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You are what you eat: Stable isotopes reveal long-term feeding ecology of Double-crested Cormorant and Anhinga

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Introduction

- Double-crested Cormorants and Anhingas are native Florida diving birds that mainly prey on small fish and have overlapping territories
- They have developed distinct morphology and feeding strategies over 40 million years of separation
- Little is known about their ecological niche
- Long-term diet data sets provided by stable isotopes are needed

Question/Hypothesis

- Are these birds occupying different trophic positions to avoid competition?
- Are they integrating different baseline food resources?
- H1: By using their unique feeding strategies, they are integrating distinct stable isotope ratios of carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$)

Methodology

1. Collection of 10 adult Anhingas and 12 Double-crested Cormorants from pond locations
2. Field sampling of tissues (plasma, red blood cells, stomach content) followed by preservation of tissues in 70% ethanol before being placed in a -80°C freezer
3. Lipid extraction of tissues using an ultra-pure water rinse followed by a 2:1 chloroform:methanol solution soak
4. Stable isotope analysis with elemental analysis-isotope ratio mass spectrometry

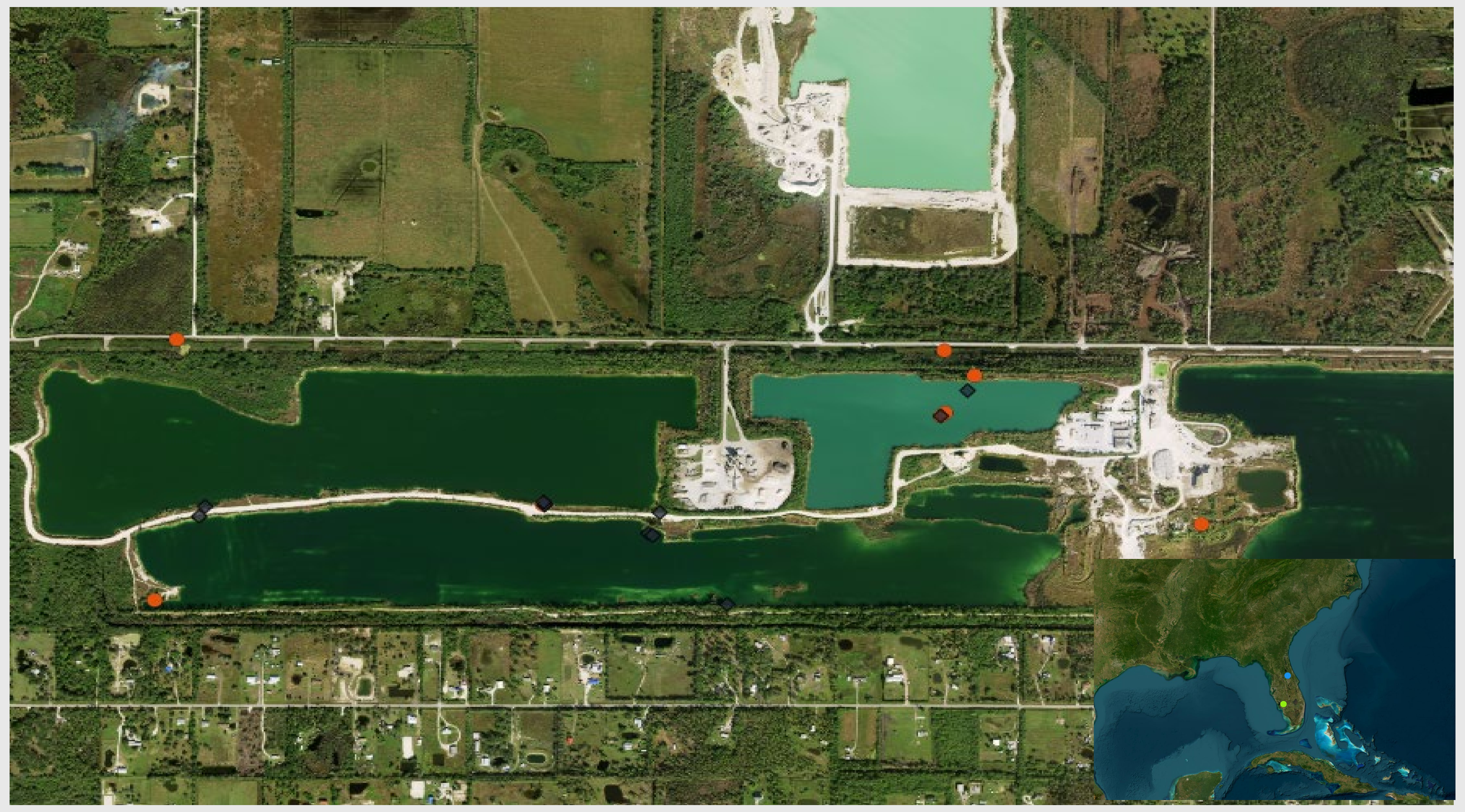
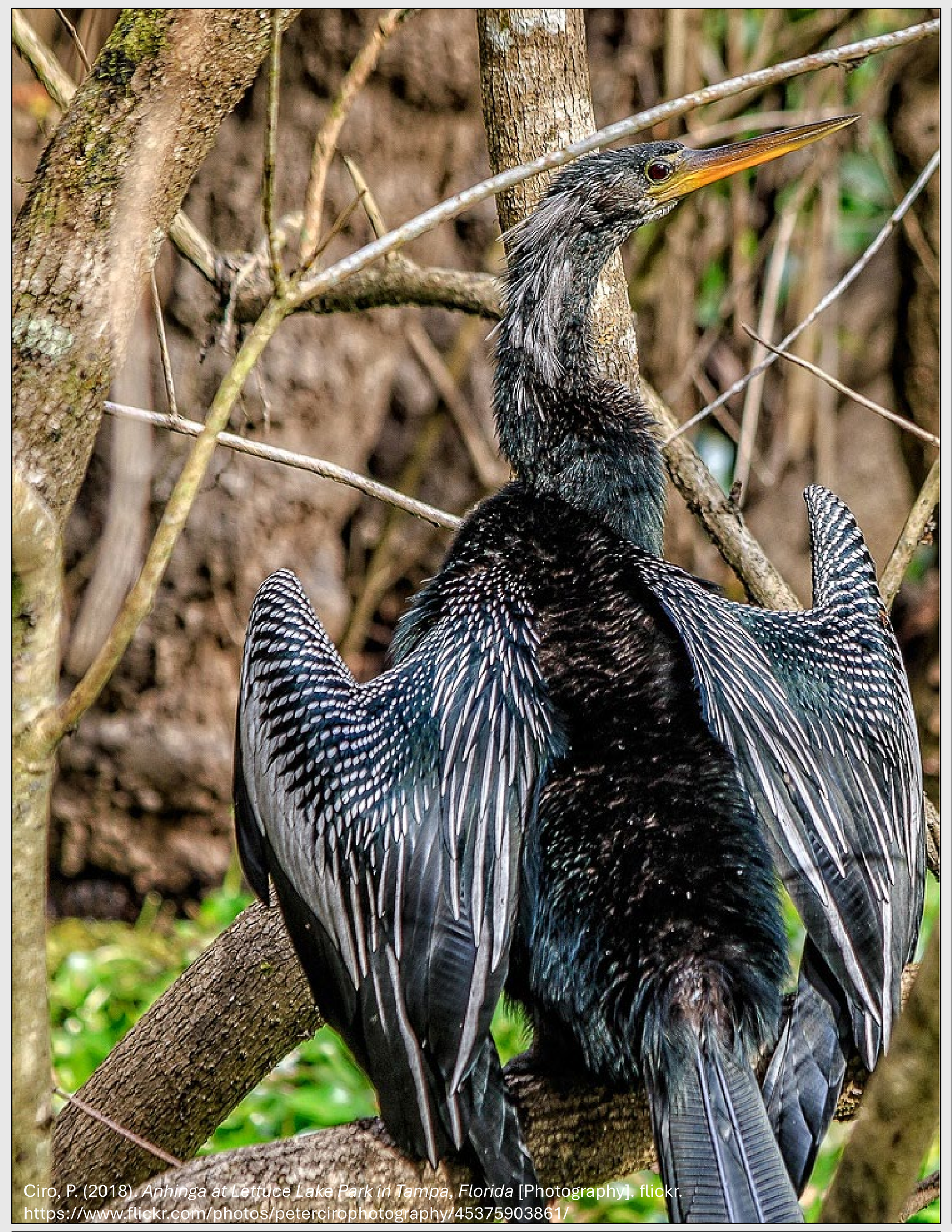


Figure 1: Google Maps view of pond locations in Charlotte (27°N, 81°W) and Lee (28°N, 81°W) County Fl

Results



Anhinga
(Anhinga anhinga)

Double-crested Cormorant
(Nannopterum auritum)

