PRPA Repercussions & Implications for Real World Study by Citizen Scientist Avocational Paleontologists

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Research Fellow: University of Texas at Austin

NE/NC GSA 2017
First LAW to regulate fossil collecting on public lands

Designed to protect scientifically important fossils
- Damaged, destroyed or removed from public land
- Goal of preserving them for study, curation and preservation
- Purpose, educational benefit of all mankind
- Adding information to the collective body of knowledge we have about our planet/past

Restricts vertebrate fossil collecting to: “by permit only”

Allows “casual collecting” of a “reasonable amount” of “common” non-vertebrate fossils without a permit

Penalties for breaking the law

Worthy cause and should be universally supported
PRPA Repercussions

Proposed Rules have serious repercussions for Citizen Scientist Avocational Paleontologists – Problematic wording includes:

- Prohibit research on casually collected specimens
- Limit casual collecting to only “common” specimens
- Limit casual collecting to 25 lbs. a day, not to exceed 250 lbs. annually
- Defines “negligible disturbance” as little to no change to the surface of the land; limits disturbance to 1 square yard; separates multiple collectors by at least 10 feet
- All other collecting requires a permit
- Criteria for applying for permit includes:
  - a graduate degree in paleontology or related field of study...
  - experience in collecting, analyzing, summarizing, reporting, preparing collections
  - Experience in planning, equipping, staffing, organizing, etc., etc. field crews
  - Other expertise
  - Past performance history
- All specimens collected under permit must be housed in an approved repository
Spectacularly Preserved, Mollusc-Dominated Fauna from a Cavity Layer in the Lower Cretaceous Edwards Formation, Central Texas

Linda McCall, James Sprinkle, Ann Molineux
Paper Background

- Road construction – 2006
- Uncovered Cretaceous fossils from the Edwards Formation
- Unusually good preservation
- Time sensitive accessibility (4 mo.)
- UT notified – unable to participate
- Obtained permission and spent parts of 22 days between August and December 2006
Documentation of Site

- **Location:** Georgetown, TX
  - Specimens embedded in red clay
  - Layer exposed only at road base
  - Exposure intermittent

- **Total Road cut**
  - .2 miles long

- **Total collecting area:**
  - 135 ft. long by 52 ft. wide, 8 inches high & intermittent
  - 13 feet below ground
Processing Cavity Material

2.5 mm mesh
Processing Cavity Material

1.5 mm mesh
Processing Cavity Material
Relevant Numbers

- 22 days field collecting
- 500 hours curating
- 900 kg (1 ton) of material
- 90 kg (200 lbs) ~ 152,000 individual loose specimens
- 90% of material has already been donated to UT
How did the Paper Happen?

- Showed material to UT in 2006

- 2008, Jim Sprinkle contacted me – want to write a paper?
  - Abstract done in 2 weeks, submitted it to GCAGS

- They suggested I be lead author
  - I had done all the work
  - Asked for an outline (never having done this before)
  - I wrote the paper in layman's terms
  - Ann and Jim helped upscale it into scientific terms

- I presented at the October 2008 GCAGS Convention
  - Awarded 2nd place for best paper at the conference

- Reprinted in the South Texas Geological Society bulletin in March 2010
Note: Most Texas Cretaceous fossils are moldic, or internal casts

Specimens at this site showed beautiful external ornamentation and details, down to growth lines, and was more diverse than any Edwards Formation fauna found anywhere else

Over 100 taxa present

60 unidentified at the species level

26 unidentified at the genus level or higher
Comparison of Two Mollusc-Dominated Faunas from Cavity Layers in the Lower Cretaceous Edwards Formation of Central Texas

Linda McCall, James Sprinkle, Ann Molineux
Background Basics

- Site 1, 2006
- Site 2, 2008
- Beautiful, atypically preserved specimens
- Freshly exposed section
- Bulk collected – single collector
- Both paved after construction
Location, Similarities and Differences

- 230 meters difference laterally
- 5 meter difference in elevation
- Moderately karstified zone - unable to determine if coeval
- Few fossils in remainder exposure
Collection Statistics

- Site 1: 4 months, 1 ton of material
- ~152,000 specimens
- Site 2: 1.5 days, 280 lbs of material
- ~7,400 specimens
- Block material – specimen transport?
Processing Cavity Material
How did the Paper Happen?

