Inventorying arthropods on Tetlin National Wildlife Refuge by next-generation sequencing

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The Taxonomic Bottleneck

Conventional morphology-based identification workflows are ill-suited to routine monitoring of biodiversity [1, 2]
Methods Design

Forest Inventory and Analysis 2014 Tanana Inventory Pilot [3]
Field Methods

- Extensive remote-sense and vegetation data collected at each site [3].
- 24 ft. radius circular plot, 2 sweep net samples (E and W halves of plot, each 84 m²)
Molecular Methods

Primer selection: \textbf{ZBJ-ArtF1c} + \textbf{ZBJ-ArtR2c} \rightarrow 157 \text{ bp} [5]

Graphic modified from Brandon-Mong (2015) [4].
**Methods**

**Samples**
- Sequencing [6] illumina MiSeq platform
  - demultiplexing by illumina software

**Research and Testing Laboratory**
- Galaxy [9–11]
  - Pear Paired-End read merger [7]
  - VSearch dereplication [8]
  - VSearch clustering [8]
  - VSearch search [8]
  - identifications

**Sequences from BOLD [12]**
- Alaska vicinity COI reference library
Results

- 84 latin names at various levels of taxonomic resolution
- 53 species names
- **118 BINs [13]**
- 1–9 species per plot
- Each species found on 1–12 (4–46%) of plots
- 2–13 BINs per plot
- Each BIN found on 1–12 (4–46%) of plots

Most common species: *Ochlerotatus communis*

Data will be posted on **NCBI SRA** and **Arctos**.
RESULTS

- Araneae (17)
- Diptera (20)
- Lepidoptera (9)
- Hymenoptera (2)
- Hemiptera (3)
- Coleoptera (2)
First collection date (2014) of the Blackberry Skeletonizer (*Schreckensteinia festaliella*) from Alaska (check it).

Image by Peter Buchner (http://bit.ly/1WOE1Iu)

See also *Schreckensteinia* sp. observed in Sitka in 2015 (http://bugguide.net/node/view/197612).
Thoughts

👍 Overall, these methods worked well.

👍 Quick.

👍 Repeatable.

👍 Cheap.

👎 157 bp region used was too short.
   → 313 bp primer set available for illumina platform [4].
   → 658 bp DNA barcode region on PacBio instrument?

👎 PCR/primer bias.

👎 Alaska sequence library needs work.

👎 This is the future of routine monitoring for terrestrial arthropods.
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References