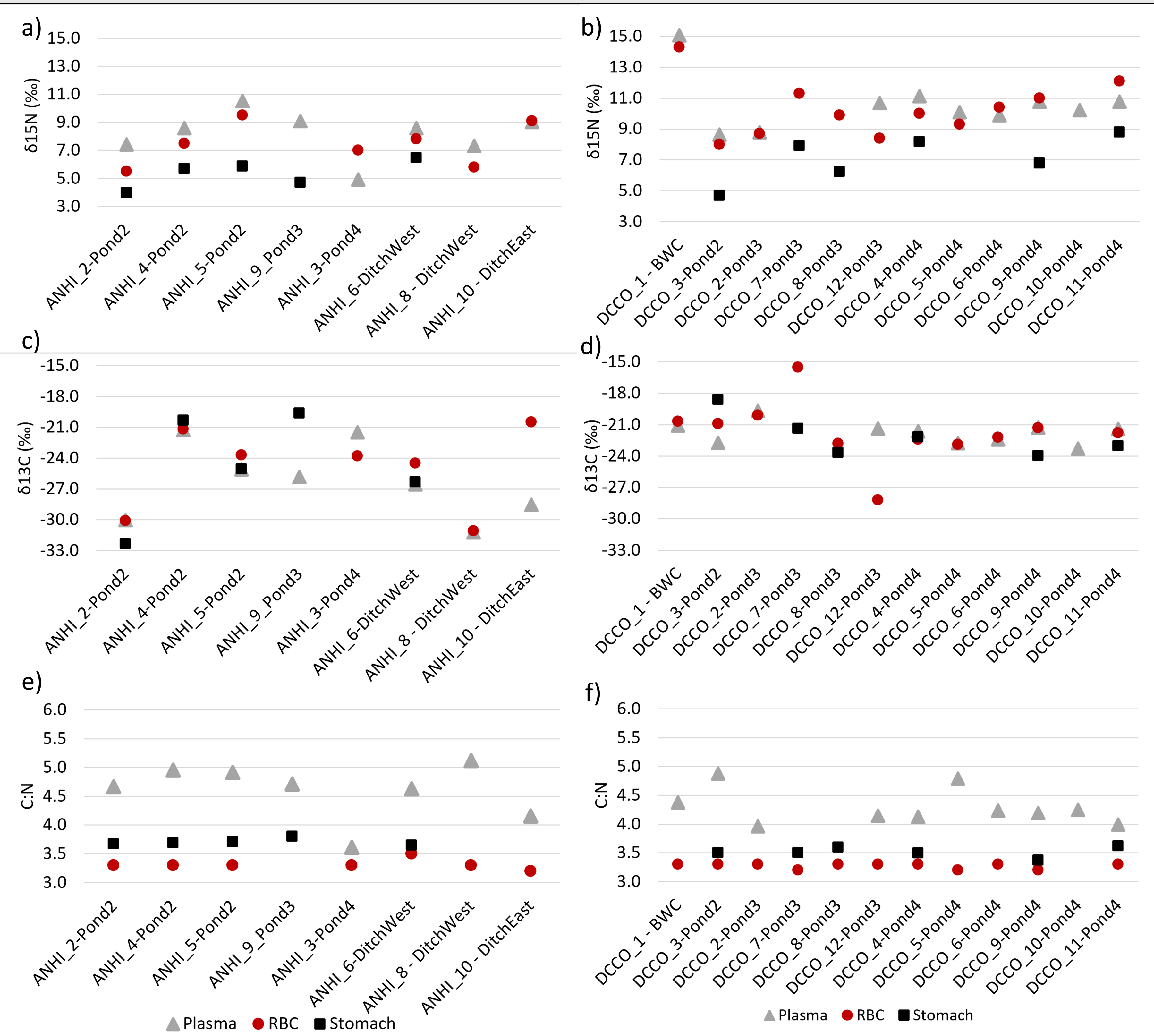


Figure 2: Results of elemental analysis for the tissues and stomach content of individual birds: bulk $\delta^{15}N$ values for Anhingas (a) and Cormorants (b); bulk $\delta^{13}C$ values for Anhingas (c) and Cormorants (d), and C:N ratios for Anhingas (e) and Cormorants (f). Bird tissue types include plasma, red blood cells (RBC), and stomach content

