

**Australasian Bittern (Matuku) and Spotless Crake (Pūweto) Survey
at Selected Wetlands Within Wairarapa Moana
Spring 2022**

**Prepared for
Greater Wellington Regional Council
by
Shane Cotter**

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1.0 Executive Summary

John Cheyne of Wetlands Works led annual spring surveys for Australasian bittern (matuku, *Botaurus poiciloptilus*) and spotless crake (pūweto, *Zapornia tabuensis*) at selected wetlands within Wairarapa Moana between 2012 and 2021. In 2022, John passed this responsibility to me. I conducted the annual spring (October-November) 2022 survey using the same methodology as in previous years so continued comparisons could be made of the annual results.

This year's survey focused on the core wetlands (Boggy Pond, Matthew's Lagoon and Wairio wetland) and the northern wetlands (Barton's Lagoon, Tauherenikau delta, Simmond's Lagoon, JK Donald Block). Only booming male matuku are surveyed because females are much less vocal and therefore very difficult to detect and monitor. This booming call is associated with males attempting to attract females for breeding. Pūweto were also surveyed at Boggy Pond and Matthew's Lagoon.

In the 2022 survey, 11 booming male matuku were located at the core wetlands and 12 in the northern wetlands. This is an increase in previous years and a record number at both locations. At the core wetlands, numbers have remained relatively stable at 8-9 birds since 2014 while at the northern wetlands, annual numbers of male matuku has varied between 3-9 birds. Overall, the combined number of booming male matuku at the core and northern wetlands has steadily increased from 10 in 2016, to 16 in 2018, to 18 in 2020, and now 23 birds in 2022. In addition to the 23 male matuku heard booming during the 2022 survey, three other birds were seen, one in Matthew's Lagoon near Boggy Pond and two in Wairio wetland.

At Boggy Pond, nine pūweto were located, the most in Boggy Pond since 2018 and significantly up on the single individual in 2021. At Matthew's Lagoon, none were recorded during the kayak survey which has been a regular result there since 2014. While undertaking the matuku survey, four other pūweto were heard calling independently, not in response to playback calls. Two were calling in Matthew's Lagoon close to each other while at two locations within Wairio wetland, one individual was heard calling. I believe there are more pūweto present than recorded during the pūweto surveys. They have just moved to different areas of the wetland complex outside the pūweto survey routes seeking more suitable habitat.

On-going predator trapping with the regular servicing of traps is essential as several predators were seen dead in traps within days of the traps being serviced and rebaited with fresh bait by the trapping contractor at the core wetlands. These included a weasel and several rats. All traps observed were well set up and maintained, and had good vegetation clearance.



Photo 1 and 2. A weasel and a rat in DOC 250 traps recently rebaited.

During our night surveying for matuku, we saw several possums in trees on the edge of the wetlands. Timms traps set up around the wetland are baited for predators favouring meat, particularly feral cats. We saw no traps targeting possums. With possums known to predate birds' eggs and young chicks, traps targeting possums at the surveyed wetlands should be considered. Further recommendations are listed in Section 7 of this report.

2.0 Introduction 2022 Survey

Since 2012, an annual spring survey for matuku and pūweto at the core wetlands and biannually at the northern and southern wetlands of Wairarapa Moana have been conducted by John Cheyne of Wetland Works. Unfortunately, in 2022 John decided he was unable to continue completing these surveys. I met with John and discussed at length how the surveys had been conducted, the methods used, the location of listening points, access and survey routes as well as timings so I could replicate these surveys using the same methodology as in previous years to allow continued comparisons to be made of the annual results. John also provided maps of each wetland with the location of each listening point and pūweto survey routes shown as well as a copy of the pūweto recording that he used during the pūweto survey.

The surveyed wetlands are located on the eastern shore of Lake Wairarapa with the exception of Pounui Lagoon on the edge of Lake Ōnoke. They are split into three groups for logistical purposes:

- Core wetlands - Boggy Pond, Matthew's Lagoon and Wairio wetland - surveyed annually
- Northern wetlands - Barton's Lagoon, Tauherenikau delta, Simmond's Lagoon, JK Donald Block – surveyed biennially
- Southern wetlands - Pounui Lagoon and Barrage Gates - surveyed biennially

The annual spring surveys are timed to coincide with the yearly peak calling period for both species. They were not conducted when winds were moderate or above, or when rain was falling as these

weather conditions affect the surveyor's ability to hear matuku booming or pūweto calling in reply to the played recordings.

