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Some food items of introduced Alaska blackfish (*Dallia pectoralis* T. H. Bean, 1880) in Kenai, Alaska

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Introduction

The Alaska blackfish, *Dallia pectoralis* T. H. Bean, 1880 is native to Alaska's North Slope, Western Alaska, and Alaska's interior, but was introduced to Anchorage in the 1950s (Chlupach, 1975). The introduced range of blackfish has expanded since that time so that they occur in the Palmer area, the Kenai Peninsula (Eidam et al., 2016), and almost all lakes in the Anchorage area (Stratton and Cyr, 1997). Blackfish on St. Paul Island are also thought to have been introduced (Aspinwall, 1965; Mecklenburg et al., 2002).

It is of interest to try to understand how these introduced fish may alter the systems that they invade, especially how blackfish may affect native fish species through competition for invertebrate prey.

Alaska blackfish prefer to live in vegetated areas of ponds, lakes, and slow-moving streams. They are opportunistic predators, feeding on diverse invertebrates and, to a lesser extent, small fish. In previous studies of blackfish diet (Ostdiek and Nardone, 1959; Chlupach, 1975; Gudkov, 1998; Eidam et al., 2016), the most important prey groups included cladocerans, ostracods, dipterans, gastropods, trichopterans, and copepods.

Methods

Three blackfish were collected by Jennifer Hester in a minnow trap baited with cured salmon eggs from a small, shallow pond in Kenai, Alaska (60.5688 °N, -151.1902 °W ± 150 m). The trap was set out on October 18, 2018 and collected the following day.

In the laboratory we measured lengths of the blackfish, dissected out their stomachs, and sorted through stomach contents under a dissecting microscope. We selected 14 specimens representing a variety of perceived prey species and submitted these for DNA barcoding using lifescanner kits (http://lifescanner.net/).

Results

The blackfish we obtained were two small adults (KNWRObs:Fish:1 and KNWRObs:Fish:3, both 76 mm long) and one juvenile (KNWRObs:Fish:2, 31 mm long).

The most abundant prey group that we observed in blackfish stomachs was Diptera larvae, followed by Coleoptera, but a variety of arthropods were represented. We saw only one snail. No prey fish were identified from blackfish stomach contents. The two 76 mm adults both contained diverse arthropods; in the 31 mm juvenile fish we found only ostracods.

We received DNA barcode sequences for 10 of the 14 submitted samples. Sequencing apparently failed for three specimens. For one specimen (the ostracod) we obtained a blackfish DNA barcode sequence. Details for all specimens are provided in Table 1.

Discussion

Our findings are consistent with the diet of blackfish reported by previous studies. We found that smaller blackfish had eaten mostly minute crustaceans while larger fish had a more diverse diet, a pattern also observed by Chlupach (1975). These results represent only a snapshot of blackfish diet from a single time and place and so cannot be considered to be representative of the diet of Alaska blackfish in general.

The most notable observation from this small project was that blackfish had consumed several species that are not particularly aquatic. Some of these species including *Lathrobium washingtoni*, *Scyletria inflata*, and the cicadellid could have fallen into the water from above, but others including larval staphylinids, larval *Bryotropha similis*, and the pseudoscorpion were more surprising to see in blackfish stomachs. Water levels in this small pond and the stream flowing into it were high at the time the fish were

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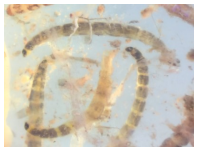
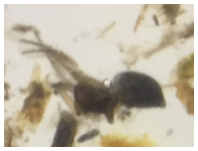
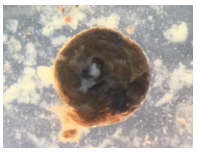
collected, so terrestrial species may have ended up in the water due to flooding.

Metabarcoding methods would be more appropriate than our Sanger sequencing methods for learning about the full range of blackfish diet because many more species could be identified and some measures of relative abundance would be obtained. However, we might have been suspicious of some of our more surprising identifications if they had been obtained by high-throughput sequencing methods. Given what we observed in blackfish stomachs, we now would believe almost any idenfication of small animal species that coexist in the vicinity.

Table 1: Food items from the stomachs of three Alaska blackfish. Food items are listed below the blackfish specimens from which they were dissected.

