An Overview of Game Bird Management in the Auckland/Waikato Region

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2. Introduction.

This paper serves as a very brief overview of the policies, research outcomes, monitoring techniques, and subsequent decision-making process involved in setting hunting regulations in the Auckland/Waikato Fish and Game Region. It aims to summarize some of the information we have and are continuing to collect. There are several reports, theses, and published papers available for any new councilors that wish to delve deeper into the topics raised here which can be sent to those interested. The key focus is on mallards and grey duck as these make up the mainstay of the hunter's bag and are under the greatest harvest pressure.

3. General Policy Overview.

In 2020 the following policies were reaffirmed.

8/10/11	Regulation Setting	**Following 2012 F&G election game season regulations set in accord with staff recommendations for a three year duration, subject to any material extraneous circumstances that might occur during that period.**
6/10/12	Season Duration	**Dabbling duck season to be from 1st Saturday in May.**
21/4/07	Research & Monitoring	**Gamebird research & monitoring continue to ensure collection of best possible data with view to increasing the resource.**

The proposed Auckland/Waikato Sports Fish and Game management Plan stipulates that staff prioritise sports fish and game species management activities through:

a) population trend monitoring
b) angler and hunter harvest and opinion surveys
c) identification of species management threats and opportunities
d) assessments of the effectiveness of species management activities.

It is also required that staff recommend conditions for the Open Season for Game Notice in order to provide acceptable levels of hunter opportunity, whilst balancing this against the potential impacts on the game bird resource.

These policies require that both biological and social components are adequately considered in order formulate decisions on gamebird hunting regulations. The fact that we are solely funded through licence dollars adds a further constraint to setting hunting regulations. If very restrictive regulations are implemented that would have significant effects on harvest rates these will likely have negative consequences on hunter satisfaction, participation, and income. Council has not formulated a policy on what the tradeoff between providing hunter opportunity and impacts on game bird populations should look like.

4. Mallard and Grey Ducks.

New Councilors will note that these are often referred to as Grallards in correspondence and reports produced by staff. This is because genetic analysis has shown that there is genetic introgression of both species and we are essentially managing a hybrid. Moreover, it is often difficult to determine the degree of hybridization based on phenotypic features alone. Therefore, what may look to be a grey duck can actually be genetically more mallard and vice versa. We still attempt to differentiate the two species during banding and harvest surveys but will often combine the two for the purpose of data analysis.

5. Biological and Habitat Considerations.

The research that we have conducted indicates that survival rates and likely productivity are heavily influenced by climatic conditions. This lends weight to the use of DMUs (duck management units) that are based on climatic zones rather than current regional boundaries for managing dabbling duck populations and setting harvest regulations.

Duckling survival is the single most important variable governing populations growth/decline but is difficult to manage and is largely controlled through changes to seasonal climatic conditions leading to changes in habitat quality. For example, duckling survival was shown to more than doubled when hens had seasonally flooded wetlands available in their brood rearing area. The Auckland/Waikato is likely to be even more heavily reliant on such areas as the remaining permanent watercourses are compromised to the point where they no longer possess the habitat quality (primarily high protein food sources) that will lead to optimum survival. Apart from setting up predator control projects, advocating for improvements in habitat and helping to create breeding areas for waterfowl, duckling survival is largely outside of our control.

Post fledging hen survival is the second most influential vital rate and is something we have partial control over. Survival rates in the Auckland/Waikato are generally very low, particularly juveniles (young of the year), and hens tend to have lower survival rates than drakes(Table 2). The disparity between the sexes is unlikely to be due to any harvest selectivity given that both sexes have similar harvest rates for their respective juvenile and adult cohorts (table 3). It is well documents in the literature that hens tend to have lower survival rates due to reductions in fitness during the breeding season coupled with an increased risk of non-harvest mortality during this time. During the mallard telemetry study for example, we lost close to 20% of the mallard hens we were tracking during the nesting and brood rearing period.

At the time of banding we find an average sex imbalance of 56:44 in our post-fledging juvenile population favouring drakes (table 1). It is relatively rare for mallard young of the year populations internationally but is found in other banding datasets throughout NZ. Given the lower average survival rates of both juvenile and adult hens, this imbalance will increase as the cohort ages leading to the population being skewed further towards drakes. This data has led us to promote the ‘go for green concept and also lends weight to the potential for sex-based limits. Increasing hen survival and reducing the impact on breeding populations are viewed as the most important factors when it comes to managing harvest.