The 2022 spring survey of matuku was carried out during 31 October – 9 November at the core and northern wetlands. The survey for pūweto was carried out during the same period at Boggy Pond and Matthew's Lagoon. These locations were chosen for pūweto surveys in 2012 as they held the highest numbers of birds and predator trapping was about to commence in these wetlands. Results from previous surveys are documented in reports prepared for GWRC annually.

These surveys aim to determine population estimates, distribution and habitat use. The surveys also provide an opportunity to determine whether the predator trapping programme at the core wetlands has led to an increase in the abundance or conspicuousness of either species.

3.0 Survey Methods

3.1 Matuku

Matuku are extremely cryptic and rarely seen. This is due to their secretive behaviour, inconspicuous plumage and the inaccessibility of their habitat. They are considered "Threatened - Nationally Critical". Their presence is most commonly detected by hearing the distinctive 'booming' call of the male trying to attract a female during the breeding season (Williams, 2013). Females are much less vocal and therefore very difficult to detect and monitor.

Before surveying for matuku, the timing of sunrise and sunset at Masterton over the period we were in the field was determined. Surveying for booming male matuku was carried out for approximately two and a half to three hours at dawn and again at dusk. This was to ensure the daily peak calling periods as determined in O'Donnell & Williams (2015), "*The peak calling period is generally highest, one-and-a-half-hours before sunrise and a second lower peak, 30 minutes before sunset until one hour after sunset*" were well covered. Using the information obtained from John Cheyne, we were able to position ourselves close (<400 metres) to the most likely sites of booming male matuku. Some of the booming birds were close and their exact location was easy to determine while for birds further away, a compass and triangulation was used. This provided good information on the numbers and location of birds and followed the methodology described in O'Donnell *et al* (2013).

3.2 Pūweto

Pūweto are also a cryptic wetland bird species, which are considered "At Risk – Declining". They are hard to detect visually and typically do not make calls regularly of their volition. The best method for locating pūweto is to cause them to respond to played recorded calls in their territory during the breeding season.

Pūweto were surveyed on foot at Boggy Pond (two areas) and by kayak at Matthew's Lagoon following set routes and using the standard playback recording of calls supplied by John Cheyne. This 5-minute recording of pūweto calls was played approximately every 50 - 75 metres along the set routes. If a pūweto responded, its location was noted and we moved approximately 100 metres further along the route so this bird would not respond again at the next location the playback recording was played.

The recording was played on an iPhone through a UE Boom 3 speaker. On the walking survey, the speaker was placed on a stand, approximately one metre above the ground, which was carried between locations. A member of the survey team stood approximately 5-10 metres away from the speaker on each side of it as the recording played, listening for pūweto to respond as well as looking for them to approach the speaker which they do on occasion. Surveys were completed in the morning immediately after the matuku survey was completed or in the late afternoon.

4.0 Results

4.1 Matuku

Numbers of booming male matuku have continued to remain relatively stable at the core wetlands of Boggy Pond and Matthew's Lagoon and at the northern wetlands of Barton's Lagoon, Tauherenikau delta, Simmond's Lagoon and Lake Edge. However, in 2022, numbers increased at Wairio wetland from three to six birds and at JK Donald Block from five to seven birds. This increase is likely to have been in response to significant positive habitat changes that have occurred at these wetlands over the last 3-5 years including an increase in the size and density of rushlands, extensive shallow water through these rushlands, large scale willow control and the intensive predator trapping programme carried out at the core wetlands.

Table 1. Number of individual booming male matuku recorded during the annual spring survey at Wairarapa Moana 2012-2022

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Boggy Pond	2	3	3	4	2	5	3	3	4	3	4
Matthew's Lagoon	1	1	2	2	1	1	3	2	1	2	1
Wairio wetland	2	3	3	3	3	3	3	3	4	3	6
TOTAL: Core Wetlands	5	7	8	9	6	9	9	8	9	8	11
Barton's Lagoon	2	1	ns	ns	1	ns	0	ns	1	Ns	2
Tauherenikau delta	ns	1	ns	ns	1	ns	1	ns	1	Ns	1
Simmond's Lagoon	ns	0	ns	ns	0	ns	0	ns	1	Ns	1
JK Donald Block	1	2	ns	ns	1	ns	5	ns	5	Ns	7
Lake Edge (south of JK Donald Block)	ns	2	ns	ns	1	ns	1	ns	1	Ns	1
TOTAL: Northern Wetlands	3	6			4		7		9		12

Barrage Gates	ns	3	ns	1	ns	2	ns	2	ns	3	ns
Pounui Lagoon	ns	2	ns	3	ns	3	ns	3	ns	3	ns
TOTAL: Southern Wetlands		5		4		5		5		6	

NOTE: ns = Not surveyed.

