

Experimental harvest of waterfowl eggs informs management by Indigenous peoples

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Customary harvests of wildlife have supported and shaped many cultures over centuries. Indigenous peoples and local communities (IPLC) have managed and conserved wildlife populations using a variety of customary approaches such as habitat protection, access restrictions, and harvesting specific life stages. Customary approaches to management are adaptive and informed by detailed knowledge of local biodiversity. The long-term nature of customary management means that harvests are often rooted in local tradition and central to the cultural identities, wellbeing, and ecological knowledge of IPLC. However, modern environmental laws often criminalize customary harvests, regardless of species conservation status or their significance for IPLC. Supporting IPLC in customary management, including sustainable harvests, is increasingly recognized as beneficial for wildlife, their habitat, and the cultures that value them. Re-initiating customary management is challenging, however, because it requires updating local knowledge to new environmental contexts within appropriate cultural contexts that recognize IPLC values.

Using an experiment jointly initiated by the Māori tribe Ngāi Tahu and researchers (Māori and non-Māori) in Aotearoa/New Zealand, we assessed how customary egg harvest regimes (removal of one-third, two-thirds, or all eggs from individual nests) impact hatching success of a culturally important waterfowl species, the black swan (kākī anau, *Cygnus atratus*). Ngāi Tahu are interested in re-initiating customary harvests of swan eggs and this study aimed to update the tribe's knowledge of harvest impacts under current environmental conditions. Partial harvests caused a loss of approximately one hatchling per egg removed, because swans replaced few of those harvested eggs yet incubated most unharvested eggs until they hatched. Conversely, harvesting

an entire clutch caused a loss of approximately one hatchling for every two eggs removed, because swans often subsequently re-laid new, albeit smaller, clutches. Therefore, for a given number of eggs harvested during a nesting season, removing entire clutches early during nesting could induce some re-laying and prevent abandonment of unharvested eggs. Restoring foraging habitat in degraded wetlands such as our study site could provide the plant resources swans require to re-lay additional eggs.

Customary management can simultaneously improve IPLC wellbeing and local monitoring of wildlife numbers and habitat conditions. Moreover, customary harvest could be a practical, culturally appropriate, and less wasteful alternative to non-consumptive culling for mitigating human-wildlife conflict, such as waterfowl grazing pasture.



Ngāi Tahu customary harvester Craig Pauling gathering black swan eggs.

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