

# “Arctic Warblers” – three species instead of one

The Arctic Warbler was previously considered to be distributed from northern Scandinavia eastward to western Alaska, and south to Mongolia and Japan, with a number of subspecies. We showed this to be better treated as three anciently separated species. The vocal differences were found to be much more pronounced than the morphological differences.

We collected DNA samples and sound recordings from throughout the range of the Arctic Warbler. We demonstrated congruent differences in mitochondrial DNA, songs and calls between birds from (1) Scandinavia to Alaska, (2) southern Kamchatka, Sakhalin Island, the Kurile Islands and Hokkaido (Japan) and (3) the rest of Japan (Honshu, Shikoku, Kyushu).

We concluded that these three groups were best treated as three species. However, in order to determine which names to apply to these species, we had to sequence mitochondrial DNA from name-bearing type specimens of the taxa *xanthodryas*, *examinandus* and *flavescens*, which were all collected on migration or in the winter quarters.

In conclusion, the species from continental Eurasia and Alaska should be called *Phylloscopus borealis* (**Arctic Warbler**), the one from Kamchatka, Sakhalin and Hokkaido *Phylloscopus examinandus* (**Kamchatka Leaf Warbler**) and the one from the rest of Japan *Phylloscopus xanthodryas* (**Japanese Leaf Warbler**).

The differences in song are consistent and with practice clearly audible, especially the difference between *Phylloscopus borealis* and the two others. Also the calls are noticeably and consistently different. In contrast, plumage and structural differences are very slight. *Phylloscopus xanthodryas* is on average more yellow below, brighter green above and has a longer outermost primary than the others, which are even more similar to each other.

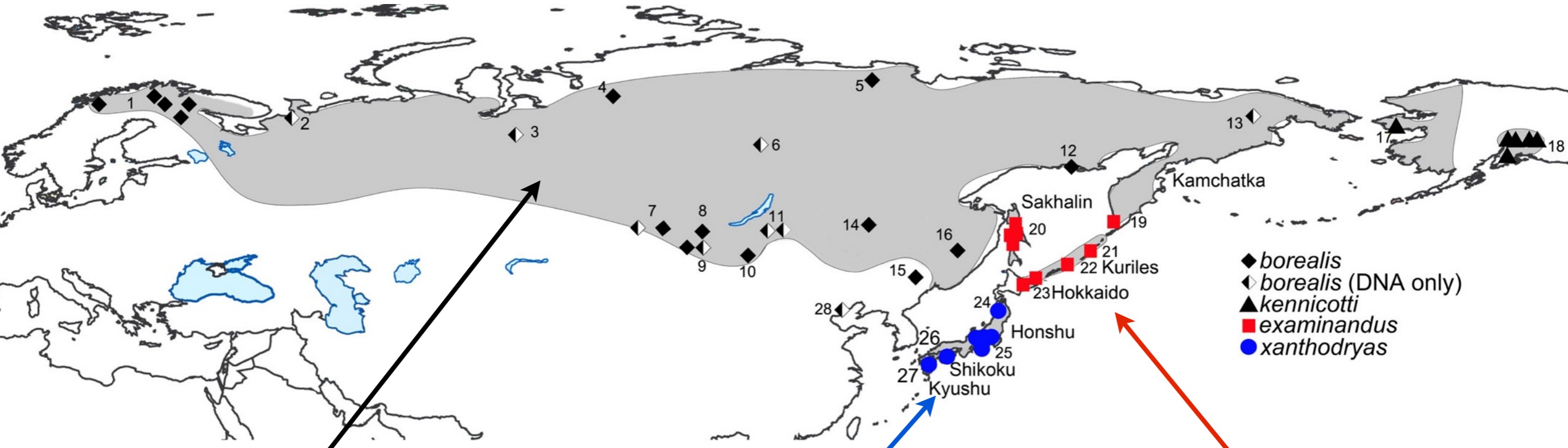
Based on a molecular clock, we estimated the age of the split between the first two of these three lineages to be c. 2 million years old, and the separation between the third and the two others to be c. 2.5 million years old.

Saitoh, T., Alström, P., Nishiumi, I., Shigeta, Y., Williams, D., Olsson, U. & Ueda, K. 2010. Old divergences in a boreal bird supports long-term survival through the Ice Ages. *BMC Evolutionary Biology* 10:35.