The approximate location of each booming male at each surveyed wetland is shown in Appendix 1.

4.2 Pūweto

Since 2014, annual pūweto surveys have focused on Boggy Pond and Matthew's Lagoon because they contain extensive beds of raupō/reedland and carex sedgeland and when surveyed in 2012, contained the highest number of birds. These wetlands are also subject to an ongoing intensive predator trapping programme carried out by GWRC and DOC staff and it is desirable to monitor pūweto numbers for any related changes.

Table 2 sets out the number of pūweto located during the annual surveys 2014-2022. The first column '2012' shows the location and number of individuals originally located.

Table 2: Number of individual pūweto recorded during the annual spring survey at Boggy Pond and Matthew's Lagoon 2012-2022.

	2012	2014	2015	2016	2017	2018	2019	2020	2021	2022
Boggy Pond	9	14	11	5	11	11	7	0	1	9
Matthew's Lagoon	7	1	0	0	0	2	2	0	1	0
TOTAL individuals	16	15	11	5	11	13	9	0	2	9

The approximate location of each pūweto recorded is shown in Appendix 2.

5.0 Discussion

5.1 Matuku

5.1.1 Core wetlands

Spring surveys of booming male matuku at the core wetlands have now been completed over 11 consecutive years. During the first 10 years, total numbers fluctuated between five and nine birds, with 8–9 males being recorded consistently over the last five years. This year the number of booming male matuku increased to a record high, 11 individuals with the number at Wairio wetland doubling from three to six birds, with four on the lakeside (west) of the Ducks Unlimited (DU) Wairio wetland project stopbank and two inside (east) of this stopbank.

Continuing a trend from previous years, several booming sites at each wetland held a male bird again this year. It is unknown whether the same male returns to the same booming site at Wairapa Moana each year but it is strongly suspected. A study by Williams (2016) at Lake Whatuma in Hawkes Bay used

transmitters placed on male birds to track them over long periods of time. This showed some males exhibit strong site fidelity in successive springs. This is also likely to be the case in the Wairarapa.

The vast majority of male matuku have been recorded booming each year out of raupō reedbeds and this continued in 2022. The exception has been a small number of birds heard booming out of oioi rush/*Isolepis* rushland closer to the lake edge. Most birds recorded booming at other wetlands around Wairarapa Moana have also been located in raupō. Raupō appears to be a key habitat for booming males however they will also use other tall reeds, rushes and sedges when raupō is not present.

In 2022, matuku were not recorded in the eastern half of Boggy Pond where the majority of the open water is located. Similarly, only one individual was recorded in Matthew's Lagoon (in the north eastern corner) in thick raupō while none were recorded elsewhere in this lagoon. This continues a trend from previous years where matuku have only been found in the northern end of Matthew's Lagoon close to Boggy Pond. This is puzzling as there is no obvious difference in vegetation in these areas compared to the rest of the same wetlands.

5.1.2 Northern wetlands

The spring 2022 survey recorded 12 booming males, also a new maximum count. Two matuku were recorded at Barton's Lagoon and one at both Simmond's Lagoon and Tauherenikau delta. At JK Donald Block, seven matuku were located plus a further individual on the lake edge, 1.25 km south of the southern boundary fence. Matuku numbers have steadily increased in the northern wetlands from 4 in 2016, to 7 in 2018, 9 in 2020, with 12 matuku recorded in 2022. Over this time, JK Donald Block has seen the biggest increase in numbers, from 1 to 7 birds.

Again, a number of the locations where matuku were heard booming are the same sites where matuku have been recorded annually for many years, again indicative of site fidelity. Similar to Matthew's Lagoon, it is interesting to note that matuku have favoured the southern half of JK Donald Block throughout these surveys and this continued in 2022 even though there is no obvious difference in vegetation at either end.

5.1.3 Southern wetlands

Matuku were not surveyed at the southern wetlands in spring 2022 as this is scheduled for 2023.

