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Limitations on the use of historical and database sources to identify changes in distribution and abundance of the platypus. Response to *A silent demise: Historical insights into population changes of the iconic platypus* (Ornithorhynchus anatinus)

Hawke et al. (2019) have attempted to identify historical changes in platypus distribution and abundance by collating information from archival sources (mainly newspaper articles), museum and government databases and citizen-science reports. We applaud the authors' goal of raising concerns regarding the species' status, but shortcomings in their methodology and unjustified use of inference limit the scope and plausibility of their findings.

An implicit assumption underpinning the paper is that when no platypuses were reported for a particular time period and sub-catchment, the species was actually absent. Our considerable experience with this highly cryptic species exposes this as an unsound assumption unless supported by field checks, which the authors have not attempted. It is also disturbing that this failure to articulate, let alone justify, a fundamental premise of the paper extends to the mapping and categorisation of "potential pre-European distribution"; thus there is no valid baseline for inferring declines in those areas.

The authors' proposition that the findings are based on "data over 258 years (1760–2018)" is invalid, since this period begins some 37 years prior to the Platypus being 'discovered' by Europeans and 10 years before 'discovery' of the East Coast of Australia. A widespread decline in the species' distribution is inferred from the finding that only 58.6% of sub-catchments with at least one platypus record in 1760–2008 also had a record in 2009–2018. However, this conclusion would only be valid if the sampling in the decade 2009–2018 is comparable (or nearly so) to that in 1760–2008 (~25 decades). Even if the underlying spatial distribution and abundance of animals remained unchanged, it would be expected that substantially fewer records would be lodged during the much shorter recent period. Indeed the number of records from 2009 to 2018 ($n = 2428$) is actually only 20.7% of the number reported from 1760 to 2008 ($n = 11734$). Although there is some support for a pattern of modest decline in the number of recent sightings per sub-catchment when the overall sample size from 1760 to 2008 is adjusted to be comparable to that from 2009 to 2018, the amount of change evident at this spatial scale is relatively small (Fig. 1). Also, the number of reports of platypus sightings depends on observer/reporter presence; the latter has been substantially reduced in recent decades by ongoing decline in the Australian rural work force associated with changes in farming and other land use practices.

Hawke et al. (2019) present estimates of platypus abundance gleaned from eight newspaper articles to support their assertion that platypus numbers were previously far greater. Having read the original accounts, we have significant reservations about use of these as reliable estimates of historical platypus abundance. Of four accounts of animals being captured, three fail to provide details about the extent of the collection area. Other accounts describe events that occurred months or years prior to their reporting: one was associated with severe overbank flooding at a time of year when adults and all of that year's juvenile cohort would have been displaced from nesting burrows; another describes more animals being present ($n = 40$) than in our experience could conceivably be counted with any degree of accuracy.

Furthermore, the eight accounts in their Table 1 were selectively chosen from 179 accounts containing estimated numbers sighted; importantly, comparably large 'sampling' records are still being reported - e.g. 17 platypus skulls from an abandoned fyke net in the early 2000s (Serena and Williams, 2010) and our unpublished captures of 10–13 individuals in single pools during 6 hour periods of mesh netting in the Wingecarribee and Shoalhaven Rivers, NSW and 21 captures in 6 hours of fyke netting along 1.5 km of the Buchan River, Victoria (Grant and Serena, unpublished). We maintain that the historical accounts

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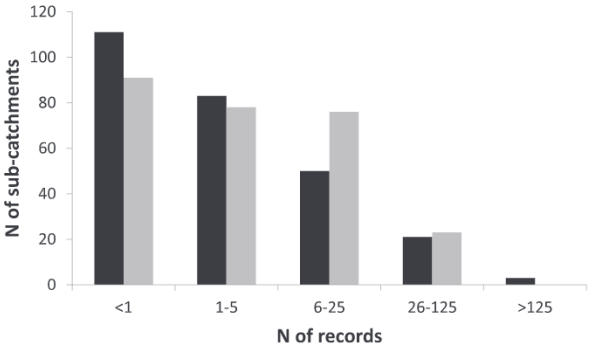

Fig. 1. Number of platypus records reported for 286 sub-catchments from 2009 to 2018 (black bars) and 1760–2008 (gray bars). Records were extracted from Supplementary data S1 in Hawke et al. (2019). To compensate for unequal sampling in the two periods, number of records for sub-catchments from 1760 to 2008 were divided by 4.83.

presented by Hawke et al., though interesting, don't provide compelling grounds for concluding previous platypus abundance was consistently much higher.

Finally, the authors claim that the large numbers killed for the early platypus fur trade has caused a lasting reduction in abundance. Although the number of platypus pelts sold in the Sydney market constitutes plausible evidence that hunting would have devastated populations in at least some areas, the assertion that "it is likely that most platypus populations never fully recovered from hunting, given their slow reproductive rate … and high juvenile mortality rates" is unconvincing. More than 120 years have elapsed since platypuses were legally protected throughout their range and their reproductive rate cannot realistically be classed as "slow" (e.g. 2 years to maturity, mean annual reproductive output = 1.9 juveniles, ca. 40% females breeding annually: Grant et al., 2004; Serena and Grant, 2017). An example of the species' apparent potential for population recovery is provided by Hawke et al. themselves; platypuses were notably abundant near Princes Bridge in Melbourne in 1908, just 16 years after they became legally protected in Victoria.

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