Parts of the Auckland/Waikato Region have experienced significant dry spells in recent years leading to reduced water tables and a lack of seasonally flooded wetlands. This has had a significant impact on recruitment and subsequent seasons populations. Last year’s productivity estimate based on the juvenile:adult ratio at the time of banding is the lowest on record since we have the current banding

site configuration. During this time, we have also experienced some of the worst botulism outbreaks on record. These are compounding factors, and if climate model predictions are accurate longer, hotter, drier conditions will become more frequent in some of the key breeding areas for mallard and grey duck in our region. e.g., the Haurakai Plains.

Table 1 Male to female ratios for Juvenile birds captured in our trap locations at the time of banding.

Year	Juvenile Male	Juvenile Female	Juvenile Male to Female Ratio
2002	811	583	1.39
2003	2151	1606	1.34
2004	1822	1553	1.17
2005	2456	1662	1.48
2006	2645	1750	1.51
2007	2310	1726	1.34
2008	1621	1284	1.26
2009	1900	1322	1.44
2010	1354	1072	1.26
2011	1437	1111	1.29
2012	855	696	1.23
2013	1433	1004	1.43
2014	1268	944	1.34
2015	1443	1181	1.22
2016	1583	1284	1.23
2017	2086	1626	1.28
2018	1894	1405	1.35
2019	987	880	1.12
2020	1177	1002	1.17
2021	929	728	1.28

6. National Harvest Survey.

In order to determine how many gamebirds we harvest and be able to evaluate the efficacy of regulation change, we undertake the national harvest survey which has been conducted annually since 1993. We randomly select a minimum of 120 hunters on opening weekend and every 2 weeks thereafter for the duration of the dabbling duck hunting season. The last survey conducted at the end of July is also used to gain an estimate of reporting rate for band returns. Hunters give us information regarding the regions they hunt in, how many birds they shot during the survey period and the number of hours they hunted. From this data we can determine key metrics such as ducks harvested per hunter per hour which can be used as an index of hunter success. The survey also affords us an opportunity to ask targeted questions about potential regulation changes or other work F&G conducts and receive unbiased feedback from a random selection of licence holders. If there are any specific questions councilors have and would like to canvas hunters, pleases contact staff and we will attempt to include them in the survey.

Mallard and grey duck harvest has declined nationally along with the number of hours hunting waterfowl. (There is a statistically significant $p < 0.05$ relationship between hours hunted and harvest in our region). Declining hunter effort is also occurring in many regions with reputedly high

population levels which tends to indicate there are social drivers governing overall participation in the sport. Hunter satisfaction surveys have indicated that competing interests and work commitments provide constraints. Hunters do however place high value on seeing lots of game birds in their hunting area which routinely ranks higher than harvesting lots of game so ensuring good populations of game are present is likely to be an important driver for overall participation in the sport.