5.1.4 Other matuku comments

Apart from the 23 male matuku heard booming during the survey at the core and northern wetlands, three other birds were seen. A bird was disturbed while it was feeding along a drainage ditch, in the afternoon in Matthew's Lagoon near Boggy Pond. It flew off in an easterly direction. At the same time, a matuku could be heard booming just north of this location in Boggy Pond. A second bird was seen one evening flying in over Wairio wetland from the lake edge towards Boggy Pond. It was not observed landing or heard calling. Early one morning, a bird was seen feeding at the southern end of Wairio wetland. This bird is potentially the same bird that was heard booming nearby earlier that morning.

Three matuku were heard calling repeatedly over extended periods (many hours) during the daytime. At two locations, they were heard calling on multiple days. This is not unusual. Booming birds are competing for females and have to practice and go through a morphological change to do this. When

they really get cranked up and in the flow of booming, they will boom night and day. Call frequency will still peak around sunrise and sunset though (E. Williams, pers. comm. 2022)

While speaking to Paula Gillett, the land owner controlling access to JK Donald Block, she reported hearing a matuku booming at Hayward's Lagoon over the last few years and her partner had recently seen two matuku there. Hayward's Lagoon is in a wetland at the northern end of JK Donald Block. It lies immediately north of Pepperill's stream on Tairoa farm which is the northern boundary of the JK Donald Block. It is owned by Paula and her family has carried out extensive willow control, planted natives and undertaken predator trapping there over the last 10 years. It is not included in our monitoring but has improved as matuku habitat because of their intensive management.

5.2 Pūweto

5.2.1 Boggy Pond

In spring 2022, nine pūweto were recorded at Boggy Pond. This was a return to the normal long-term range of 5-14 birds recorded between 2012 and 2019 after no birds had been recorded in 2020 and only one in 2021.

One pūweto at Boggy Pond was very inquisitive and came out of the raupō to approach the speaker playing pūweto calls before running back under cover.



Photo 3. Pūweto at Boggy Pond investigating the location of playback calls.

5.2.2 Matthew's Lagoon

No pūweto were recorded during the kayak survey in Matthew's Lagoon in 2022. Pūweto numbers have consistently been between none and two during these kayak surveys since 2014 after seven were recorded there in 2012.

However two birds heard calling in Matthew's Lagoon one morning while the survey team was undertaking the matuku survey, indicates they are still present at Matthew's Lagoon just not within the surveyed area. This may be a result of water level fluctuations changing the location of suitable feeding and breeding habitat.

5.2.3 Other Pūweto Comments

Two further pūweto were heard calling in Wairio wetland by the survey team while they were undertaking the matuku survey. The first was heard in the evening at the northern end. It called multiple times over an hour-long period. The second bird was heard in the morning at the southern end. It called several times in quick succession. This is the first time they have been recorded in Wairio wetland during the annual spring surveys.

Pūweto were not heard calling at the northern wetlands during the matuku surveys.

5.2.4 Survey route

Initially, pūweto surveys were carried out using kayaks and followed the main raupō/open water edge at both Boggy Pond and Matthew's Lagoon. At Boggy Pond, an area of the main stopbank was also surveyed. With an increase in water levels at both wetlands, pūweto appeared to abandon these sites and an alternative route at both wetlands was utilised. At Boggy Pond, when the initial kayak route produced no birds, the methodology changed to walking/wading the western margin of Boggy Pond parallel to Parera Road as well as continuing with the walking survey route along the stopbank on the western and southern sides. At Matthew's Lagoon, the existing kayak route was maintained but the surveyors were able to push deeper into the raupō margin.

These initial routes were selected for repeatability and therefore annual comparisons but unfortunately, changes were necessary. With continuing zero to very low counts at Matthew's Lagoon since the annual survey was initiated, and with it known that pūweto are still present within this wetland, just not along the kayak survey route, maybe now is the time to change from the kayak survey route to walking/wading routes around selected sections of stopbank surrounding Matthew's Lagoon similar to what occurs at Boggy Pond.

5.3 Matuku eBird reports

From wetland and bird survey work completed by GWRC staff and John Cheyne around the Wellington region, including the Kapiti Coast chain of wetlands, it is believed that the Wairarapa Moana matuku population is probably the largest in the Wellington region. This is supported by checklists submitted to eBird (2023a) over the last 10 years, with Wairarapa Moana holding the largest number of reported matuku in the Wellington region (see table 3 below).

