

Feather samples for stable isotope analysis

Determination of molting and wintering areas for sea ducks

Stable isotope markers are providing another tool that can help describe movements of sea ducks between geographically separated areas with varying isotopic ratios (e.g., ^{13}C , ^{12}C). Stable isotopes in animal tissues reflect those values in food webs and thus provide insights into feeding location and diet. Waterfowl undergo a simultaneous wing molt during summer, so **wing feather** samples will reflect preferred food types in molting areas and may help in identifying molting site locations and potentially the degree of molt site fidelity (if we obtain old and new feathers from the same bird). Most waterfowl replace the feathers on the **top of the head** during winter, so feather samples collected from birds during spring, summer, and fall may help identify where the bird wintered. **Tail feathers** can be replaced throughout the year, but a growing tail feather (i.e., with blood in the quill) would reflect local isotope signatures and may be informative for establishing isotopic signatures for certain geographic areas (if the bird is not migrating). Thus, isotopic ratios of feathers can be useful in identifying wintering and molting areas on a relatively broad geographic scale.

The objective in this study is to collect feathers that have been grown on molting or wintering areas. Feathers to be sampled will vary by species, as different species re-grow specific feather groups at different times.

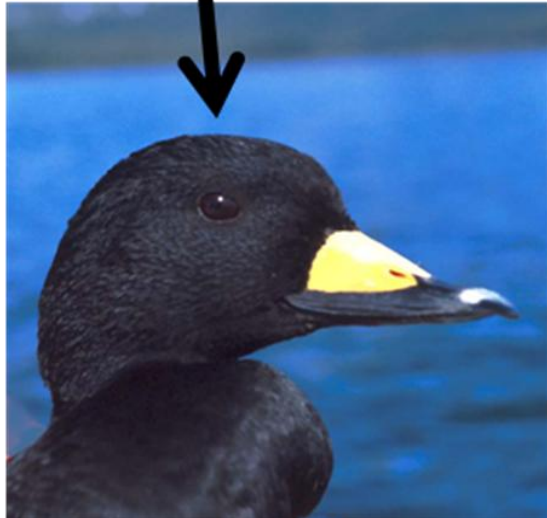
Feathers to be sampled

Target sample size: $n = 30$ individuals per species per sex per age class (first-year of life vs older birds) per sampling area. We need 1-2 mg of feather sample to run each isotope; 3-6 mg for 3 isotopes (C/N,D/O,S).



Pull one secondary wing feather or secondary covert from each bird. A new feather will be re-grown if the entire feather is pulled. For ducks undergoing wing molt - if both old and new primary or secondary feathers are evident on the same bird, pull one of each. New feathers will still have a blood supply in the shaft at the base of the feather; old feathers will appear worn and shafts will not have blood in the shaft. If only new feathers are evident, then pull one newly emerging secondary feather or secondary covert. It is important, however, to label and store old and new feathers separately – label them as “old feather” or “new feather”.

Pluck 4-5 feathers
from top of head



If you are capturing ducks during spring, summer, or fall, pluck 4-5 feathers from the top of the head (not from the nape). These will provide isotopic signatures for the wintering areas where these feathers were replaced.

If sampling during winter, the head feathers are likely to be in some stage of replacement, so they may not be a useful.

Also, long-tailed ducks have a more complex molt sequence and it is likely that head feathers will not be useful for distinguishing among wintering areas.

New rectrices



Old rectrices

If you encounter a duck that is actively replacing rectrices (tail feathers), pull one feather that has blood in its quill (these feathers are often shorter than fully grown tail feathers). These feathers will provide isotopic signatures for the area where these feathers were replaced. A new feather will be re-grown if the entire feather is pulled.

Feather Storage and Archival

Place feathers from each duck in a pre-labeled small coin envelope. Include all the information requested on the label. If more than one feather is being obtained from a bird, and they **are not readily distinguishable** (e.g., an old and a new secondary from the same molting bird), please put each feather in separate labeled coin envelopes, then label appropriately and place together inside one labeled envelope.

Species _____	Age/Sex _____
Tissue Type _____	
Location _____	
Date _____	Collector _____
Sample # _____	

Keep samples dry and if possible, include a coin envelope containing a small amount (a tablespoon) of silica crystals (as a desiccant) in a Ziploc bag containing all the feather sample envelopes. You can buy silica crystals at Michael's Arts and Crafts (it's used for drying flowers).

Until we come up with a plan for analysis of these samples, you can mail the feather samples for archival to:

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