Modifying capture techniques for wild Laysan Teal *Anas laysanensis*

JAMES H. BREEDEN JR.[1,2,*] & KELLY L. GOODALE[3]

[1]SWCA Environmental Consultants, Honolulu, Hawai'i 96814, USA.
[2]U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai'i 96850, USA.
[3]U.S. Fish and Wildlife Service, O'ahu/Maui National Wildlife Refuge Complex, Kahuku, Hawai'i 96731, USA.
*Correspondence author. E-mail: james_breeden@fws.gov

Abstract

The Laysan Teal *Anas laysanensis* is endemic to the Hawaiian archipelago with wild populations currently occurring on Laysan Island, Midway Atoll and Kure Atoll. Previous Laysan Teal translocations expanded their range by establishing new populations to reduce extinction risk. In 2015 the House Mouse *Mus musculus* was documented feeding on live Laysan Albatross *Phoebastria immutabilis* and a plan was developed to eradicate mice from the atoll. To protect Laysan Teal from non-target mortality during a mouse eradication, new capture techniques were developed to move and isolate Laysan Teal temporarily on a mouse-free island within Midway Atoll until the ducks were no longer at risk of secondary and primary poisoning. Here we describe modifications to techniques previously used for the capture of Laysan Teal. These techniques can be applied to the other waterfowl and adapted for other species.

Key words: *Anas laysanensis*, Laysan Duck, stress management, Midway Atoll, rodent eradication.

Midway Atoll (Midway) is an unorganised, unincorporated territory of the United States located *c.* 2,100 km northwest of Honolulu, Hawai'i (28°12 N, 177°22 W). The atoll is made up of Sand Island (460 ha), Eastern Island (135 ha) and Spit Island (5 ha) and is in the southern part of a chain of volcanic islands, atolls and seamounts that extends from Hawai'i to the Aleutian Islands (USGS 1987, USFWS 2009; Fig. 1). Midway is a National Wildlife Refuge and a National Memorial within the Papah naumoku kea Marine National Monument, managed by the US Department of Interior through the US Fish and Wildlife Service (USFWS).

Midway is occupied by half of the global population of the critically endangered Laysan Teal *Anas laysanensis* (also called Laysan Duck). Founders from two conservation translocations from Laysan Island to Midway in 2004 (n = 20) and 2005 (n = 22) increased to as many as 661