Identifiers	Images	Identifications
KNWRObs:Fish:1, MOBIL8739-18		Chordata: Actinopterygii: Esociformes: Esocidae: *Dallia pectoralis* T. H. Bean, 1880)
KNWR:Ento:11289, MOBIL8742-18		Arthropoda: Insecta: Coleoptera: Staphylinidae: *Eucnecosum brunnescens* (J. Sahlberg, 1871)
KNWR:Ento:11307		Arthropoda: Insecta: Coleoptera: Hydrophilidae
KNWR:Ento:11290, MOBIL8744-18		Arthropoda: Insecta: Diptera: Chironomidae: *Metriocnemus* sp. BOLD:ACB0600
KNWR:Ento:11288, MOBIL8753-18		Arthropoda: Insecta: Diptera: Tipulidae: *Prionocera turcica* (Fabricius, 1787)
KNWR:Ento:11308		Arthropoda: Insecta: Hemiptera: Cicadellidae
KNWRObs:Fish:3, MOBIL8743-18		Chordata: Actinopterygii: Esociformes: Esocidae: *Dallia pectoralis* T. H. Bean, 1880)
KNWR:Ento:11310, MOBIL8996-18		Arthropoda: Arachnida: Araneae: Linyphiidae: *Scyletria inflata* Bishop & Crosby 1938

Continued on next page...

Identifiers	Images	Identifications
KNWR:Ento:11287, MOBIL9001-18		Arthropoda: Arachnida: Pseudoscorpiones: Neobisiidae: *Microbisium brunneum* (Hagen, 1868)
KNWR:Ento:11309, MOBIL8995-18		Arthropoda: Insecta: Coleoptera: Staphylinidae: *Lathrobium washingtoni* Casey, 1905
KNWR:Ento:11311, MOBIL8997-18		Arthropoda: Insecta: Coleoptera: Staphylinidae: *Lathrobium washingtoni* Casey, 1905
KNWR:Ento:11312, MOBIL9000-18		Arthropoda: Insecta: Coleoptera: Staphylinidae: *Olophrum consimile* (Gyllenhal, 1810)
KNWR:Ento:11313, MOBIL9002-18		Arthropoda: Insecta: Diptera: Chironomidae: *Metriocnemus intergerivus* Sæther, 1995
KNWR:Ento:11314, MOBIL9003-18		Arthropoda: Insecta: Lepidoptera: Gelechiidae: *Bryotropha similis* (Stainton, 1854)
KNWR:Inv:39		Mollusca: Gastropoda
KNWRObs:Fish:2		Chordata: Actinopterygii: Esociformes: Esocidae: *Dallia pectoralis* T. H. Bean, 1880)
KNWR:Ento:11315		Arthropoda: Ostracoda

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Two new records of mayflies (Ephemeroptera) from Alaska

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by Matt Bowser[1]

Sikes et al. (2017) noted that DNA barcode sequences from mayflies (Ephemeroptera) were poorly represented from Alaska. While opportunistically collecting and submitting mayflies for DNA barcoding, we at the Kenai National Wildlife Refuge found that two specimens we collected appear to be new records for Alaska.

Ameletus celer McDunnough, 1934

A single naiad (KNWR:Ento:11230, MOBIL5127-17) was collected from Johnson Creek, northern Kenai Peninsula, at the bridge where the Gull Rock Trail crosses the creek on June 8, 2017. The specimen was collected directly into a lifescanner (http://lifescanner.net/) vial in the field and identified only by DNA barcoding as *Ameletus celer* McDunnough, 1934. The sequence from this specimen was grouped by BOLD's BIN algorithm (Ratnasingham and Hebert, 2013) into BIN BOLD:AAE5588 in which 89 sequences are identified as *A. celer* and one sequence is identified as *Ameletus*.

Ameletus celer was not listed from Alaska by Randolph and McCafferty (2005), but this species is widespread in northwestern North America (Zloty, 1996), including near the Alaska border in the Yukon (GBIF.org, 2019*a*).

Paraleptophlebia strandii (Eaton, 1901)

A subimago or adult specimen (KNWR:Ento:11298, MOBIL8445-18) was collected from the surface of Daniels Lake in Nikiski on the Kenai Peninsula on August 2, 2018. The specimen was identified as *Paraleptophlebia strandii* (Eaton, 1901) by its DNA barcode. The sequence from this specimen was grouped by BOLD's BIN algorithm into BIN BOLD:AAU2089 in which all 12 member sequences were identified as *P. strandii*.

Paraleptophlebia strandii was not listed from Alaska by Randolph and McCafferty (2005) and appears to be unreported from North America in the literature. However, a private record on BOLD from the Yukon is a 100% match (*p*-dist) with the sequence from Nikiski and is also identified as *P. strandii*. The previously known range of this species includes Fennoscandia to the Russian Far East (Salmela and Savolainen, 2013; GBIF.org, 2019*b*).

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