"eBird" is an online database of bird observations providing scientists, researchers and amateur naturalists with real-time data about bird distribution and abundance. Their goal is to gather this information in the form of checklists of birds, archive it, and freely share it to power new data-driven approaches to science, conservation and education (eBird.org. 2023b). As anyone can submit checklists, eBird data is citizen science and is influenced by many factors including accessibility to and around sites, frequency of visits to sites (popularity), timing of visits (most visits occur during daylight hours), people entering data onto eBird and the accuracy of identification. However, I believe this data gives a good impression of where matuku are frequently seen and how common they are at these locations.

There have only been three eBird reports of matuku south of Waikanae through to the Wellington south coast in the last 10 years. There are 26 further reports of matuku between Waikanae Estuary and Lake Waiorongomai just north of Otaki. Four of these are from GWRC. Most reports in eBird are single birds flying or feeding in wetlands during the day. There are only three reports of booming male matuku, one at the Waikanae oxidation ponds in April 2014, another at O te Pua in February 2018 and one at Te Hapua also in February 2018, both by GWRC.

Compare this to eBird reports at the core wetlands where 90 matuku have been reported over those 10 years with a further 41 birds at JK Donald Block, Haywards Lagoon and surrounding wetlands and another 22 at Barton's Lagoon and Tauherenikau delta. Twenty four birds were heard booming at these locations with only two of these booming at night, both at JK Donald Block. Like Wellington to Otaki, the vast majority of reports are single birds flying or feeding in wetlands during the day.

Table 3: eBird reports of matuku over the last 10 years across the entire Wellington region.

	Number of individual birds reported	Booming - number of birds and reports by month	Number of GWRC reports
Lake Onoke/Spit/Pounui lagoon	32	4 birds Oct 3 Nov 1	3
Between Lake Onoke and Lake Wairarapa	4	0	0
Lake edge south of Core wetlands	6	0	5
Wairio wetland	48	2 birds Jan 1 Nov 1	3
Boggy Pond	40	13 birds Apr 2 (2x 2 birds) Oct 3 (2x 2 birds + 1) Nov 2 (1x 2 birds + 1) Dec 1	5
Matthews Lagoon	2	0	1
Oporua Spillway	6	0	1
JK Donald Block and surrounds	27	3 birds May 2 Nov 1	5
Haywards Lagoon and surrounds	14	0	0
Tauherenikau delta	11	3 birds Oct 1 Dec 1 (1x 2 birds)	1
Barton's Lagoon and surrounds	11	3 birds Nov 1 (1x 2 birds) Dec 1	1
Lake Domain	3	1 bird Nov 1	2
Western shore of Lake Wairarapa	2	0	0
Rest of Wairarapa	1	0	0
Wgtn south coast to south of Waikanae	3	0	0
Waikanae Estuary and Lake Waiorongomai (just north of Otaki)	26	3 birds Feb 2 Apr 1	4

5.4 Matuku population estimate

While John Cheyne (2021) estimates the Wellington regional population to be possibly less than 50-60 individuals, looking at the eBird data and the number of birds seen and heard during the 2022 spring survey, this appears to be an under estimate. With 23 males in the core and northern wetlands, and an average of five males in the southern wetlands, this number could be doubled to include both females and sub adults. This would mean there are 56 matuku in Wairarapa Moana alone or 93% of the estimated regional population.

Nationally matuku populations are declining principally as a result of habitat loss and predation. The New Zealand Threat Classification System is used by the DOC to assess the conservation priorities of species in New Zealand. In June 2016, DOC reassessed the conservation status of matuku in New Zealand down from “Nationally Endangered” to “Nationally Critical”, the most at-risk classification and one of only 23 New Zealand birds with this status (Robertson *et al*, 2016). The Wellington Regional Risk Assessment carried out by GWRC in 2020 (Crisp, 2020) assessed the regional population as stable. Identified breeding sites included Wairarapa Moana and one site on the Kapiti coast. This alone shows the importance of Wairarapa Moana to matuku survival in the Wellington region. This assessment also identifies predators (mainly mustelids and cats), as well as habitat loss as the main threats facing matuku.