© Wildfowl Press

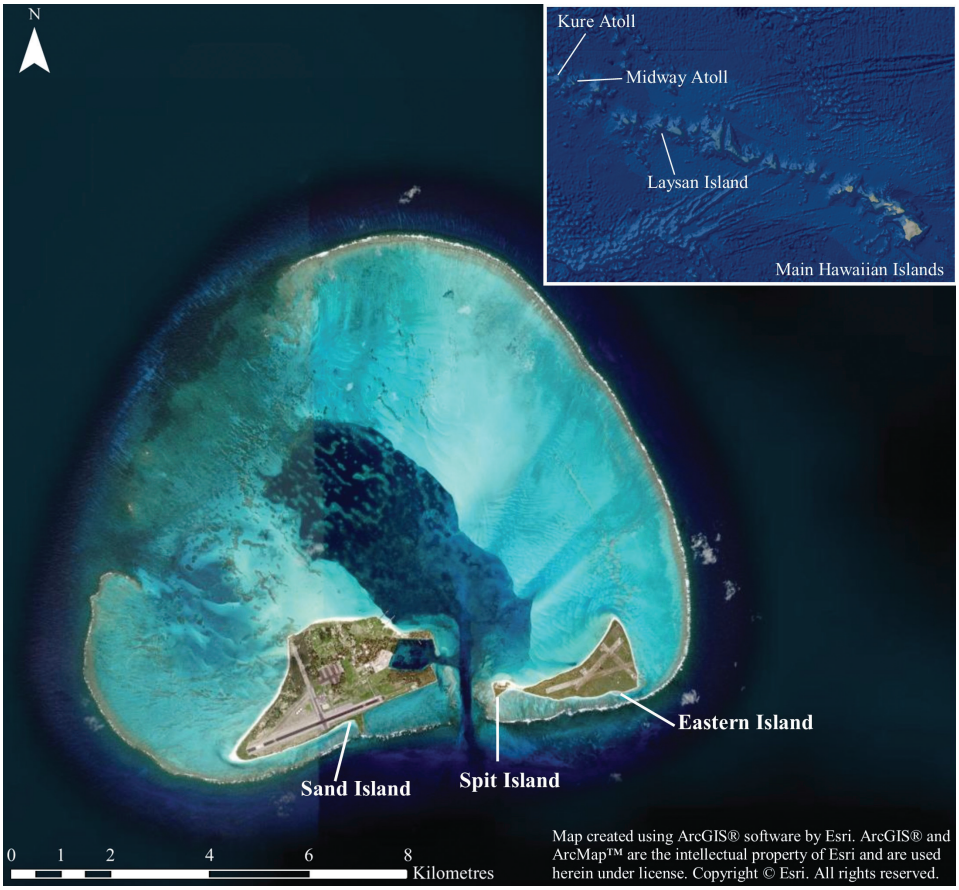

Figure 1. Map of the Hawaiian archipelago and the islands of Midway Atoll (Papāhanaumokuākea Marine National Monument 2021).

individuals in 2010, and numbers were estimated at 314–435 individuals in 2015 (Reynolds *et al.* 2017). Data from 2017–2018 indicate that the current Laysan Teal population comprises *c.* 600 individuals (K. Goodale, unpubl. data), although anecdotal information following a botulism outbreak in summer 2019 together with observations in winter 2019/20 suggest that the Midway population in February of 2020 may have been closer to 500 Laysan Teal.

Post-release monitoring using mark-resight methods and radiotelemetry data indicate that Laysan Teal move freely among the islands and wetlands of Midway (Work *et al.* 2010). Home range size and movements vary with breeding status, with post-fledgling juveniles and pre-breeders making larger movements and more flights than most adult Laysan Teal (Reynolds *et al.* 2010). Based on the habitat assessment conducted in 2017, Eastern Island can support *c.* 85–

102 Laysan Teal, with Sand Island supporting *c.* 498–515 birds (SWCA 2017). Although larger numbers of ducks are likely to visit Eastern Island at a time, they are not exclusive residents, and often return to Sand Island (SWCA 2017).

In 2015 the House Mouse *Mus musculus* was found to be feeding on nesting adult Laysan Albatrosses *Phoebastria immutabilis* on Sand Island, and the Seabird Protection Plan was developed to eradicate mice from Midway using the toxicant brodifacoum (Duhr *et al.* 2017; Work *et al.* 2021). To protect Laysan Teal from non-target mortality during the Midway mouse eradication programme, modifications to published capture techniques were developed using easily available materials to move Laysan Teal temporarily *c.* 1 mile (1.6 km) from Sand Island and isolate the entire Midway population on the mouse-free Eastern Island until the ducks were no longer at risk of secondary and primary toxicant poisoning.

Wild Laysan Teal are nocturnal and active from *c.* 1 h before sunset to 1 h after sunrise. Previous capture techniques used dazzle-netting at night and noose carpets during the day to target individual ducks (Hollom & Brownlow 1955; Dennis 1966; Bub 1991; Reynolds *et al.* 2009). These capture methods, however, limit the number of duck caught to 1–3 individuals per capture event. Furthermore, depending on the environmental conditions, Laysan Teal can be difficult to locate at night and the use of noose carpet traps cause uncaptured ducks to flush from their socialising areas. To increase capture efficiency, we therefore used a Skokholm funnel trap (Bub 1991) in conjunction with a modified capture box, which allowed for multiple birds to be caught during a single trapping event, without needing to handle Laysan Teal during the process. Capture efforts occurred from 6–23 February 2020, prior to the Laysan Teal breeding season (April–July), when ducks congregate on water bodies and therefore are easier to catch (USFWS 2009). Here we describe modifications to capture techniques developed for catching multiple Laysan Teal, to provide a record for future research or conservation programmes.

