Ocala fauna

fauna: *Lepidocyclina* & *Operculinoides*

Avon Park 463-691 feet (TD)

lithology - (upper 160 feet) limestone, grainstone, cream, rounded very fine skeletal grains

fauna - *Lepidocyclina* & *Operculinoides* (both loose & imbedded in grainstone)

Well 4 (Bermes water well 48, W-3018)

Location: 5-34S-40E

Hawthorn base 425 feet: dolomite, euhedral, tan, fine microcrystalline, phosphatic

Suwannee 425-543 feet (118)

lithology - 425-525 limestone, silty, grainstone, gray/cream, rounded very fine skeletal grains with imbedded shell fragments, silt-size glauconite

525-543 limestone, wackestone, light gray, rounded very fine to medium skeletal grains

fauna - shark teeth (462-83 feet)

Ocala 543-545 feet (2)

lithology - limestone coquina of Ocala fauna

fauna - *Lepidocyclina* & *Operculinoides*

Avon Park 545-714 (TD)

lithology - limestone, grainstone & packstone, interbedded cream & white, very fine to medium rounded skeletal grains

fauna - *Lepidocyclina* & *Operculinoides*

Well 5 (Bermes water well 48, W-3018)

Location: 3-33S-39E

Hawthorn base 394 feet: dolomite, sandy, euhedral, brown, fine microcrystalline, very fine sand grains, phosphatic

Suwannee 394-513 feet (19)

lithology - 394-500 feet limestone, silty, grainstone, gray/cream, rounded very fine skeletal grains, silt-size glauconite
500-513 feet limestone, wackestone & grainstone, white, rounded fine to medium skeletal grains

fauna - none

Ocala 513-517 feet (4)

lithology - limestone coquina of Ocala fauna

fauna - *Lepidocyclina* & *Operculinoides*

Second Suwannee 517-580 feet (63)

lithology - limestone, grainstone & packstone, white, fine to medium rounded skeletal grains

fauna - *Lepidocyclina* & *Operculinoides*

Avon Park 380-671 (TD)

lithology - limestone, grainstone & packstone, tan, fine rounded skeletal grains

fauna - *Lepidocyclina* & *Operculinoides*

Well 6 (Bermes water well 107, W-2446)

Location: 35-31S-39E

Hawthorn base 390 feet: gray/green silty shale

Suwannee 390-557 feet (167)

lithology - limestone, silty, grainstone & packstone, gray/cream & white, very fine to coarse rounded skeletal grains, silt-size glauconite, lower 47 feet contains 50% brown chert

fauna - none

Ocala 557-576 feet (19)

lithology - limestone, chalky & micrograined, cream, lower 58 feet contains 10% brown chert

fauna - *Lepidocyclina*

Avon Park 676-725 feet (49)

lithology - limestone, grainstone & packstone, cream, rounded very fine skeletal grains

fauna - *Lepidocyclina*, *Operculinoides* & *Camerina*

Second Ocala 725-735 feet (10)

lithology - limestone, chalky, cream

fauna - *Lepidocyclina*, *Operculinoides* & *Camerina*

Second Avon Park 735-1000 feet (TD)

lithology - (upper 20 feet) limestone, packstone & wackestone, cream, very fine rounded skeletal grains

fauna - none

Well 7 (Bermes water well 207, W-3019)

Location: 14-31S-39E

Hawthorn base (samples not now available 0-432 feet)

Bermes reports base at 360 feet, but from his description I would put it at 349 feet at the base of "clay, light green, hard, dense, phosphatic with dark translucent chert"

Suwannee (probably 349 feet in missing samples)

lithology - 25 feet of limestone, silty, grainstone, gray/cream, rounded very fine skeletal grains, silt-size glauconite; overlies 69 feet of limestone, grainstone & wackestone, cream & light gray, rounded very fine to medium skeletal grains; glauconitic in lower section with chert at base

fauna - none

Ocala 575-788 feet (263)

