

Investigating The Diet Of The Piping Plover (*Charadrius melodus*)

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Abstract

This research focused on the diet and preservation of the North American shorebird, the Piping Plover, or *Charadrius melodus*. The Piping Plover is a near threatened species that migrates up and down the East coast of North America for breeding and feeding purposes. The Piping Plover serves as an indicator species in the scientific community. An indicator species is an organism whose presence or absence displays a specific environmental condition. Indicator species show changes in an ecosystem and are used as “indicators” to whether or not an ecosystem is healthy or not. Piping Plovers are a delicate species and slight changes can affect them greatly. This makes them a useful tool in identifying problems within an ecosystem. Piping Plovers are also incredibly skittish and will abandon nests if humans get too close. This does not help the fact that they only lay about four eggs a year. The studying of a piping plovers diet can help us locate feeding grounds of the piping plover and protect those areas from trespassers, therefore preserving the species. The Piping Plover is an important component in the scientific community.

Introduction

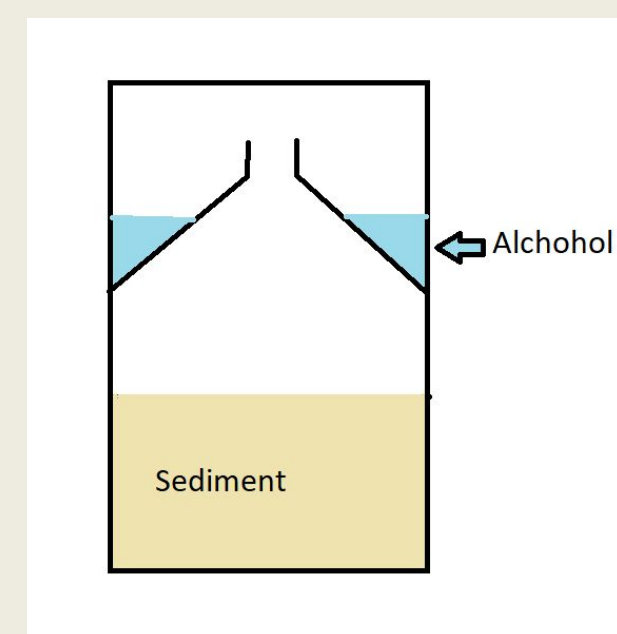
The diet of the piping plover is not well understood. DNA barcoding allows scientists to accurately identify invertebrates found in known nesting sites. Piping plovers are very skittish and will abandon nests if a human gets too close. The birds are also greatly affected by hurricanes and tropical storms because of their reliance on coastal feeding and breeding grounds. Piping plovers are very important in the scientific community because they are used as an indicator species. An indicator species can signal a specific environmental condition based on the abundance of that particular species. The piping plover is classified by the IUCN to be near threatened. Without preservation efforts from humans, the piping plover would not survive in its current state. Not much is known about the diet of the piping plover, which is crucial information needed to discover more about their habits. The extinction of Piping Plovers would have a significant effect on human health. Generally speaking, humans interact with beach ecosystems on a regular basis, damage to these ecosystems could harm humans, and to make sure that our beach ecosystems are safe, scientists use piping plovers as an indicator species; The presence of piping plovers tells of a healthy and functioning beach ecosystem. If these piping plovers become extinct, there wouldn't be any obvious red flags to suggest beach pollutants, poor soil conditions, and other such factors that could harm humans.

DNA Barcoding

- Identify samples of invertebrates that are most likely feed upon by piping plovers and have been collected from successfully maintained (ephemeral wetland) nesting areas.
- Taxonomically ID species. - Follow barcode LI protocol for identifying species if we are unable to be identified using taxonomic keys.
- First, we will isolate the DNA by using the rapid DNA isolation process incorporated with previous barcode methods. It starts off by grinding up the sample in a lysis solution to break up the cells. To isolate the DNA we then add resin which soaks up the DNA.
- Now with the DNA isolated, we can amplify it by PCR. In this process we will be using a primer mix which is combined with the DNA. After that, we will put it in a thermal cycler to amplify the DNA.
- When the amplifying process finishes we will analyze the products using gel electrophoresis. Finally, we will sequence the PCR product to further analyze the bioinformatics.

Sample Gathering

Sample have been gathered over a three year (2017-2019) period. Two methods of collection where used: hand collection (invertebrates were placed into collecting apparatus [test tubes/tupperware]) and reverse berlese funnel traps. The latter was used primarily in 2019 to great success.



Sediment samples are taken from the ephemeral pond area and maintained in warm and humid conditions. Invertebrate eggs and larvae mature and fly into the alcohol. This method is responsible for 11 different species collected and a total of ~50 individual specimens.

Sample Locations - Nickerson Beach

Nickerson Beach Parking Lot

Sanctuary

Legend

- Ephemeral Ponds
- Ephemeral Pond
- Intertidal Zone
- Wreck Line

0 25 50 100 150 Meters

Sample #1

Sample #2

Ephemeral Pool

Discussion

This project is an ongoing study involving multiple collaborators. We are excited to have a potentially novel sequence. The success of piping plover chicks is dependent on suitable foraging areas. We look forward to further investigation of these unique ephemeral pools and the diversity of insects they foster.

Results:

- 19 specimens were connected over three years**
- 2 were collected by hand in 2017**
- 7 were collected by hand in 2018 but only 6 where barcoded successfully**
- 18 were collected using berlese funnel traps**
- 1 novel sequence under further investigation**