Methods

Skokholm funnel traps (Fig. 1) constructed using pre-existing materials on Midway. Traps varied in design, but in general were constructed from a 20 ft (6.1 m) of 3/4 inch (1.9 cm) polyvinyl chloride (PVC) pipe, 8 × 3 ft (2.44 × 0.92 m) of 1.25 × 1.50 inch (3.2 × 3.81 cm) mesh fencing, a 0.50 inch × 2 ft (1.27 cm × 0.61 m) rebar, a 5 ft (1.5 m) u-channel fence post, a 4 × 4 × 3 ft (1.22 × 1.22 × 0.91 m) wooden box frame, and a *c.* 30 × 30 ft (9.14 × 9.14 m) commercial fishing net with *c.* 1 inch (2.54 cm) mesh and 24 square ft (7.32 m^2) of shade cloth. The materials for the Skokholm funnel trap were used as follows. Firstly, the PVC pipe was slid over the rebar, which had been anchored in the mud to form a 6 ft (1.83 m) radius semicircle for the entrance. The commercial fishing net was then attached to the PVC pipe and the wooden frame, using nylon cable ties, to form a tunnel. The fencing was attached using nylon cable ties to both sides of the entrance, at a 45 degree angle to form a drift fence for funnelling birds into the trap. The

© Wildfowl Press

Figure 2. Skokholm funnel trap design. Rice and commercial cat food were placed inside the trap to attract ducks, and the doors were left open to allow Laysan Teal to move in and out of the trap freely. The drift fence is not attached in the photo. Photograph by James Breeden.

fence post was used to support the centre of the tunnel (Fig. 2).

Capture boxes were made to remove Laysan Teal from the Skokholm funnel trap (Fig. 3a,b). The dimensions of each capture box were 3 × 1 × 1 ft (0.91 × 0.31 × 0.31 m). Capture boxes were made with 1 × 1.5 inch (2.54 × 3.81 cm) wood lumber (frame), shade cloth (top and sides), 0.50 inch (1.27 cm) plywood (floor), 0.25 inch (0.64 cm) plywood (doors), a 18 × 28 inch (45.72 × 71.12 cm) reach tube (top door), and 0.25 × 1 inch (0.64 × 2.54 cm) wood strips (to attach the reach tube to the frame). Materials were attached using staples, screws and finishing nails. Each capture box had three doors: two sliding doors at the front and back that moved up and down, and one reach tube centred on the top. Capture boxes were joined together during capture events to form a segmented chute. Laysan Teal were removed from the Skokholm funnel trap by attaching a capture box to a 1 × 1 ft (0.31 m) hole in the shade cloth at the back of the trap, which was framed with 1 × 1 inch (2.54 × 2.54 cm) wood lumber and 1/2 inch (1.27 cm) plywood.

The Skokholm funnel trap was set up with the tunnel entrance extending approximately 10 ft (3.05 m) into the water. Before trapping, cooked rice and commercial cat food were put out to attract ducks to the trap. A veterinarian provided support as needed. Laysan Teal were slowly driven into the trap and then transitioned into the segmented chute capture box system (Figs 4a,b). Up to 10 capture boxes were joined together and each capture box

© Wildfowl Press

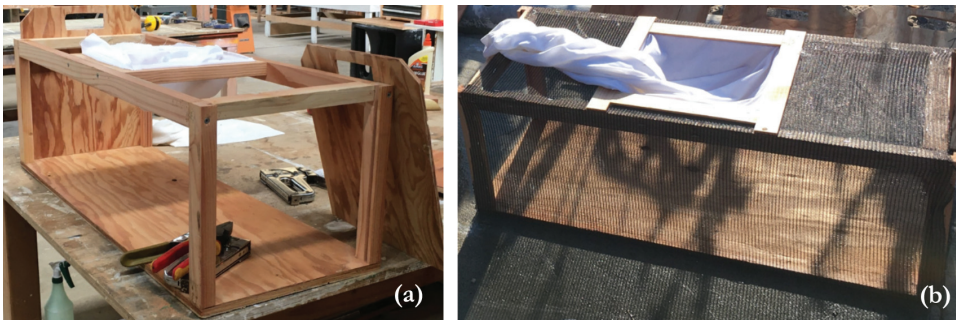

Figure 3. Capture boxes built to remove Laysan Teal from the Skokholm funnel trap, showing: (a) main structure, and (b) with netting and reach tube attached to the top. Photographs by James Breeden.

held up to five ducks. Once the capture boxes were full, the doors were closed, towels were placed over the boxes to reduce stress, and the ducks were transported to a separate area for processing. Here the capture boxes were placed in a dark room and each box was again covered with towels. Laysan Teal were removed from the capture box for processing via the reach tube.

