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A SURVEY OF THE INSECT ORDERS PRESENT IN THE GYPSUM DUNES OF THE WHITE SANDS NATIONAL MONUMENT

Zell Zanarkand

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A SURVEY OF THE INSECT ORDERS PRESENT IN THE GYPSUM DUNES OF THE WHITE SANDS NATIONAL MONUMENT



Zell Zanarkand
Student ID – 83311893
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ENTO 896 - Independent Study (1 Credit)
Instructor: Erin Bauer
Title: A Survey of Insect Orders Present in the Gypsum
Dunes of the White Sands National Monument
Date Submitted - 07/20/2016

Overview

- Introduction Video to White Sands National Monument (WSNM)
- Facts and History
- Insects Orders and Families Found in WSNM
- Introduction Video to Theories Regarding Lighter Coloration
- Three Theories on Color Change
- Insects in WSNM depicting lighter coloration
- Conclusion Video

Introduction to WSNM





Facts and History of White Sands National Monument

Facts

- Dunefield has existed for only 7,000-10,000 years
- It encompasses 275 square miles of white sand dunes
- Dunes are composed of gypsum crystals



History

- **1898-The town of Alamogordo established**
- **1900-First article on White Sands published in Journal of Geology**
- **1912-New Mexico becomes a state**
- **1928-Highway 70 from Las Cruces to Alamogordo completed**
- **1932-Prehistoric tracks first discovered in the monument**
- **1933-President Herbert Hoover declares White Sands a national monument**



History Continued

- **1934-Opening Day Ceremony held in April**
- **1935-First asphalt road into the dunes was completed; first annual "Play Day" held in dunes**
- **1936-Works Progress Administration begins construction of the visitor center**
- **1938-Visitor center and museum opened**
- **1942-President Roosevelt signs order establishing a large military land presence around the monument**
- **1945-First atomic bomb tested at Trinity Site, 60 miles north of the monument**



History Continued

- **1950s-Nature and hiking trails constructed**
- **1950-First major motion picture filmed at White Sands**
- **1956-First Lake Lucero tour given by "auto caravan" with 160 participants**
- **1969-93 African Oryx released onto the missile range surrounding the Monument**
- **1993-First music video and first documentary filmed at White Sands**



INSECTS OF WHITE SANDS



Insects of White Sands

- Nearly 100 families of insects have been found in the dunes
- Most inhabit the margins of the dune field and the adjacent desert plain.
- Some insects have evolved a white coloration that camouflages them in the dunes.

