Newly discovered or new colony site?

For emperor penguins what constitutes a “newly discovered” colony is difficult to say with certainty. Even the question what constitutes a colony is different to other species of penguins that breed on rock. Emperor penguin breeding sites are, by nature, as dynamic as the sea ice and ice shelf environment which they inhabit. However, from the little experimental evidence that we have, mainly collected from Dumont D’Urville, adult birds prefer to return to the same location every year and therefore an aggregation of the same birds breeding at the same location can be classed as a colony.

There are times when the morphology of the surrounding ice may change enough that a group of penguins has to abandon its usual locations and re-locate, sometimes may kilometres away. This may include sea ice break-up or ice shelf or ice tongue calving events. However, if birds move to a new site it is unclear if all birds move or just some of them. Therefore, defining a colony based on the assumption that a group of birds that were at one site have moved entirely to a new site and classing it as the same colony is problematic. There are also other additional problems associated with naming colonies if this practice is adhered too. These include:

1. In extreme cases if a breeding location is no longer suitable, some or all of a group may move to merge with an existing colony (see Fretwell & Trathan 2019). This movement may take several seasons.
2. In other examples after a topographic change a colony can split into multiple locations as seen at Mertz Glacier (see Ancel et al. 2014). Here, after a break-up of the Mertz Glacier tongue, the colony relocated into two colonies approximately 20 km apart. These two groups were considered as separate colonies by the authors and persisted for several years until the colony reformed. This behaviour has also happened at Sanae colony (unpublished work) and possibly West Ice Shelf where two breeding sites exist in close proximity on a calving ice shelf.
3. Names of colonies are often associated with locations, If the location of the group of bird changes then using the old name is sometimes no longer relevant and can lead to confusion. One such example is Gould Bay colony, which was first discovered in 1957 in Gould Bay to the east of Gould Island in the Weddell Sea (Wienecke 2010). When the area was re-surveyed by satellite in 2009 no colony existed in Gould Bay, but a breeding location was found some 90 km to the west in a different bay on the west side of Gould Island, but not in Gould Bay. As it was assumed that the new location was probably the offspring of the birds from the 1957 colony as so it retained the name Gould Bay colony. This has become extremely confusing as the Gould Bay emperor penguin colony is now not in Gould Bay, but located in another, unnamed bay almost 100km away from the physical Gould Bay.
4. It is impossible to tell for certain if a colony that was first seen many decades ago at one location, holds the same birds (or the offspring of birds) from a new site found many kilometres away from the old colony location. Recent papers have suggested that there may be interchange between colonies and that regional populations should be thought of as meta-populations (LaRue et. al. 2014).
5. For population monitoring, which, for the majority of colonies, takes place by satellite, it is essential to know the location of breeding sites for tasking requirements. Currently satellite acquisitions tend to be a maximum of 100 km2 (10 km x 10 km), so if a colony moves outside of a 5km buffer around the usual location it will not be captured, and population counts derived from satellite will not be correct.

In essence, our naming conventions for emperor penguin groups have historically been taken from other colonial nesting birds where the breeding sites are fixed. Emperors do not have a fixed site and, due to the dynamic nature of the ice, are much more mobile so the conventions of fixed sites do not always apply. Here we propose the use the term *colony site* rather than colony to denote a newly discovered site.

*References*

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