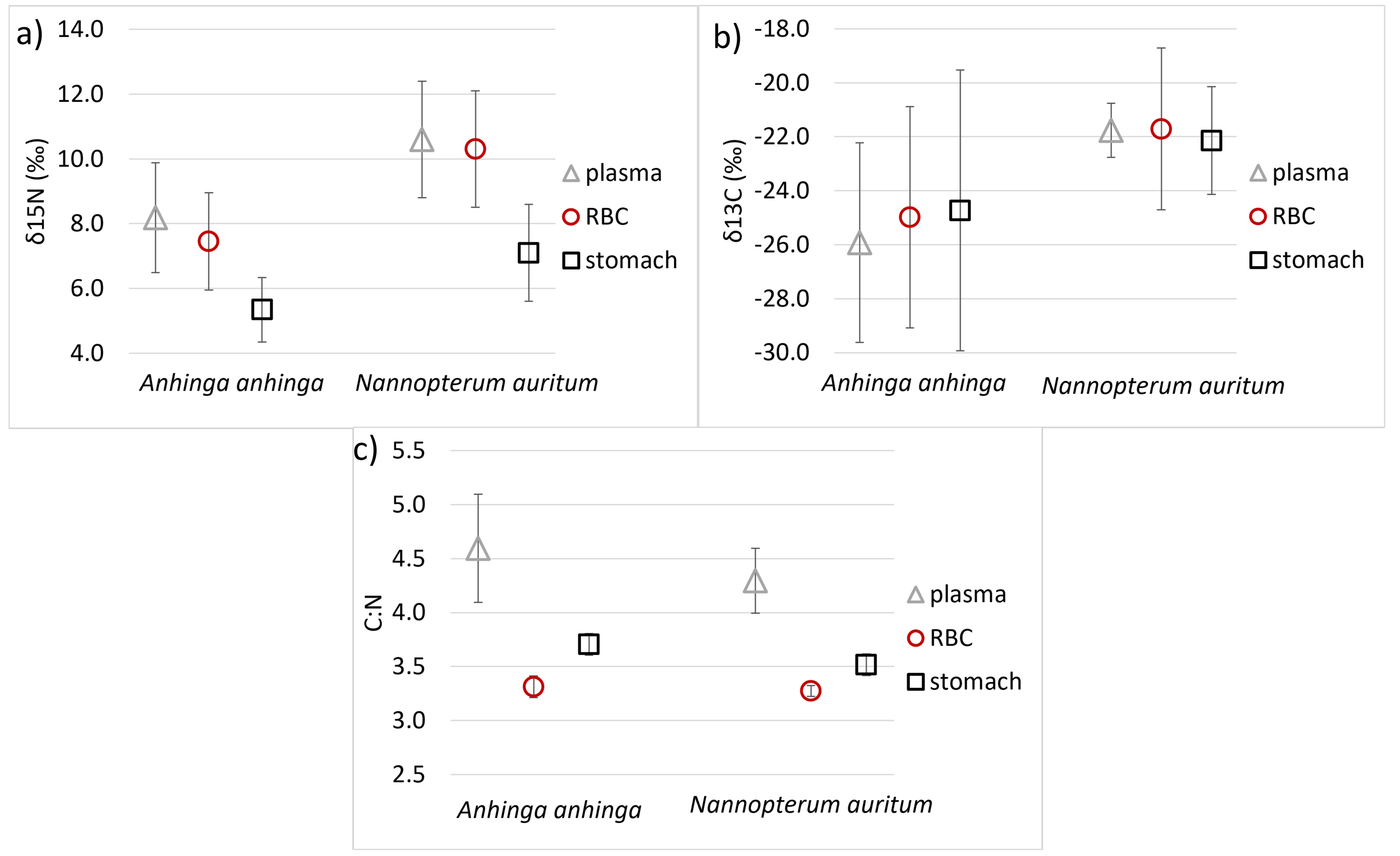


Figure 3: Comparison of mean and standard deviation across all sampled Anhingas and Cormorants bulk $\delta^{15}N$ values (a), bulk $\delta^{13}C$ values (b), and C:N ratios (c) for tissue types and stomach content. Bird tissue types include plasma, red blood cells (RBC), and stomach content

Discussion

- Similar isotopic results for plasma and red blood cells within a single species displaying consistent dietary sources from a few days (3-5) to 1-month time scales
- Differences in $\delta^{15}N$ values between species lead to the trophic position of Double-crested Cormorants being on average 0.6-1.4 higher than Anhinga (assuming same N sources at base of local food web)
- Differences in $\delta^{13}C$ data between species possibly show different baseline food resources of tilapia (main stomach content of Cormorants) and catfish (found only in Anhinga stomachs), based on the grazing habits of these fish
- High C:N ratios of plasma, even after lipid extraction may be a possible indicator for N-poor composition of metabolites in the bloodstream of diving birds

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