ORDER - THYSANURA

- F. Machilidae



- F. Lepismatidae



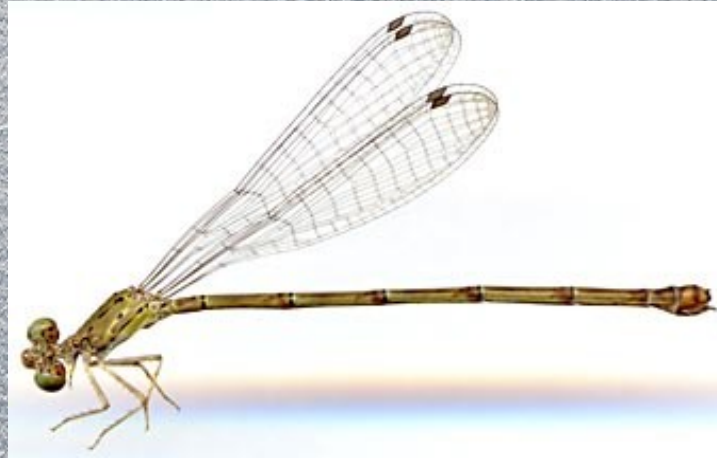
ORDER - COLLEMBOLA



F. Entomobryidae

ORDER - ODONATA

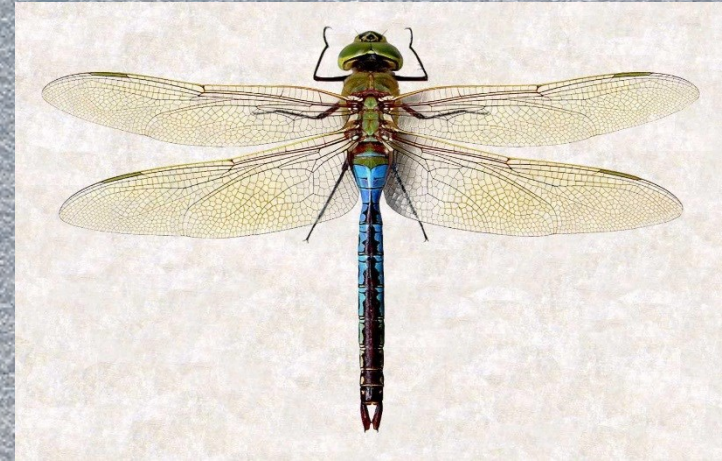
F. Coenagrionidae



F. Libellulidae



F. Aeshnidae



ORDER - ORTHOPTERA

F. Gryllacrididae



F. Gryllidae



ORDER - ORTHOPTERA CONTINUED

F. Acrididae



F. Tettigoniidae



F. Mantidae



ORDER - DERMAPTERA



F. Labiidae

ORDER - HEMIPTERA

F. Belostomatidae



F. Notonectidae



F. Nabidae



ORDER - HEMIPTERA CONTINUED

F. Pyrrhocoridae



F. Coreidae



F. Miridae



ORDER - HEMIPTERA CONTINUED

F. Pentatomidae



F. Lygaeidae



F. Scutelleridae



ORDER - HOMOPTERA



F. Cicadellidae



F. Aphididae



ORDER - HOMOPTERA CONTINUED

F. Cercopidae



F. Dictyopharidae



F. Flatidae



ORDER - NEUROPTERA

F. Myrmeleontidae



F. Chrysopidae



ORDER - COLEOPTERA

F. Silphidae



F. Anthicidae



F. Meloidae



ORDER - COLEOPTERA CONTINUED

F. Tenebrionidae



F. Cleridae



F. Elateridae



ORDER - COLEOPTERA CONTINUED

F. Carabidae



F. Dermestidae



F. Oedemeridae



ORDER - COLEOPTERA CONTINUED

F. Chrysomelidae



F. Histeridae



F. Coccinellidae



ORDER - COLEOPTERA CONTINUED

F. Dytiscidae



F. Cerambycidae



F. Bupresitidae



ORDER - COLEOPTERA CONTINUED

F. Malachiidae



F. Scarabaeidae

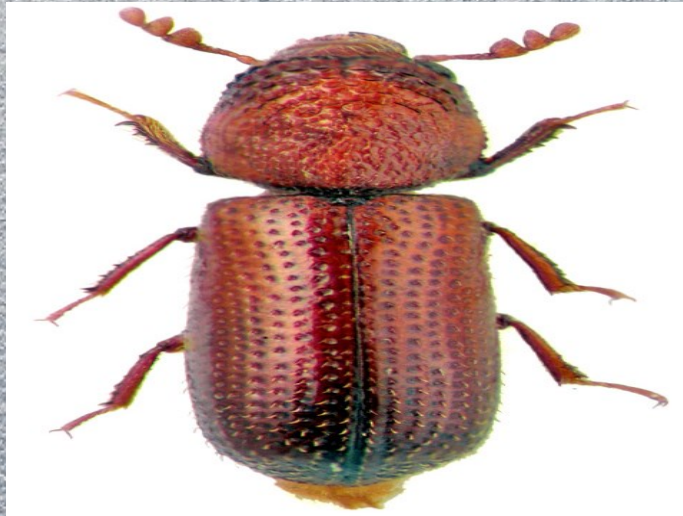


F. Curculionidae



ORDER - COLEOPTERA CONTINUED

F. Bostrichidae



F. Cicindelidae



F. Hydrophilidae



ORDER - LEPIDOPTERA

F. Saturniidae



F. Nymphalidae



F. Gelechiidae



ORDER - LEPIDOPTERA CONTINUED

F. Noctuidae



F. Lycaenidae



F. Danaidae



ORDER - LEPIDOPTERA

CONTINUED

F. Papilionidae



F. Hesperidae



F. Sphingidae



ORDER - DIPTERA

F. Tipulidae



F. Bombyliidae



F. Calliphoridae



ORDER - DIPTERA CONTINUED

F. Tabanidae



F. Sarcophagidae



F. Syrphidae



ORDER - DIPTERA CONTINUED

F. Otitidae



F. Dolichopodidae



F. Culicidae



ORDER - DIPTERA CONTINUED

F. Tachinidae



F. Asilidae



F. Ephydriidae



ORDER - HYMENOPTERA

F. Cynipidae



F. Formicidae



F. Apidae



ORDER – HYMENOPTERA CONTINUED

F. Halictidae



F. Ichneumonidae



F. Megachilidae



ORDER – HYMENOPTERA CONTINUED