Alström, P., Saitoh, T., Williams, D., Nishiumi, I., Shigeta, Y., Ueda, K., Irestedt, M., Björklund, M. & Olsson, U. 2011. The Arctic Warbler *Phylloscopus borealis* – three anciently separated cryptic species revealed. *Ibis* 153: 395–410.

# “Arctic Warblers”

Very similar appearances



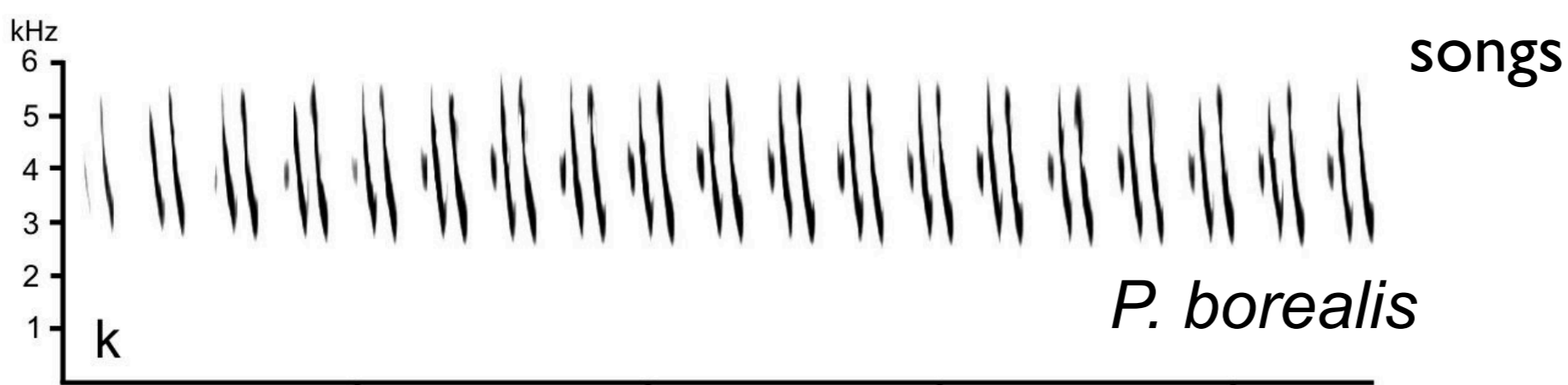
*Phylloscopus borealis* Magadan, Russia, 3 July 2007. Photo: Takema Saitoh.