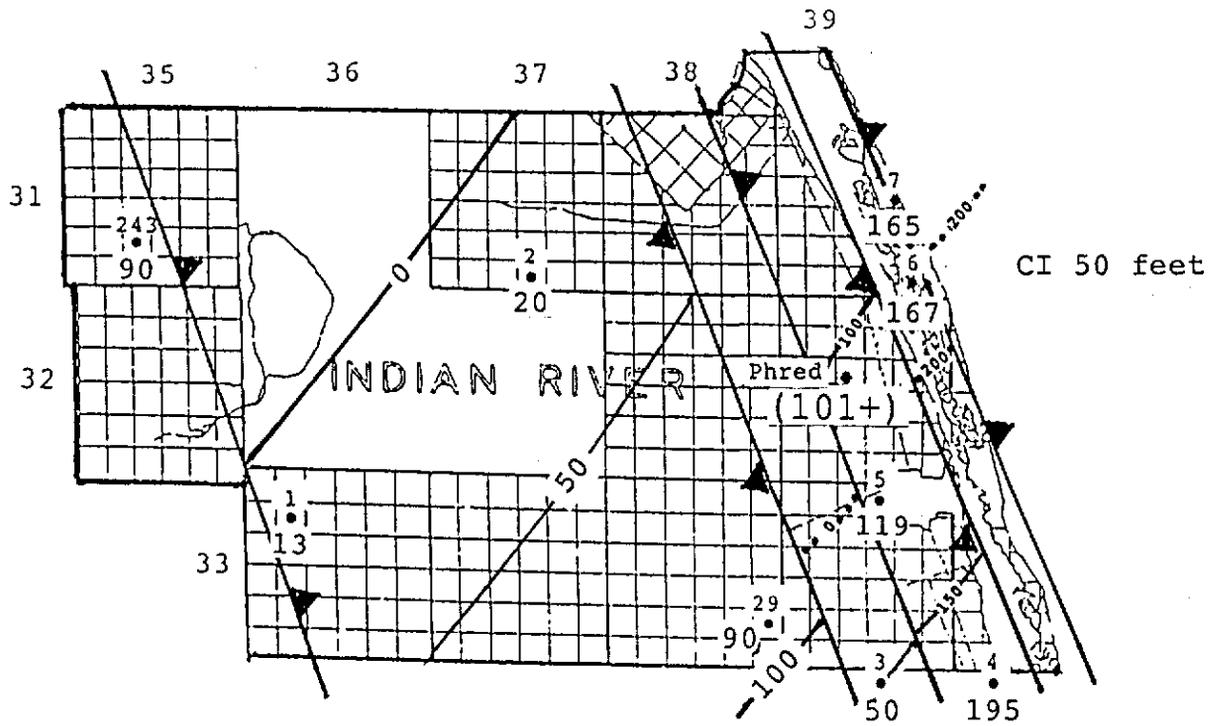
lithology - limestone, microgranular, tan, 10% brown chert

fauna - 1 tiny Operculinoides in basal section

Avon Park 788-882 (TD)