- Showed material to UT while collecting 2008
- 2009 – Jim again – want to write another paper?
- Second abstract was submitted to GCAGS
- They asked me to be lead author again,
  - I made up the outline this time,
  - wrote the paper in layman's terms, and
  - Ann and Jim helped me upscale it into scientific terms
- I presented at the October 2010 GCAGS Convention
- Reprinted in the South Texas Geological Society Bulletin in December of 2011
Paper Findings

- Single crystal calcite casts
- Beautifully preserved external ornamentation
- Re-crystallized matrix
- Red clay pockets / 20 cm
- Random orientation
- Mollusc dominated faunas – differ size, comp, diversity
Paper Highlights

- **200+ species level taxa**
  - Largest and most diverse fauna from a single locality

- **134 Taxa new to the Edwards**
  - extending ranges forward
  - extending ranges back
  - 96 new taxa to be described

- **Wealth of material allowed for multiple biodiversity comparisons**
  - Species comparisons
  - Weight – rough proxy for biomass
Species Diversity - Cavity

- 70 sp. unique to Site 1
- 77 sp. unique to Site 2
- 73 sp. present at both

Site 1
- rudists (Monopleurid)
- less corals (4 sp.)
- gastropods – diff.
- bivalves - large

Site 2
- rudists (Caprinid)
- more corals (10 sp.)
- gastropods – diff.
- bivalves – small
- more echinoderms
- more worms
- taxa smaller
Comparison of Weight vs. Species

Weight (Biomass)

- 36.5% Gastropods (75 species)
- 20% Bivalves (non-rudist) 31 species
- 7% Red Algae 2 species
- 35% Rudists 3 species 98% Monopleurid
- 6% Gastropods 74 species
- 2% Bivalves (non-rudist) 22 species
- 4% Red Algae 2 species
- 15% Corals 10 species
- 71% Rudists 12 species 78% Caprinid

Species

- 52.5% Gastropods 75 species
- 1.5% Red Algae 2 species
- 3% Corals 4 species
- 5% Green Algae 8 species
- 4% Unknown 6 species
- 10% Other Groups
  - Echinoids 1 sp.
  - Worms 1 sp.
  - Arthropods 2 sp.
  - Fish 2 sp.
  - Sponges 2 sp.
  - Scaphopods 1 sp.
  - Foraminifera 3 sp.
  - Unidentified 2 sp.

- 1% Red Algae 2 species
- 7% Corals 10 species
- 5% Green Algae 7 species
- 6% Echinoderms 6 species
- 8% Other Groups
  - Bryozoa 2 sp.
  - Scleractinids 1 sp.
  - Cephalopods 1 sp.
  - Articulata 1 sp.
  - Sponges 1 sp.
  - Scaphopods 1 sp.
  - Foraminifera 1 sp.
  - Fish 1 sp.
  - Odd 2 sp.

- 8% Rudists 12 species 78% Caprinid
Comparison of Cavity vs. Wall Rock

Cavity

- 1.5% Red Algae
- 3% Corals
- 53% Green Algae
- 4% Unknown
- 10% Other Groups
- Echinoderms
- 3% Worms
- Arthropods
- Fish
- Sponges
- Scaphopods
- Foraminifera

Wall Rock

- 2.2% Red Algae
- 2.2% Corals
- 4% Green Algae
- 10.6% Other Groups
- Worms
- Arthropods
- Sponges
- Foram inifera

- 2% Rudists
- 98% Monopleurid

- 51% Gastropods
- 41 species

- 49% Gastropods
- 74 species

- 49% Gastropods
- 36 species

A

B
Conclusions

- Two distinct faunal assemblages located close together
- Range extensions
- Many “new” species added to Edwards faunal record
- Cavity faunas worthwhile candidates for study when taken with wall rock
- Valuable resource for further study/future research
Bivalves

Site 2

*Toucasia hancockensis*

*Cosmetodon sp.*

*aff. Carditae*

*Caprinid rudist*

*Caprinuloidea perfecta*
Gastropods - Site 1

Monocyphus singleyi (1 prong)

Monocyphus singleyi (4 prong)

Monocyphus brittsi

Arrhoges sp.
Gastropods - Site 2

Arrhoges sp.

