An overview of ongoing research: Arthropod abundance and diversity at Olive-sided Flycatcher nest sites in interior Alaska

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Introduction

The Olive-sided Flycatcher (*Contopus cooperi*) is an aerial insect specialist that nests in the boreal forest of Alaska each summer. Population declines over the last four decades in North America have elevated conservation concern for this species in many places, including Alaska (Sauer et al., 2014; Hagelin et al., 2015). In 2013, the Alaska Department of Fish and Game (ADF&G) began investigating the migratory habits and breeding biology of Olive-sided Flycatchers. In other populations, aerial arthropods are positively associated with foraging rate of adults and negatively associated with nest failure (Meehan and George, 2003). For some species of passerine, the abundance and diversity of arthropod prey are primary factors in habitat selection (Brown et al., 2011).

A previous study conducted by ADF&G in the 1990s (Wright, 1997) has provided us with the location of historical Olive-sided Flycatcher nests. These locations were resurveyed for three consecutive years (2013–2015) and found to be unoccupied. Comparing arthropod biomass and diversity at these historical sites with current breeding sites will allow us to correlate insect prey with bird occupancy. We hypothesize that (1) occupied sites will have higher arthropod biomass than historical sites and (2) occupied sites will have greater taxonomic diversity than historical sites. This study is amongst the first to document aerial insect communities in black spruce forests and has already produced new state records.

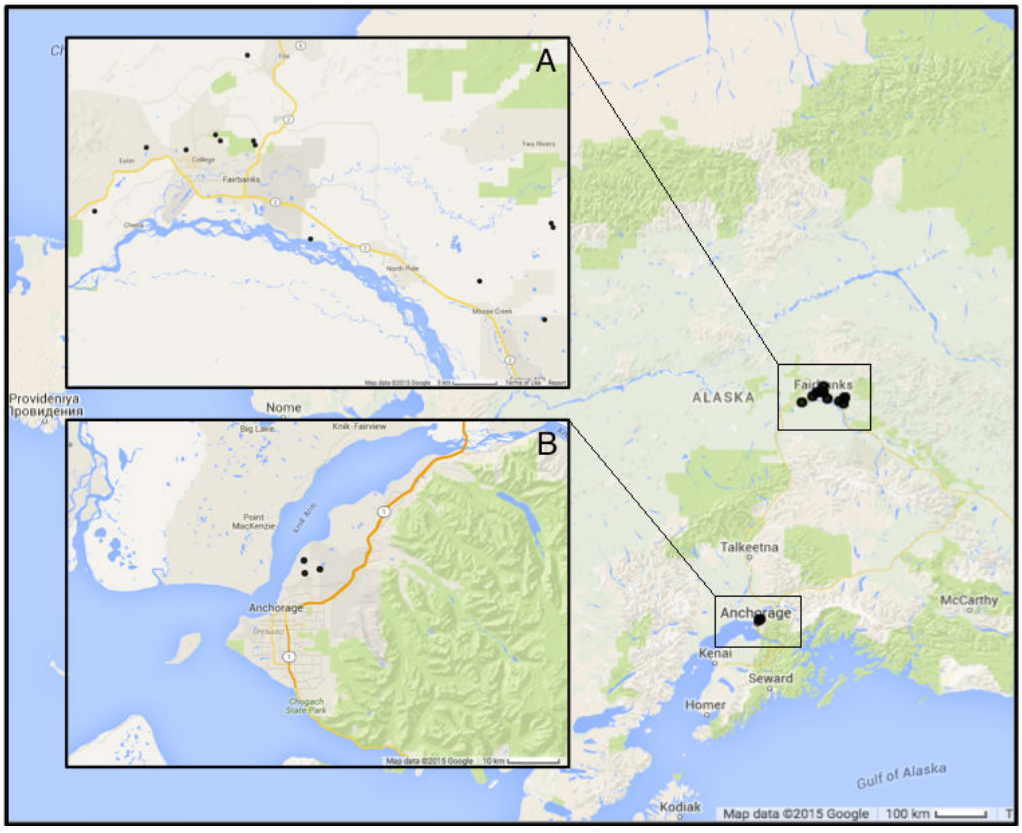

Figure 1: Collection sites of the 2013 sampling year in both Fairbanks (A) and Anchorage (B).