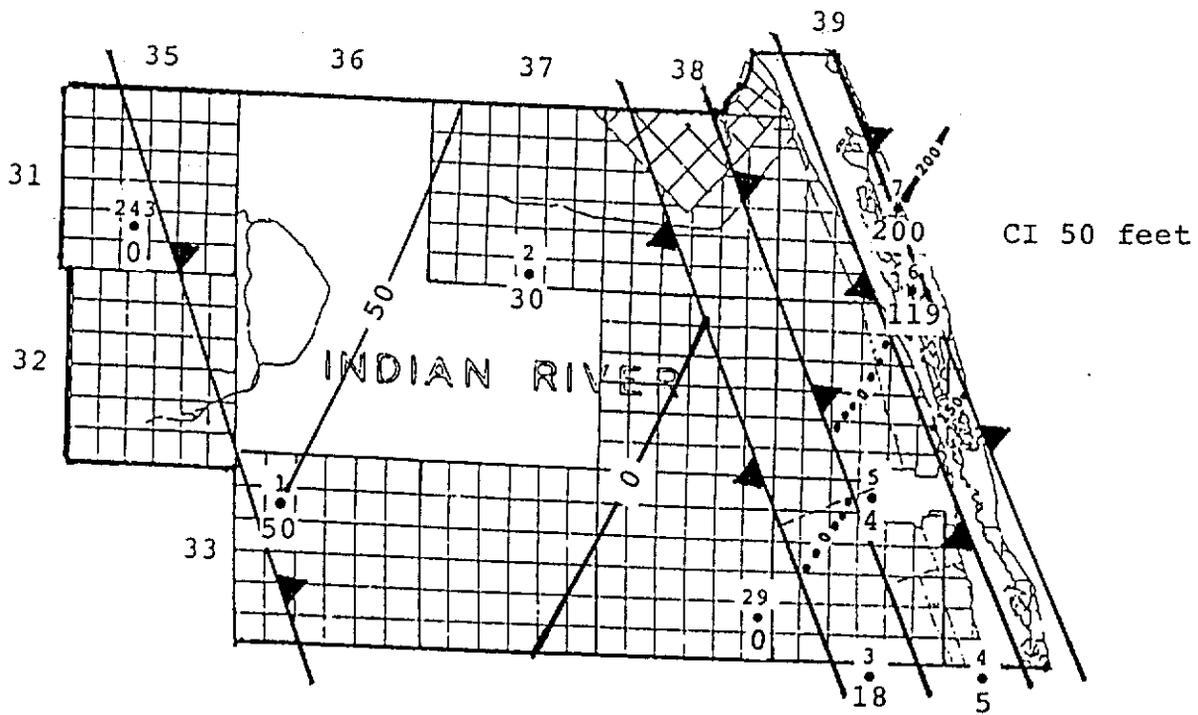
lithology - limestone, grainstone, packstone & wackestone, cream, rounded fine skeletal grains

