

## Avifaunal Responses to Warm Climate: The Message from Last Interglacial Faunas

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**ABSTRACT.** The possible effect on avifaunas of a hypothetical future warmer climate has recently caused much speculation, frequently ill-founded. On the other hand the actual effects of past warmer interglacials on avifaunas have strangely enough attracted no interest. This paper is an effort to remedy this, by reviewing the avifaunas of the previous interglacial (MIS 5e, 117–130 Ka BP). This interglacial was significantly warmer than the present one, about 2°C in the North Temperate zone and 5°C or more in the Arctic, and may have been the warmest interval since the Pliocene. Most of the known Last Interglacial avifaunas are from the temperate parts of North America and Europe. The scarcity of avifaunas from other areas are due both to a scarcity of Pleistocene avifaunas in general and to rudimentary Quaternary chronologies, which makes it difficult to date faunas older than the last glaciation. In North America, the largest collections are from California and Florida. The Californian faunas are similar to modern faunas, both for seabirds and landbirds, while the Florida faunas contain a number of extralimital Central American and South American species. A small fauna from Arctic Canada (Old Crow Basin) is also similar to modern faunas. In Europe, several faunas from Central Europe differ little from extant faunas in the same areas, while faunas from Great Britain contain some southern (Iberian) species. Material from the southern hemisphere is very limited, and consists of one small fauna from New Zealand which is similar to modern faunas from the same area. The only LIG avifauna that shows dramatic differences from present-day conditions is from southwestern Egypt. This area is now extreme desert but had a rich Afrotropical avifauna during LIG, presumably due to a northward expansion of the African Monsoon. In general it seems that a temperature rise of the order of 2°C does not have a very dramatic impact on temperate avifaunas, while in the tropics changes in precipitation patterns may be more important than temperatures.

TYRBERG, TOMMY, 2010. Avifaunal responses to warm climate: the message from Last Interglacial faunas. In *Proceedings of the VII International Meeting of the Society of Avian Paleontology and Evolution*, ed. W.E. Boles and T.H. Worthy. *Records of the Australian Museum* 62(1): 193–205.

The possible effect on avifaunas of a hypothetical future warmer climate has recently caused much speculation. However the actual fossil data on avifaunas during past warmer interglacials have attracted very little or no interest. This paper is an effort to address this oversight.

The last interglacial (MIS 5e, about 130–117,000 years BP) is of special interest in this context. It was apparently about 2°C warmer than modern climates globally and up to 10°C warmer in large parts of the Arctic (e.g., Velichko *et*

*al.*, 2008, CAPE-Last Interglacial Project Members, 2006), while sea-levels were a few meters higher than at present, though the exact figure is very uncertain. As a matter of fact to judge from the  $\delta^{18}\text{O}$  record MIS 5e was the warmest interval since the Pliocene (ca. 2.5 Ma), and to find a sustained period of lower  $\delta^{18}\text{O}$  one has to go back about 4 million years to the Early Pliocene warm period (Lisiecki & Raymo, 2005).

Because the last interglacial *sensu stricto* (i.e. MIS 5e) is known by a variety of local names (Sangamonian,