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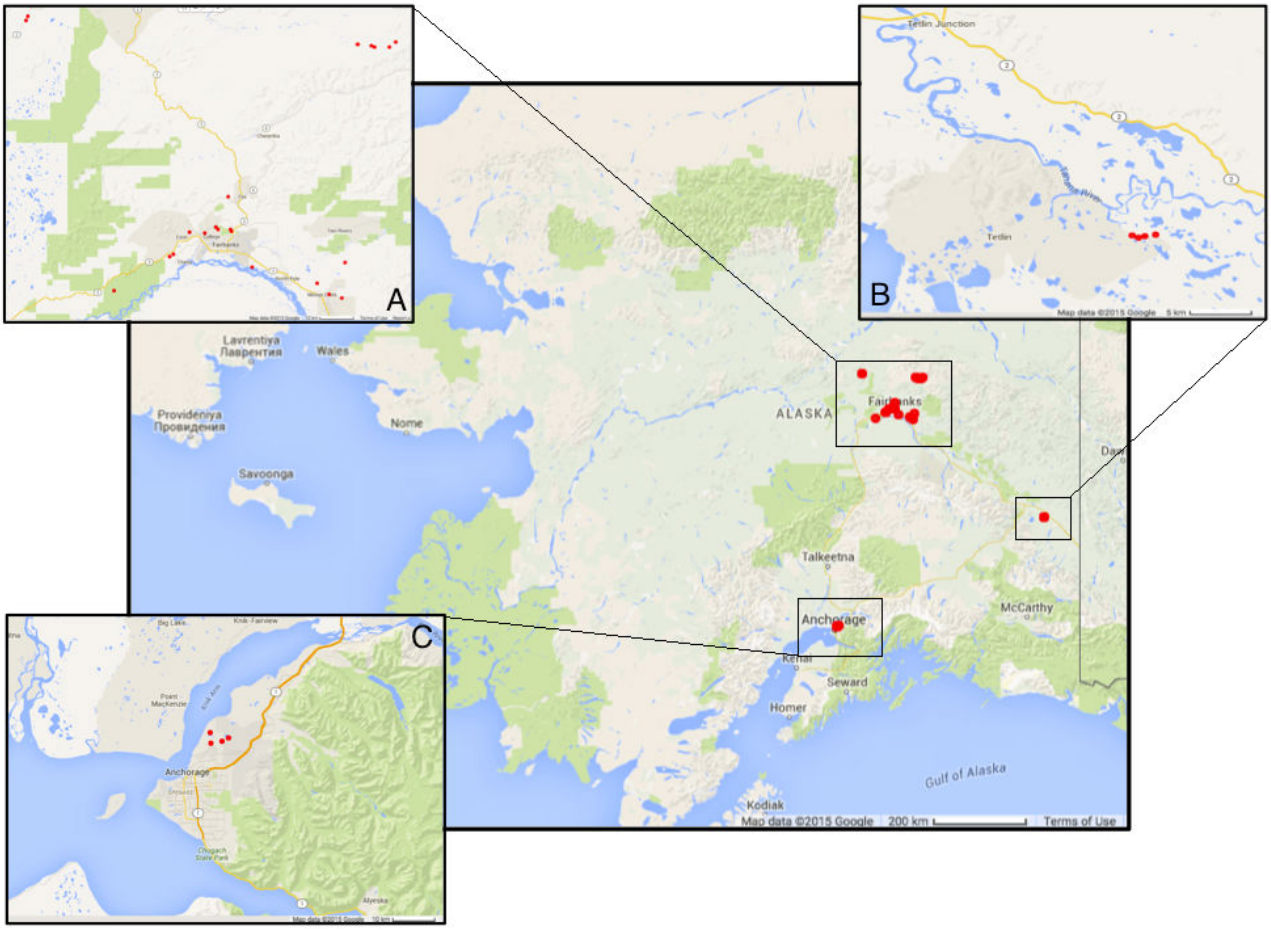

Figure 2: Collection sites of the 2014 sampling year in Fairbanks (A), Tetlin National Wildlife Refuge (B) and Anchorage (C). 2015 sampling locations were similarly located.

Study sites

Olive-sided Flycatchers nest predominantly on the edge of forest openings, including those caused by clear cutting or seasonal burns. They prefer to build nests on tall conifers with singing perches, to ensure their songs will carry (Altman and Sallabanks, 2012). In Alaska, nest sites occur in wet, boggy environments dominated by muskeg, spruce and birch.

Study sites were concentrated in three locations; the greater Fairbanks area, Joint Base Elmendorf-Richardson in Anchorage, and the Tetlin National Wildlife Refuge (Figure 1, 2). We studied 17 nest sites in 2013 (9 occupied and 8 historical); 31 sites in 2014 (19 occupied and 12 historical), and 32 sites in 2015 (20 occupied and 12 historical). Nest sites were located by ADF&G and were designated occupied or unoccupied following a series of bird song surveys during peak singing times.

Insect collection

Insect collection took place between May and July. Hanging Malaise traps were placed within 50m of known nest locations, approximately 5m from the ground. Hanging Malaise traps represent the upper story foraging level of Olive-sided Flycatchers. In 2014 and 2015, pollinator vane traps were deployed in addition to the hanging Malaise traps. Pollinator vane traps represent the near ground foraging level of flycatchers and attract insects, particularly *Bombus* spp., which are infrequently caught in hanging Malaise traps. Samples were collected every two weeks.

After collection, samples were sorted, databased into Arctos (the University of Alaska Museum's online database), and labeled for incorporation into the Insect Collection. These records are accessible via an Arctos project link[3].

[3] http://arctos.database.museum/project/olive-sided-flycatcher-contopus-cooperi-habitat-quality-study

Diversity calculations

Taxonomic order richness will be calculated by comparing the number of insect orders present at each collection site. The number of individual specimens per order was totaled for each sample site and these totals will be used to compare taxonomic order evenness between occupied and historical sites.

Biomass calculation

Specimens were measured from head to abdomen (excluding wing length) and biomass was determined using the calibrated formulae determined by Rogers et al. (1977). Formulae are provided for Araneae, Coleoptera, Lepidoptera, Hemiptera, Homoptera and Diptera. Other arthropods will be grouped within the aforementioned orders based on morphological similarity (Rogers et al., 1977). Although this may leave room for error, we feel it is important to include all specimens in the calculation. Arthropods smaller than 3mm were excluded based on the assumption that they are too small to be viable prey for Olive-sided Flycatchers. Biomass will be standardized by number of trap-days to correct for differences in trap deployment time. A comparison of total biomass will be made between occupied and historical sites for all years.

Moving forward

Insect collection is scheduled to continue during the summer of 2016, in order to test our hypotheses related to how insect patterns are associated with Olive-sided flycatcher breeding occupancy. Additional specimens will be collected in 2016 for stable isotope analysis. Stable isotope analysis of insects relative to bird blood will give us a better understanding of Olive-sided Flycatcher diet, which is not well understood, and potentially a limiting factor to successful reproduction. Isotope work will also reveal whether certain taxa of insects which are under-represented in our traps, such as grasshoppers and dragonflies, may constitute a significant portion of the flycatcher's diet.

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