fauna - Lepidocyclina & Operculinoides



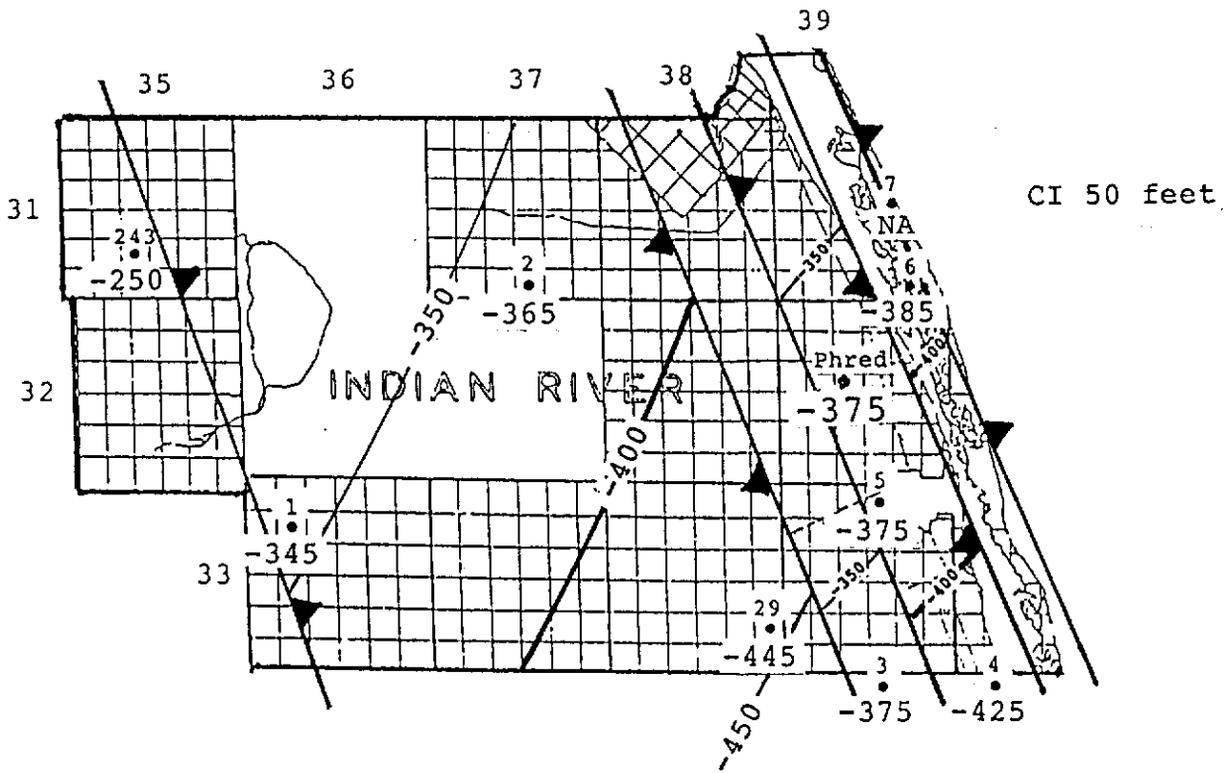
Isopach Suwannee Member

a



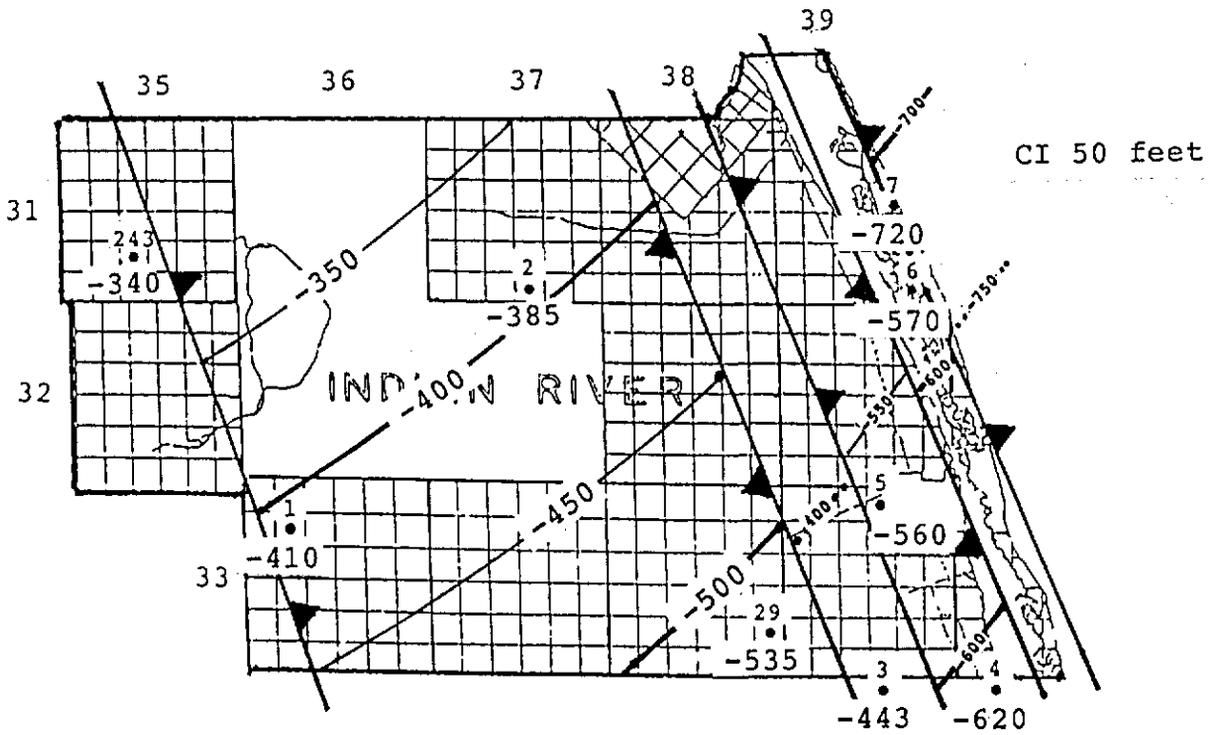
Isopach Ocala Member

b



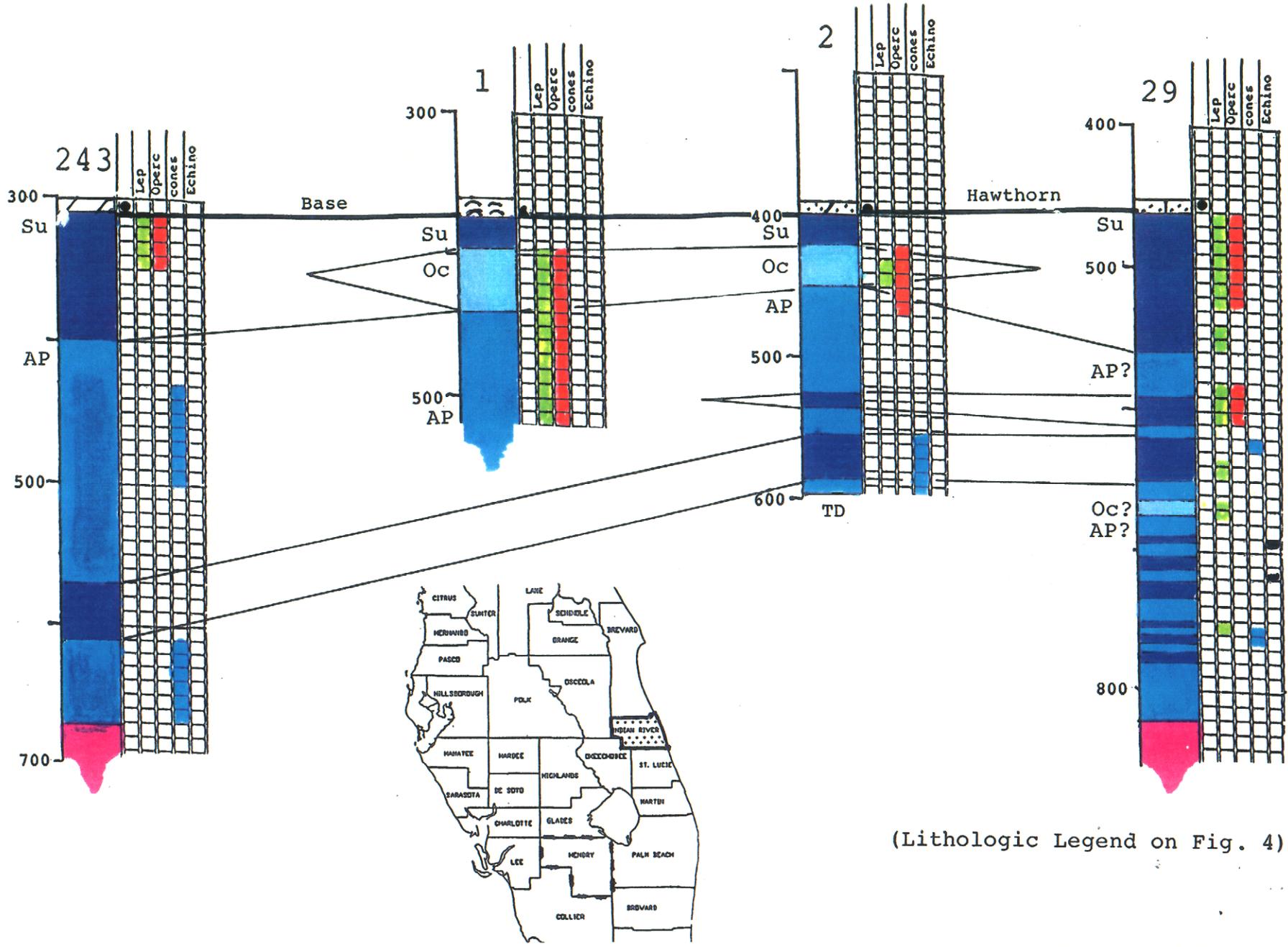