These assessments highlight the serious predicament faced by matuku and the challenge biodiversity managers have in saving them. Matuku are a flagship species for wetland conservation and the change in threat status (confirmed in 2021, (Robertson *et al*, 2021)), coupled with the knowledge of the probable small size of the regional population and threats they face, must create greater urgency to do something about their current circumstances. The matuku population at Wairarapa Moana (and Kapiti coast wetlands) must be a high priority for conservation efforts by statutory agencies (GWRC, DOC) if matuku are going to survive as part of the natural biodiversity in the Wellington region.

5.5 Habitat quality

Having sufficient quality habitat and food as well as managing the threat of predators are the keys to maintaining healthy populations of these birds, reversing the national decline and increasing the regional population. The habitat requirements of matuku and pūweto are very similar as they are both specialist freshwater wetland birds. Both have suffered significantly from the loss of over 90% of New Zealand’s wetlands which have been drained for agriculture and human development. Both virtually ground nesting, wetland obligated birds are sentinels of predator pressure within these ecosystems. They are, however, significantly different in size and leg length which determines the depth of water they can walk around in. They both use the permanent shallow freshwater reedlands, sedgelands and rushlands around the edge of open water areas as well as much shallower and ephemeral swampland. Often these two species will be co-located at the same sites.

5.5.1 Water Levels

Shallow relatively stable freshwater levels, less than 0.3 metres deep for matuku and 0.1 metres deep for pūweto, are important for the nesting and feeding of both species. Matuku nests are usually only 20-30 cm above water level (Williams, 2013) while pūweto nests are 30-50 cm above water (Fitzgerald, 2013). As water levels change, the invertebrate life at the water’s edge also changes as it is either drowned or dried out. This is the muddy margin pūweto feed within. Matuku are sight feeders wading

in the shallows for fish and eels and along the same muddy margin as pūweto for other food items such as spiders, insects, worms, frogs and lizards. Water levels at both Boggy Pond and Matthew's Lagoon have fluctuated frequently and often by more than 30 cm. Whenever this occurs it will impact on areas of the wetland the birds can utilise for feeding and if this occurs during the breeding season, this will impact nesting.

Natural water level changes due to heavy rain and flooding are in the most part uncontrollable however man-made water level changes are more manageable. This includes adding or removing wooden boards to the sill in the outlet structure of Boggy Pond as it goes under Parera Road. When wetland water levels need to be adjusted with the assistance of man, thought needs to go into the decision-making process to ensure these actions are appropriately timed to have minimal impact on wildlife. Just before the commencement of the breeding season or during it, is probably not the best time for these actions to be undertaken.



Photo 4. Outlet structure at Boggy Pond as it goes under Parera Road on the right.

5.5.2 Water Quality

Water quality is just as important as water levels. If water quality falls, aquatic life that both species feed on, living within that water also suffers, whether this is plant, invertebrate or vertebrate life. It is well known that Lake Wairarapa and the surrounding wetlands have high levels of nutrients like nitrogen and phosphorous, causing algal growth and poor water clarity. This causes many native plants, insects and fish to struggle. Any improvement in water quality at these wetlands will improve the food chain matuku and pūweto depend upon for food.

Matuku are also sight feeders so clear water is essential for them to see their prey and stalk it. A bird's ability to see and stab their prey is suspected to be important for matuku foraging and survival. Williams (2013) noted this is a concern in New Zealand, as water quality and depths vary considerably, and are

often artificially maintained as part of flood schemes, making matuku prey difficult to access seasonally at some sites.

5.5.3 Vegetation

Around Wairarapa Moana, male matuku prefer raupō reedbeds in which to boom while a small number also use the oioi rush/*Isolepis* rushland areas. Pūweto were all located in dense raupō reedbeds.

Willows and alders do invade wetlands and smother desirable native rush, sedge and reedlands. The current programme for controlling willows and alders on the edge of Wairarapa Moana has been very successful in preventing further invasion by these weed species. However, some regrowth has been observed during the surveys and the implementation of a follow-up control programme is encouraged. Willow spraying has not impacted any known booming sites.

5.5.4 Food

Matuku feed regularly on fish, including eels, but they also take spiders, insects, molluscs, worms, freshwater crayfish, frogs and lizards (Williams, 2013). As a result, obstacles to eel migration like perched culverts and weirs can impact significantly on their food supply. There is potential for barriers to eel migration to exist at Boggy Pond and Matthew's Lagoon and this should be investigated by sampling the eel population in these two wetlands to determine what size and age class of eels occur there. If small eels 0.1m - 0.5m are largely absent in these two wetlands it may indicate that there is a barrier to their upstream migration into these wetlands. If so, this could have a significant adverse impact on matuku wanting to use these habitats.