Arrhoges sp.

Aporrhais sp.

Monocyphus singleyi (4 prong)
Gastropods - Site 2

- **Cerithium austine**nese 27 mm
- **Nerinea cultrispira** 38 mm
- **aff. Paziella** 27 mm
- **Cerithium sp.**
- **Cerithium kikapooense** 20 mm
Gastropods - Site 1

- Solarium(?) planorbis
- Margarites brownii
- Solariella serrata
- Pileolius septangularis
- Unidentified
Gastropods - Site 2

- Solarium(? planorbid
- Semineritina apparata
- Unidentified
- Emarginula(? sp.
- Amaurellina sp.
- Monodonta bartonensis
Algae
Site 2

Calcareous dasyclad green alga

Calcareous dasyclad green alga – *Cylindroporella barnesii*

Calcareous dasyclad green alga

Calcareous dasyclad green alga
Rare Fossil Groups - Site 1

- Crustacean claw
- Predatory gastropod drilled bivalve
- Scaphopod – *Dentalium* sp.
- *Rogerella cragini* barnacle borings on bivalve
- Pycnodont teeth
Rare Fossil Groups - Site 2

- Crustacean claw
- Scaphopod – *Dentalium* sp.
- Unidentified bryozoan
- Unidentified cephalopod jaws
- Pycnodont teeth
PRPA Compliant?

- Prohibit research on casually collected specimens
- Limit casual collecting to only “common” specimens
- No vertebrate collecting without a permit (5 Pycnodont teeth)
- Limit casual collecting to 25 lbs. a day, not to exceed 250 lbs. annually
- Defines “negligible disturbance” as little to no change to the surface of the land; limits disturbance to 1 square yard; separates multiple collectors by at least 10 feet
- All other collecting requires a permit
- Criteria for applying for permit includes:
  - a graduate degree in paleontology or related field of study...
  - experience in collecting, analyzing, summarizing, reporting, preparing collections
  - Experience in planning, equipping, staffing, organizing, etc., etc. field crews
  - Other expertise
  - Past performance
- All specimens collected under permit must be housed in an approved repository
An undescribed fauna from the Upper Cretaceous “Pyroclastic Zone” of the Austin Group at Pilot Knob, central Texas

Linda McCall, James Sprinkle, Ann Molineux, Christopher Garvie
University of Texas – Austin

GCAGS 2012
How did the Paper Happen?

- Collected the material back in 1996 and 1997 and sat on it for 16 years.

- 2012, Jim Sprinkle contacted me – want to write another paper?

- I had always wanted to do something with the Pilot Knob material

- I wrote the abstract, they proofed it and it was submitted to GCAGS
  - I did the outline and most of the paper
  - Ann and Jim helped me when I would get stuck

- I presented the paper at the October 2012 GCAGS Convention,
  - It was awarded 3\textsuperscript{rd} place for best presentation at the conference.
Pilot Knob – Little volcano south of Austin, TX near the airport

Area quarried for McKown Limestone deposited after the eruptions ended

Fossil clubs hunted the area frequently – Austin Chalk fossils

Quarries routinely left a foot or so of limestone on quarry floor
1996 Drainage Ditch
Stratigraphic Sequence

Yellow Layer
(base of McKown Formation)

Red Layer
(clay – altered ash deposit)

Green Layer
(clay – altered ash deposit)

3m
Color/Strata Zones

Yellow layer

Red layer

Green layer

Red & Green layer
Paper Highlights

- Unique fauna eroded out – very different from contemporary Austin Group deposits

- Most specimens were quite small, though not technically “dwarf”

- Outstanding preservation – external ornamentation, possible color pattern retention, rare 3D sponges
Ecosystem Fauna