During processing, each Laysan Teal was sexed on the basis of its bill colour, marked with an aluminium ring fitted to the tibiotarsus, weighed and the primary flight feathers were trimmed. Cloacal temperature was taken to monitor for overheating and the bird's body condition keel score was recorded using a 0–4 point scale to establish baseline body condition (Frischknecht & Jull 1946; Gregory & Robins 1988). In addition, 215 ducks were given the Botumink toxoid to provide protection from Botulism type C *Clostridium botulinum* (Rocke *et al.* 2000). Once processed, the ducks were placed into an 18.50 × 9 × 12 inch (46.99 × 22.86 × 30.48 cm) cardboard pet carrier, transported to a closed cabin boat, transported to Eastern Island and released onto water. Supplemental food was provided daily at the release sites on Eastern Island to increase the carrying capacity to support *c.* 600 ducks.

Results & discussion

When capturing wildlife it is critical to use the most efficient and safe methods available to reduce potential stress and injury. Capture boxes were designed so that the ducks could be transferred from the trap directly into capture boxes and transported to the processing area without handling. Overall, 360 Laysan Teal were captured during 13 days of trapping using the Skokholm funnel trap in conjunction with the modified capture box. As many as 46 Laysan Teal were captured in *c.* 1 h during a single capture event. Thus, based on an estimated 398–415 Laysan Teal on Sand Island, *c.* 87–90% of the ducks were captured using the Skokholm funnel trap technique. The remaining birds on Sand Island were also captured, using dazzle-netting and noose carpets, for transfer to Eastern Island. In addition, Laysan Teal on Eastern Island were captured

© Wildfowl Press

Figure 4. Wildlife biologists and wildlife veterinarians catching Laysan Teal: (a) driving the birds into the Skokholm funnel trap, and (b) slowly pushing the teal into capture boxes from inside the trap. Photographs by Tristan W. Luxner.

opportunistically using a noose carpet and given a primary feather trim, to prevent movement to Sand Island.

No injuries to Laysan Teal occurred during trapping or removal from capture boxes. Because the capture boxes could be connected to form a continuous segmented chute and divided into smaller units the entire capture process was controlled and Laysan Teal did not need to be handled until

processing occurred. The reach tube at the top of the capture box combined with towels and a dark room facilitated the extraction of birds whilst minimising detection, which ultimately maximised efficiency for removing ducks from capture boxes while keeping stress levels to a minimum. We believe that this method also minimises the risk of injury to birds on capturing multiple Laysan Teal during a single capture event. Overall, we found that the Skokholm funnel trap, used in conjunction with modified capture boxes, was an effective and efficient way to catch multiple Laysan Teal over a short period of time.

Acknowledgements

We thank M. Reynolds, M. Vekasy, P. Luscumb and L. Santos for mentoring our work on Laysan Teal behaviour and trap design. We also thank A. Boyd, A. Chmielewski, B. Davis, T. Luxner, J. Plissner, R. Kohley and many volunteers, along with Kupu members, for their assistance in trapping and handling Laysan Teal, S. Pluskat for veterinarian support, and E. Beaudoin for data management. We are grateful to the Midway Atoll National Wildlife Refuge managers S. Barclay and T. Clark for logistical support on Midway, and to the Chugach master carpenter A. Juethong and his team for building the capture boxes. Chugach chef P. Wicha kindly supplied rice for attracting Laysan Teal to the trapping sites. Finally, we thank Eileen Rees, Nigel Clark, Anthony Fox and two anonymous reviewers who provided helpful comments on the text.

References

Bub, H. 1991. *Bird Trapping and Bird Banding: A Handbook for Trapping Methods All Over the World*. Cornell University Press, Ithaca, New York, USA.

Dennis, R.H. 1966. Catching wildfowl by artificial light. *Wildfowl Trust Annual Report* 17: 98–100.