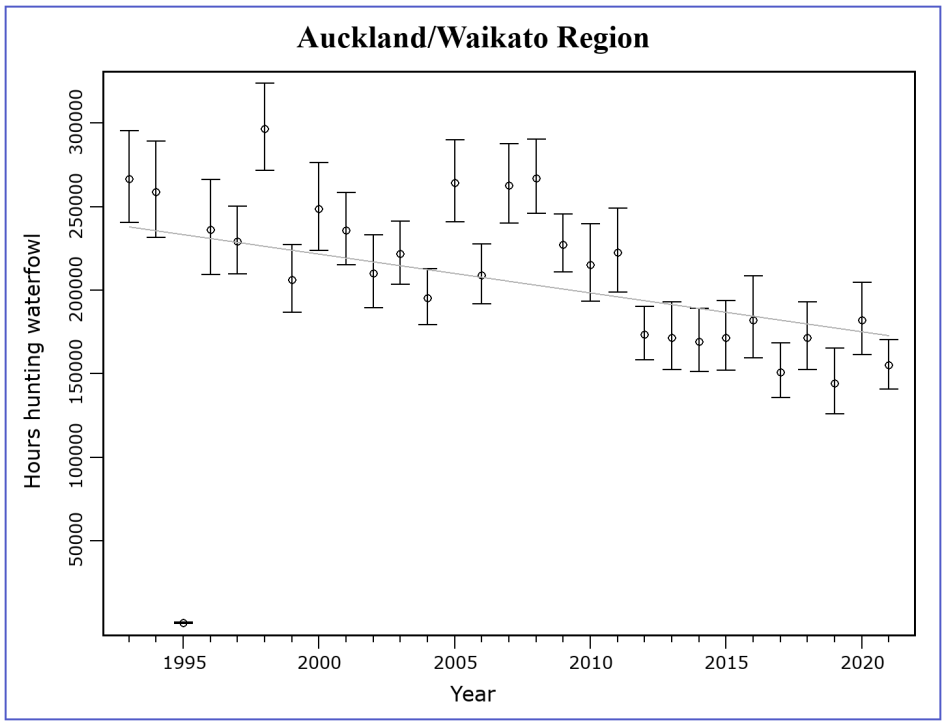

Figure 1: Total hours hunting waterfowl I the Auckland/Waikato Fish and Game Region.

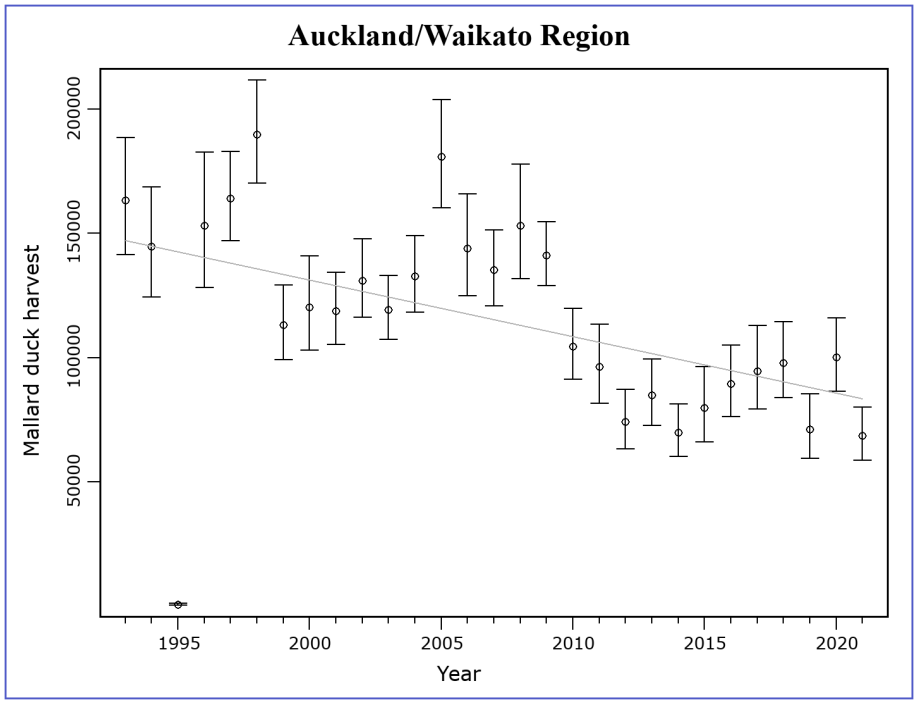

Figure 2: Mallard duck total annual harvest in the Auckland/Waikato Region.