Unique Crustacean – dominated ecosystem

~168 Different Taxa/Traces

New & Rare Species and Range Extensions

- 63 GASTROPODS
- 51 BIVALVES
- 5 AMMONITES
- 10 WORM TUBES
- 8 ECHINOIDs
- 7 CRUSTACEANS
- 4 BURROWS
- 4 SHARK
- 3 SPONGES
- 2 CORAL
- 2 BRYOZOAN
- 2 FISH
- 1 VERTEBRATE
- Numerous FORAMS
Vertebrate Fossils

- Cretalamna appendiculata
- Squalicorax falcatus
- Hybodont fin spine
- Fish tooth
- Vertebrate bone
New Gastropods

- Gegania sp.
- Gyrodes sp.
- Cerithiella sp.
- Oligopytcha sp.
- Paraturbo sp.
- Volutomorpha sp.
New Bivalves

- Crassatella sp.
- Astarte? sp.
- Corbula sp.
- Barbatia sp.
- unknown.
Rare Sponges

Plocoscyphia? sp.
Crustaceans  (color pattern retention)

3 mm

5 mm
Preservation
Preservation

Plocoscyphia? sp.

Parasmilia sp.
Conclusion

- Little published / ecosystems / late Cretaceous submarine volcanoes / rare / overlooked?

- Important for understand shallow-water inhabitants / helping locate future hydrocarbon traps

- Pilot Knob / exceptional preservation / rare fauna / unprecedented look at Santonian volcanic habitat

- Further research needed
PRPA Compliant?

- Prohibit research on casually collected specimens
- Limit casual collecting to only “common” specimens
- No vertebrate collecting without a permit *(teeth and bone fragment)*
- Limit casual collecting to 25 lbs. a day, not to exceed 250 lbs. annually
- Defines “negligible disturbance” as little to no change to the surface of the land; limits disturbance to 1 square yard; separates multiple collectors by at least 10 feet
- All other collecting requires a permit
- Criteria for applying for permit includes:
  - a graduate degree in paleontology or related field of study…
  - experience in collecting, analyzing, summarizing, reporting, preparing collections
  - Experience in planning, equipping, staffing, organizing, etc., etc. field crews
  - Other expertise
  - Past performance
- All specimens collected under permit must be housed in an approved repository
Beach Sand Restoration Project on Topsail Island, North Carolina, Yields Oligocene Fauna with Unusual Preservation, Including Color Retention

Linda McCall, NCFC; University of Texas – Austin
Ann Molineux, James Sprinkle, University of Texas – Austin
Topsail Island

Phase 5
December 18, 2014
to June 30, 2015

Erosional Beach

Offshore borrow area
3.5 miles
Primitive Whale Brain Casts/Teeth
Relevant Numbers so far

- 50+ days field collecting
- 300+ hours sorting/curating
- 1 ton of material collected
- 1,000 lbs. already processed
- 8714 specimens already donated to UT
- 1,000 lbs. left to sort
PRPA Compatible?

- Prohibit research on casually collected specimens
- Limit casual collecting to only “common” specimens
- No vertebrate collecting without a permit (whale endocasts, fish, shark...)
- Limit casual collecting to 25 lbs. a day, not to exceed 250 lbs. annually
- Defines “negligible disturbance” as little to no change to the surface of the land; limits disturbance to 1 square yard; separates multiple collectors by at least 10 feet
- All other collecting requires a permit
- Criteria for applying for permit includes:
  - a graduate degree in paleontology or related field of study...
  - experience in collecting, analyzing, summarizing, reporting, preparing collections
  - Experience in planning, equipping, staffing, organizing, etc., etc. field crews
  - Other expertise
  - Past performance
- All specimens collected under permit must be housed in an approved repository
Conclusion

• Not unique or alone
  – 15 fossil clubs studied in 2015
  – 51 non-professional members peer-review published. Often multiple times.
  – Jack Horner

• Hundreds of non-professionals authoring and co-authoring scientifically valuable paleontological papers

• Current proposed PRPA rules effectively disenfranchises an entire subset of non-professional paleontologists
  – Negative impact on the number of scientific papers being published
  – Negative impact on the depth of scientific knowledge being gained about the history of life on earth.

• We have a lot to contribute. I hope the authors of the proposed rules realize this and work to alter the current wording to be more inclusive of the non-professional sector.
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