Structure Base Hawthorne Group

a

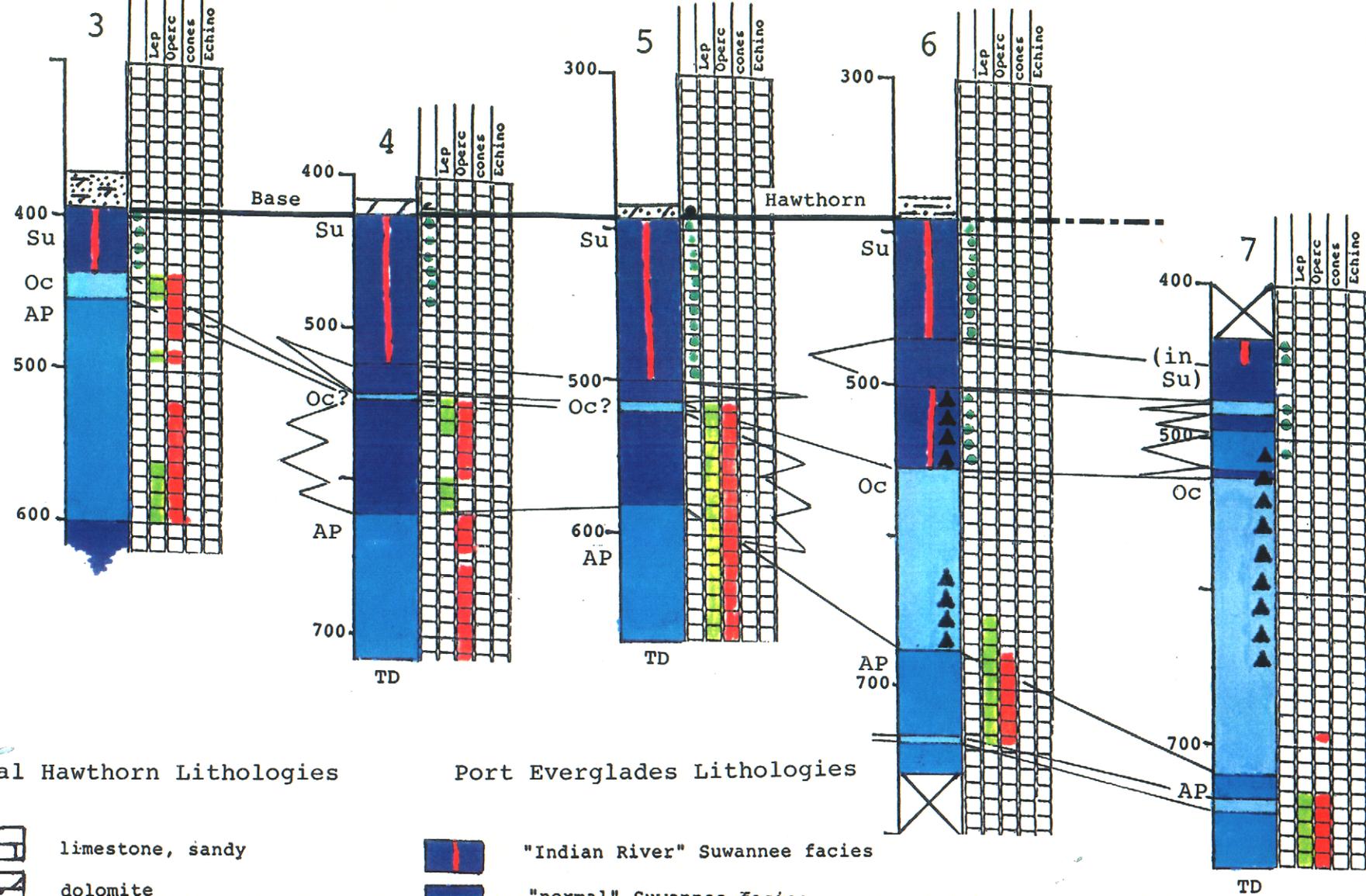


Structure Top Avon Park Member

b



(Lithologic Legend on Fig. 4)



Basal Hawthorn Lithologies

- limestone, sandy
- dolomite
- dolomite, silty or sandy
- dolosilt
- shells
- shale, silty
- phosphate

Port Everglades Lithologies

- "Indian River" Suwannee facies
- "normal" Suwannee facies
- Ocala facies
- Avon Park facies
- dolomite
- chert
- glauconite