Duhr, M., Flint, E.N., Hunter, S.A., Taylor, R.V., Flanders, B., Howald, G. & Norwood, D. 2017. Control of house mice preying on adult albatrosses at Midway Atoll National Wildlife Refuge. *In* C.R. Veitch, M.N. Clout, A.R. Martin, J.C. Russell & C.J. West (eds.), *Island Invasives: Scaling Up to Meet the Challenge*, pp. 21–25. Proceedings of the International Conference on Island Invasives, Dundee, Scotland, 10–25 July 2017. IUCN Species Survival Commission, Gland, Switzerland.

Frischknecht, C.O. & Jull, M.A. 1946. Amount of breast meat and live and dressed grades in relation to body measurements in 12-week old purebred and crossbred chickens. *Poultry Science* 25: 330–345.

Goodale, K. 2019. Laysan Teal survey results from 2017–2018. *In* M. Marxen, B. Flint, T. Hamer, K. Murray, C. Deringer, J. Hayes & M. White (eds.), *Midway Seabird Protection Project, Final Environmental Assessment*, pp. 122–124. Prepared by Hamer Environmental L.P. and Planning Solutions, Inc for the US Fish and Wildlife Service.

Gregory, N.G. & Robins, J.K. 1998. A body condition scoring system for layer hens. *New Zealand Journal of Agricultural Research* 41(4): 555–559.

Hollom, P.A.D. & Brownlow, H.G. 1955. *Trapping Methods for Bird Ringers*. British Trust for Ornithology Field Guide No. 1. BTO, Tring, UK.

O'Brien, M.F., Lee, R., Cromie, R. & Brown, M.J. 2016. Assessment of the rates of injury and mortality in waterfowl captured with five

methods of capture and techniques for minimizing risks. *Journal of Wildlife Diseases* 52: 86–95.

Papahānaumokuākea Marine National Monument. 2021. Papahānaumokuākea Marine National Monument expansion marks five years. Available online at https://www.papahanaumokuakea.gov/ (last accessed 11 September 2021).

Reynolds, M.H., Breeden Jr., J.H., Vekasy, M.S. & Ellis, T.M. 2009. Long-term pair bonds in the Laysan Duck. *The Wilson Journal of Ornithology* 121(1): 187–190.

Reynolds, M.H., Hatfield, J.S., Crampton, L.H., Vekasy, M.S. & Tweed E. 2010. Circadian habitat use, home range and behaviour of Laysan Teal *Anas laysanensis*. *Wildfowl* 60: 106–123.

Reynolds, M.H., Courtot, K.N. & Hatfield, J.S. 2017. How many Laysan Teal *Anas laysanensis* are on Midway Atoll? Methods for monitoring abundance after reintroduction. *Wildfowl* 67: 60–71.

Rocke, T.E., Sameul, M.D., Swift, P.K. & Yarris, G.S. 2000. Efficacy of a type C botulism vaccine in green-winged teal. *Journal of Wildlife Diseases* 36(3): 489–493.

SWCA. 2017. *Laysan Teal and Bristle-Thighed Curlew Assessment Report for the Mouse Eradication Project, Midway Atoll National Wildlife Refuge*. SWCA Environmental Consultants, Honolulu, Hawai'i, USA.

US Fish and Wildlife Service. 2009. *Revised Recovery Plan for the Laysan Duck* (*Anas laysanensis*). US Fish and Wildlife Service, Portland, Oregon, USA.

US Geological Survey. 1987. The Hawaiian-Emperor volcanic chain. *In* R.W. Decker, T.L. Wright & P.H. Stauffer (eds.), *Volcanism in Hawaii: Volume 1*, pp. 5–54. USGS, Reston, Virginia, USA.

Work, T.M., Klavitter, J.L., Reynolds, M.H. & Blehert, D. 2010. Avian botulism: a case study in translocated endangered Laysan Ducks (*Anas laysanensis*) on Midway Atoll. *Journal of Wildlife Diseases* 46: 499–506.

Work, T.M., Duhr, M. & Flint, B. 2021. Pathology of House Mouse (*Mus musculus*) predation on Laysan Albatross (*Phoebastria immutabilis*) on Midway Atoll National Wildlife Refuge. *Journal of Wildlife Diseases* 57(1): 125–131.

Photograph: An adult male Laysan Teal on Midway's Eastern Island, standing in Puncture Vine *Tribulus cistoides*, by Tristan W. Luxner.