Doi:10.1071/PC20052
CSIRO 2020
Pacific Conservation Biology 2020

Using Samoan traditional ecological knowledge to identify calls of the critically endangered endemic tooth-billed pigeon (*Didunculus strigirostris*)

G. Serra[A,D], *G. R. Wood*[B], *S. A. Failagi*[C], *S. T. Foliga*[C], *M. Uili*[C] *and F. Enoka*[C]

[A]Freelance conservationist and ecologist, Florence, Italy.
[B]Department of Statistics, University of Otago, New Zealand.
[C]Ministry of Natural Resources and Environment, Samoa.
[D]Corresponding author. Email: ibiseremita@gmail.com

SUPPLEMENTARY MATERIAL

Text S1: We did not offer remuneration for participating, albeit past practices with earlier international projects may have raised expectations (Serra 2016).

Text S2: This was done through five bird identification visual tests and four audio tests integrated within the questionnaire (Serra 2016). The first set of visual and audio tests involved bird species very different from each other, to test the skill of participants to identify different families. The questionnaire was designed to quickly identify within the first two or three questions those providing biased responses or with inadequate knowledge.
The second round of tests included assessing skills to distinguish bird species within the same family. For instance, hunters were played the recorded calls of the three sympatric pigeon species occurring in rainforest habitats of Samoa – *Didunculus* (using a recorded call provided to MNRE by Ulf Beichle), *Ducula* and the white-throated pigeon (*Columba vitiensis*). The questionnaire was in the Samoan language and customary protocols (Grattan 1985) were followed before requesting to interview the hunters of the village.
The following approach was used to avoid interviewers influencing the responses from interviewees: psychologically (Kalton and Schuman 1982, Podsakoff *et al*. 2003) and culturally sound (Grattan 1985) questions were discussed and designed aimed at composing the questions directed to hunters so that they were neutral (not 'leading') and did not signal what an answer 'should be'.

Text S3: At the end of both the interviews and the field visits we thanked the hunters for sharing their TEK and we reassured them that it would be always credited to them and acknowledged in presentations, reports and publications.

Text S4: The eight sites were selected based on the statements and reports of the reliable hunters: three sites being the ones where a *Didunculus* was spotted from 20–40 to 1–2 years ago; two sites were those where a *Didunculus* was killed 10 years ago; another two were sites where on-the-spot identifications of *Didunculus*' call were made during the mentioned surveys; another site was chosen as reportedly holding the best suitable forest habitat for *Didunculus* on the basis of occurrence and density of fruiting trees.

Forest area /site	*Date of setting up*	*Full days of operation dawn–sunset*
Uafato /east site	15 March 2016	7
Uafato /west site	17 March 2016	15
Malololelei	9 March 2016	5
Aopo /site 1	11 May 2016	16
Aopo /site 2	12 May 2016	7
Taga /site 1	8 June 2016	7
Taga /site 2	9 June 2016	10
Falealupo /site 1	21 June 2016	7
Falealupo /site 2	21 June 2016	16
	Total	90

Text S5: The identifications were performed by GS during 2015–2016; this area had been already identified as hosting *Didunculus* thanks to a few recent definite sightings (Serra *et al*. 2017; Beichle, pers. comm.; R. Stirnemann, pers. comm.; F. Enoka, pers. comm.). Dates and criteria of ARU site selections are detailed in Table 3 of Serra *et al*. (2017).

Text S6: The recordings were played using a laptop and headphones (Panasonic stereo) at a standardised volume, in random order for each session. If requested by the hunter, a sequence recording was played a second or third time. Each session would last between 3 and 5 h.

Text S7: Before, during and after the test identifications of coo call sequences the hunters were further tested for reliability, without their being aware (blind tests), through subtests about pigeon call identification. For instance, several opportunistic tests on the same sequence, across different spans of time (ranging from a few hours to a year), were run with the same (unaware) hunter and the results recorded. A second-level ranking of reliability was then determined for each of the 10 hunters, combining the tests from 2016 with those from 2017.

Text S8: We performed an analysis of variance (ANOVA) on each of seven variables (those described in Table 1 with their measurement explained in Text S10) using the calls of the 104 original sequences. This was done in order to test whether variance within same-location 3-day clusters differs from that between clusters. The table below summarises the results.

Variable	*P*-value
Length	0.283 (NS)
Highest Frequency	0.042 (*)
Lowest Frequency	0.008 (**)
Frequency of the decibel Peak	0.124 (NS)
Duration of the decibel Peak	0.095 (NS)
Position of the decibel Peak	0.006 (**)

Average duration of the intervals following all coo calls within the sequence	0.000 (***)

Text S9: Each cell with an identification made by each of the 10 reliable hunters on the 104×10 matrix was assigned a different colour code in order to better visualise the level of consistency of the identifications across different hunters.

Text S10: Each was measured on the display, by means of the cursor, for each single coo call (and related between-call intervals) of a given sequence, using the spectrograms produced by the sound analysis program Song Scope and its associated tools (Fig. 3). For the purpose, the Fast Fourier Transform (FFT) was set to a value of 1024 and the FFT Overlap to 1/2. Manual measurement, performed always by the same person (GS), was preferred to automatic measurement because the quality of coo call recordings, in relation to the forest background noise, was quite variable.

REFERENCES

Grattan, F.J.H. (1985) 'An Introduction to Samoan Custom'. (NZ Electronic Text Centre, Victoria University: Auckland, New Zealand). Available at: http://nzetc.victoria.ac.nz/tm/scholarly/tei-GraIntr.html [accessed 9 January 2017]

Kalton, G., and Schuman, H. (1982). The effect of the question on survey responses: a review. *Journal of the Royal Statistical Society* **145**, 42–73.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y., and Podsakoff, N.P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology* **88**, 879–903.

Serra, G. (2016) Biodiversity surveying of four KBAs in Samoa through traditional ecological knowledge: Uafato-Tiavea Coastal Forest, Apia Catchments, Central Savaii Rainforest And Falealupo Peninsula. Unpublished report, Apia, Samoa: MNRE and UNDP, pp. 83.

Serra, G., Sherley, G., Failagi, S., Foliga, S.T., Uili, M., Enoka, F., and Suaesi, T. (2017) Traditional ecological knowledge on critically endangered and evolutionary distinctive Tooth-billed Pigeon (*Didunculus strigirostris*) endemic of Samoa. *Bird Conservation International* **28**, 620–242.