Pūweto are much smaller than matuku and their food is comprised of much smaller items. They have a broad omnivorous diet, feeding on seeds, fruit and leaves of aquatic plants, and a wide variety of invertebrates including worms, snails, spiders, beetles and other insects (Fitzgerald, 2013). Feeding in the muddy margins of wetlands, they are highly susceptible to water level changes which appear to be frequent at Boggy Pond and Matthew's Lagoon.

5.5.5 Predator Trapping

Managing the threat from predators is the critical element in providing matuku and pūweto with suitable habitat for survival. This not only applies during the breeding season when the risk of predators is heightened due to birds being fixed to particular locations (nest or booming sites) but equally applies throughout the year. Being able to fly or live in a wetland does not lessen these threats. The major threat to wetland obligated birds including matuku and pūweto are mammalian predators (O'Donnell *et al* 2015, Crisp, 2020). O'Donnell (2018) reports that monitoring of pūweto and fernbird populations over a 5-year period in areas of the Whangamarino wetland that were subject to an intensive mammalian predator trapping programme revealed significant population increases compared to areas of the same wetland that had no predator trapping. At Pauahatanui inlet, both pūweto and fernbird populations have also increased in the areas covered by a well-managed mammalian predator trapping programme.

The on-going mammalian predator trapping programme, using approximately 110 DOC250 and Timms traps is currently being managed around Boggy Pond, Matthew's Lagoon, and Wairio Wetland by GWRC and DOC, suppresses feral cat, mustelid, rat, and hedgehog populations. GWRC and DOC staff are doing an excellent job trapping these predators around these wetlands. There is also predator trapping taking place around Lake Domain which covers the southern regions of Barton's and Simmonds Lagoon and

includes the Tauherenikau Delta. There is private predator trapping being led by Paula Gillett on Tairoa farm (Hayward's Lagoon) just to the north of Pepperill's stream, however there is currently no predator trapping operations in JK Donald Block itself. Dougal McKenzie with assistance from DOC and GWRC runs another successful programme at Pounui Lagoon. With matuku numbers within JK Donald Block increasing steadily, the importance of this wetland to matuku cannot be underestimated. It would benefit immensely from a structured trapping network that is funded and maintained in the same manner as the existing predator trapping programme around the core wetlands.

For predator trapping to be effective, the management of trap lines need to follow best practice and regular maintenance is essential (trap location and presentation, bait selection, vegetation clearance around traps, mowing the vegetation on top of the stopbanks for trapper/staff access, good record keeping). During the surveys around the core wetlands, several predators were seen dead in traps within days of the traps being serviced and rebaited with fresh bait by the trapping contractor. These included a weasel and several rats. All traps observed were well set up and maintained, and had good vegetation clearance. The only live mammalian predators seen during our ten days on site were several possums during the night surveying for matuku. Are there opportunities to expand this existing trapping network away from just around the core wetland edges to build buffer zones further away to catch mammalian predators at a distance from the wetlands rather than on their stopbanks? This could utilise natural barriers and pathways i.e. spillways, rivers and lake edge, roadways and treelines.

In previous reports written by John Cheyne (2020 & 2021), he suggested surveying the rat population because he believed they may have increased following the sustained trapping of higher-order predators like mustelids and feral cats. It is pleasing to see the research project in Wairio wetland currently underway to assess this potential unintended consequence.

People should not be concerned that the number of matuku and pūweto have not increased over the years of these surveys. Unfortunately, like many wetland birds, matuku and pūweto are cryptic, utilise habitat that is often challenging to survey and occur in low numbers which means monitoring the impacts of mammalian predators is not easy without extensive and expensive monitoring projects.

In 2022, the highest number of matuku ever recorded was achieved. Reasonable numbers of pūweto (13) were also recorded within the core wetlands. Research confirms that mammalian predators have an adverse impact on wetland birds and if intensive trapping is not undertaken, this impact reaches significant levels (O'Donnell *et al* 2015). With the level of predator trapping that is currently occurring around these wetlands, the populations of matuku and pūweto are at least being maintained, are not declining and are possibly increasing. This is a very positive sign, particularly as both species are declining nationally. Therefore, it is critical that these trapping programmes continue, if not be expanded both within and along natural barriers and pathways if we are going to achieve the desired conservation outcomes, an increase in the matuku population. If this is achieved a range of other wetland bird species including pūweto will also benefit.