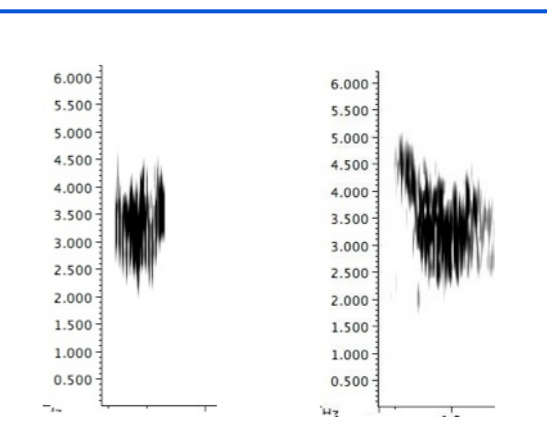
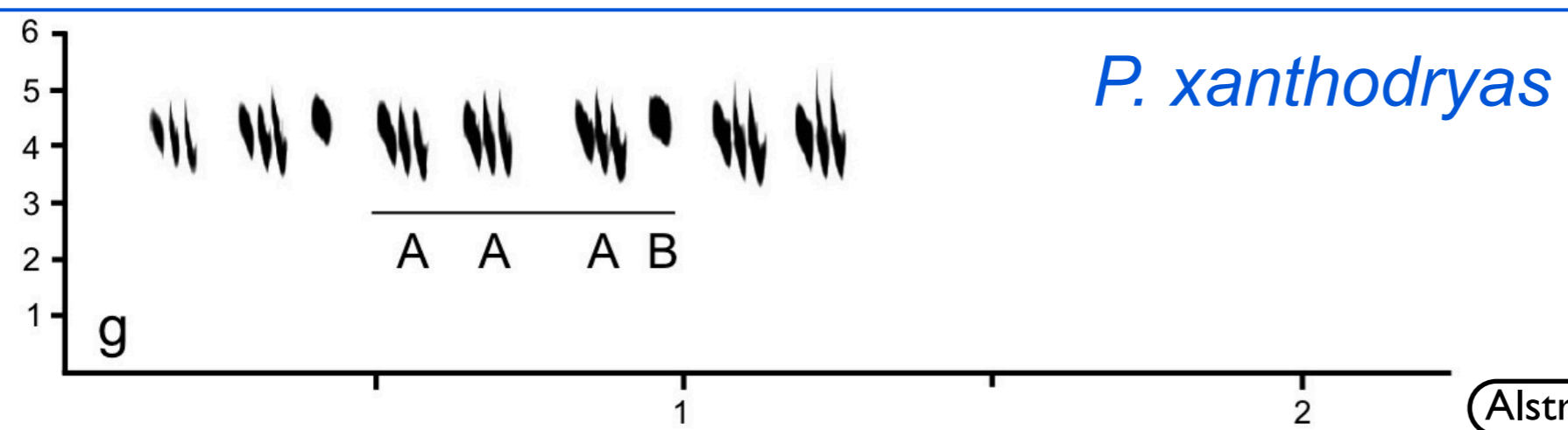
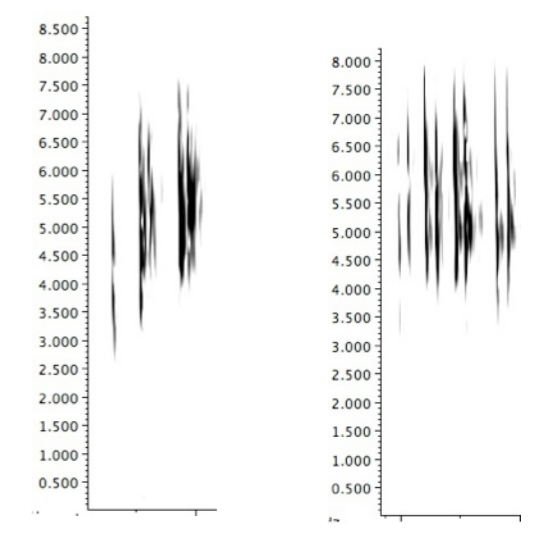
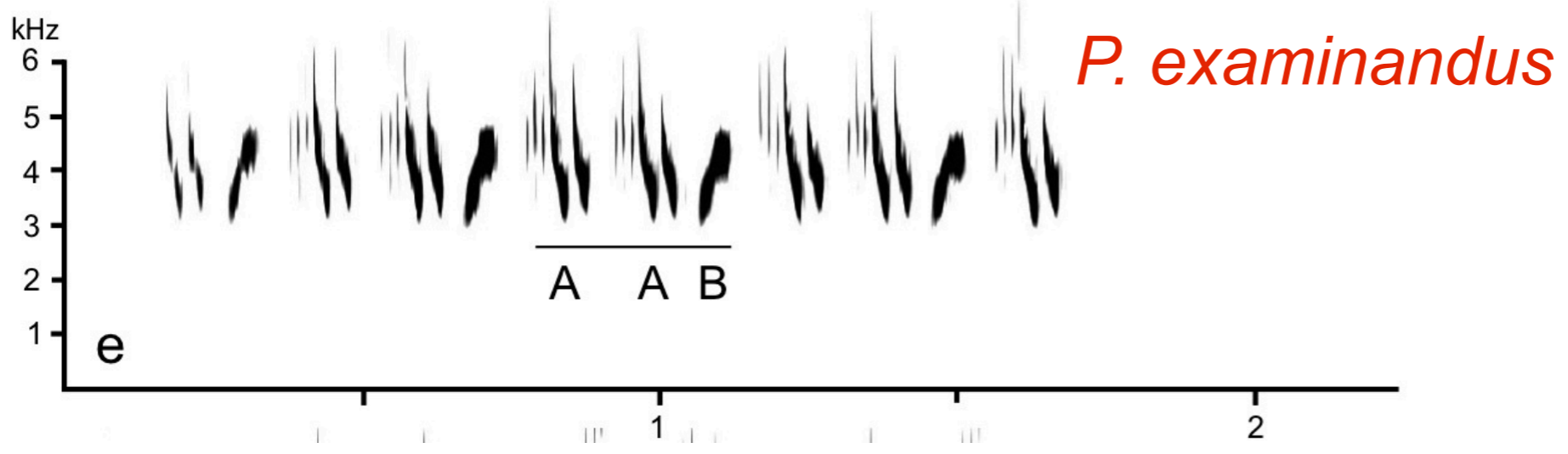
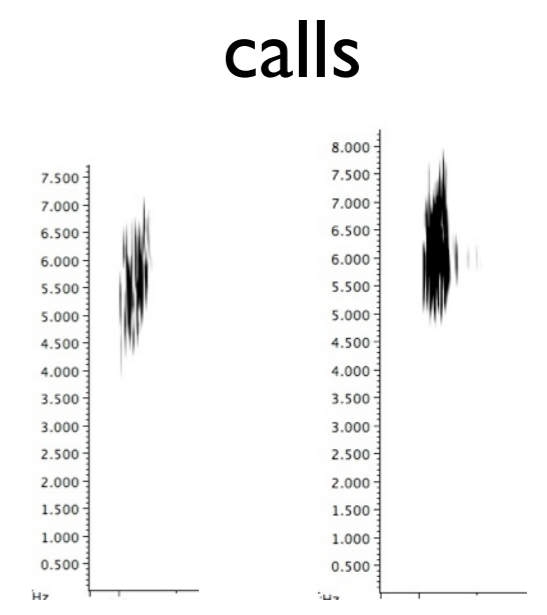
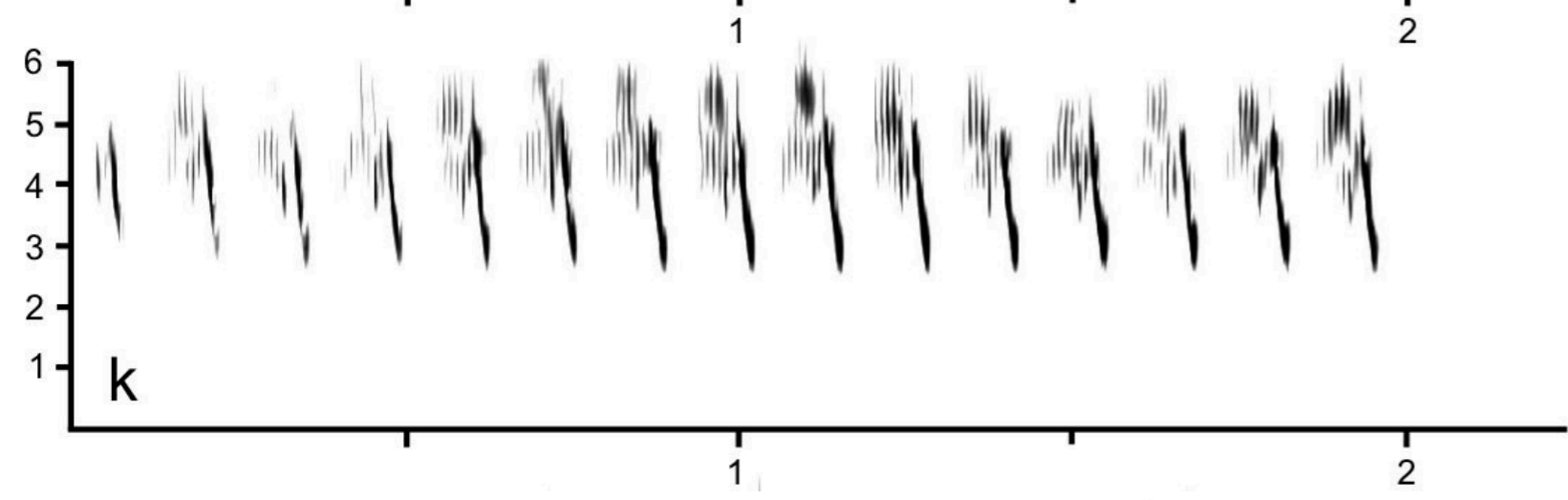
*Phylloscopus xanthodryas* Iwate, Honshu, Japan, 29 July 2004. Photo: Takema Saitoh.



*Phylloscopus examinandus* Hokkaido, Japan, 16 July 2004. Photo: Takema Saitoh.



Distinct songs and calls



Separated c. 2–2.5 million years ago