F. Pompilidae



F. Scoliidae



F. Sphecidae



ORDER – HYMENOPTERA CONTINUED

F. Vespidae



F. Tiphidae



F. Mutillidae



THEORIES ON MECHANISMS BEHIND COLOR CHANGE



Theory 1

- Individuals may be able to change color during their lifetimes to match their current substrate
- Individuals with genes coding for flexible coloration must have been more likely to survive, reproduce, and pass their flexible-coloration genes on to their offspring
- Those that reproduce pass their flexible-coloration genes on to their offspring

Theory 2

- Each individual's light color may be fixed from birth
- These lighter-colored animals must have been more likely to survive, reproduce
- By reproducing they would pass their light-coloration genes on to their offspring

Theory 3

- Rather than evolve through natural selection, light coloration could have simply been picked up from the environment
- Substances from the gypsum may be taken up by plants and cause herbivorous animals to turn white when they ingest them
- This theory is unlikely as there are similar plants growing beyond the dunes that likely absorb similar substances

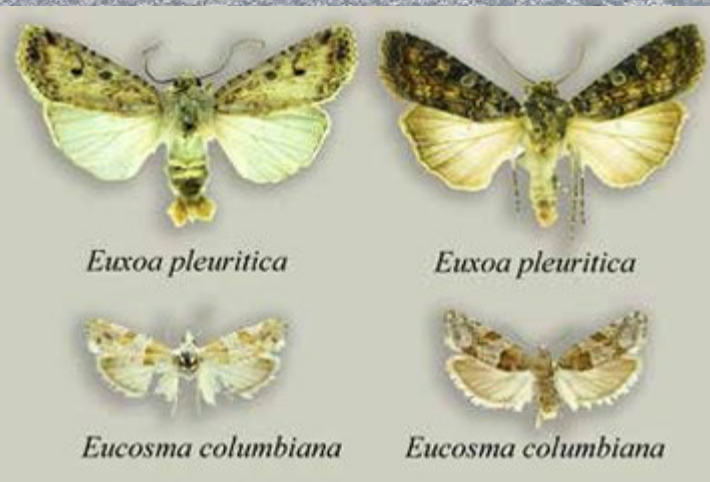
INSECTS IN WSNM DEPICTING LIGHTER COLORATION



F. Gryllacrididae



F. Acrididae



Pale moths on the left found exclusively inside the dunes; dark ones on the right from outside the dunes.

Photo by Eric Metzler

INSECTS IN WSNM DEPICTING LIGHTER COLORATION

Previously undescribed white
species of genus Scythrididae
endemic to only White Sands
and Dr. Lightfoot



Photo Credit Eric Metzler, and Dr. Lightfoot



Photo Credit Eric Metzler

Undescribed Coleophora
species found only in
WSNM

INSECTS IN WSNM DEPICTING LIGHTER COLORATION



Sand-Treader Camel Cricket
(*Daihiniodes larvale*) Photo
Credit: Dr. Lightfoot

- Two species of sand treader camel crickets live exclusively at White Sands
- They have adapted to live in the gypsum



White Moths
Photo Credit: E. Metzler

- 40 endemic species of white moths live in White Sands
- Species such as *Protophygia whitesandsensis* and *Euxoa lafontainei* evolved specifically in the monument

Conclusion



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The End