6.0 General Comments

6.1 Ramsar Site

In 2020, Wairarapa Moana (the Lake and surrounding wetlands) was internationally recognised as a Ramsar site, in part because of the diverse populations of wetland birds living there, including matuku

and pūweto. There are only six other Ramsar sites in New Zealand. A Ramsar site is a wetland site designated to be of international importance under the Ramsar Convention, also known as "The Convention on Wetlands", an intergovernmental environmental treaty established in 1971 by UNESCO, which came into force in 1975.

All Ramsar Convention countries are required to submit regular reports to the Ramsar Secretariat on the status of each of its Ramsar sites. These reports cover work to implement the Convention and the management of each site. DOC takes a coordinating role in the preparation of these national reports. What are the implications of Wairarapa Moana being designated a wetland site of international importance under the Ramsar Convention? How can this be used to support the work being undertaken here?

6.2 Other Birds Seen or Heard During This Period

On four occasions, all birds seen or heard over a two-and-a-half-hour period at Boggy Pond (twice), Matthew's Lagoon and JK Donald Block were recorded and entered into eBird as a record of the birds at these locations at that time. There were 37 different species recorded. Chicks of various species were seen, along with a minimum count of 273 royal spoonbills, many sitting on nests at the northern end of Boggy Pond. A spreadsheet of these records is attached in Appendix 3.

7.0 Recommendations - 2022

1. Predator trapping at the core wetlands - The existing predator trapping programme should continue. Consideration needs to be given to expanding this existing trapping network away from just around the core wetland edges to build buffer zones further away to catch mammalian predators at a distance from the wetlands rather than on their stopbanks. This could utilise natural barriers and pathways i.e. spillways, rivers and lake edge, roadways and treelines, to improve protection for matuku and therefore other wetland birds using these sites.
2. Predator trapping at JK Donald Block – I understand there is currently no predator trapping occurring within this reserve. With matuku numbers within JK Donald Block increasing steadily, the importance of this wetland to matuku cannot be underestimated. It would benefit immensely from a structured trapping network that is funded and maintained in the same manner as the existing predator trapping programme around the core wetlands.
3. Population monitoring – Review the existing annual monitoring method for booming male matuku to ensure all matuku within the surveyed wetlands are heard and therefore counted.
4. Population monitoring – Review the existing annual monitoring method for pūweto at Matthew's Lagoon (kayak survey) and consider introducing walking/wading routes around various areas of stopbanks surrounding Matthew's Lagoon similar to what occurs at Boggy Pond.
5. Water level management - When wetland water levels need to be adjusted with the assistance of man, thought needs to go into the decision-making process to ensure these actions are appropriately timed to have minimal impact on wildlife. Just before the commencement of the breeding season or during it, is probably not the best time for these actions to be undertaken.

6. Fish passage – Eels <0.5m are a major food item for matuku and this food source needs to be protected. There is a possibility that the migration of juvenile eels (elvers) and other fish into Boggy Pond and Matthew’s lagoon is restricted (fully or partly) by barriers. This should be investigated by sampling the eel population in these two wetlands to determine what size and age class of eels occur there.
7. Willow control - Willows and alders have previously been controlled by spraying. Some regrowth has been observed during the surveys and the implementation of a follow-up control programme is encouraged.
8. RAMSAR convention - What are the implications of Wairarapa Moana being designated a wetland site of international importance under the Ramsar Convention in 2020? How can this be used to support the work being undertaken there?

8.0 Acknowledgements

The continuation of these surveys in a manner where the results remain comparable moving forward is due entirely to the grateful assistance received from John Cheyne. Without his sharing of knowledge and information gained over many years, this transition would have been very difficult. John’s strong advocacy for matuku over the last 12 years while undertaking these surveys has been immense and is appreciated.

Permission to access the JK Donald Block from Paula Gillett is greatly appreciated, as is her sharing of information about her predator trapping efforts and matuku sightings. I would like to acknowledge the assistance received from GWRC and DOC staff while I was completing the survey, gathering information and writing this report.

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10.0 Appendices

Appendix 1 – Approximate locations of matuku at surveyed wetlands.

Appendix 2 – Approximate locations of pūweto at Boggy Pond and Matthew's Lagoon.

Appendix 3 – Periodic bird counts at various wetlands.