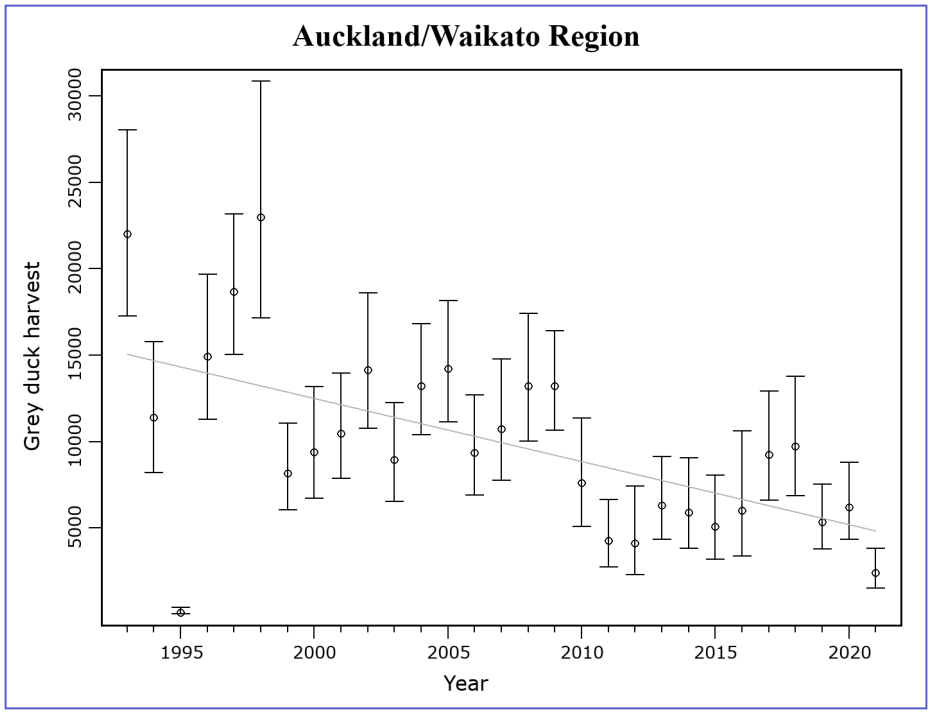

Figure 3: Grey duck total annual harvest in the Auckland/Waikato Region.

7. Banding and Aerial Transects

The Auckland/Waikato Region uses its annual summer duck banding programme as the primary form of monitoring, and accordingly most management recommendations are based on a combination of banding and harvest data. We aim to band 3000 ducks across 6 sites every summer from the start of January to the middle of February. Since the inception of the banding programme in 2002, this region has amassed the largest continuous record of banding, recapture and recovery data ever collected in the country which is no small feat.

Up until recently, staff have also conducted aerial transect counts that form part of a national monitoring protocols, although this was put on hold in 2020 due to budget constraints. To date, measures of relative abundance calculated from aerial transect data have large confidence intervals. There is a feeling by staff conducting the flights that the utility of aerial transects may be compromised by concentration and dispersion of birds dependent on climatic conditions. If this is the case, changes in relative abundance witnessed may not be reflective of changes to the population.

Aerial transects and banding do not provide the same information outputs. Aerial transects may give managers an index of changes in relative abundance over time. Conversely, banding provides population estimates (figure4) , survival rate estimates(table 2), harvest rate estimates(table 3) and movement data. Banding has also been used in our recent research projects to support population models. For example, the population models developed during the mallard tracking study relied on banding data for annual survival and harvest rates, and without a banding programme this research would have had less value.

After a hunter reports the retrieval of a banded bird, this data gets entered into an access database. Further reporting rate estimates are gathered during the game bird harvest surveys through to the end of August which allows us to estimate population and harvest rates. Since to 2012 we have

attempted to verify reporting rates further, and based on this it appears likely that the current reporting rates that average around 0.6 are overinflated and that actual reporting rate is lower. The main issue banding faces is the non-reporting of bands by hunters and hunters misreporting recovery rate information. There are several potential solutions to improve this issue such as starting a reward band programme. This would be relatively expensive and may not receive universal support for research funding.

When weighing up the two techniques as monitoring tools, banding provides a much wider range of information, but there are some drawbacks. Banding is more time consuming and expensive than aerial transects and some of analysis is also very complex. Matt McDougall from Eastern Fish and Game currently runs all of the countries banding models and this is greatly appreciated but this may not be a long-term option. In recent years we have also struggled to achieve our target of 3000 birds banded per summer.

Banding does provide some other intangibles, in so much that staff get face to face contact with hundreds of volunteers each year including the next generation of hunters. Banding therefore provides the opportunity to discuss Fish and Game issues with a diverse sector of the hunting community and is a good PR opportunity for F&G.

We calculate population using the Lincoln Petersen estimator. Estimates are retrospective as they rely on harvest, band recovery, and reporting rate estimates which are all obtained at the end of the game bird season for which the estimate applies. Using climatic models to predict the forthcoming years population is showing some promise in the Eastern Region and this may be an option moving forward, although modelling of survival rates in this region have shown different dynamics which may be linked to the effects of botulism outbreaks. Moreover, given that council currently only evaluate regulations every 3 years and that the timing of our banding falls after council makes its decisions on the subsequent seasons harvest regulations being able to predict the forthcoming seasons population has little relevance to setting harvest regulations under the current policies and timeframes this council operates under. One potential option would be for council to set thresholds as for the King Country special paradise duck season with defined bands so if the population falls within them a certain set of hunting regulations apply.

Population estimates in the Auckland/Waikato are low at the moment yet harvest rates of Juvenile birds in particular remain high. This indicates that despite an overall reduction in hunter effort and total harvest, we are continuing to shoot a relatively high proportion of the remnant juvenile population.

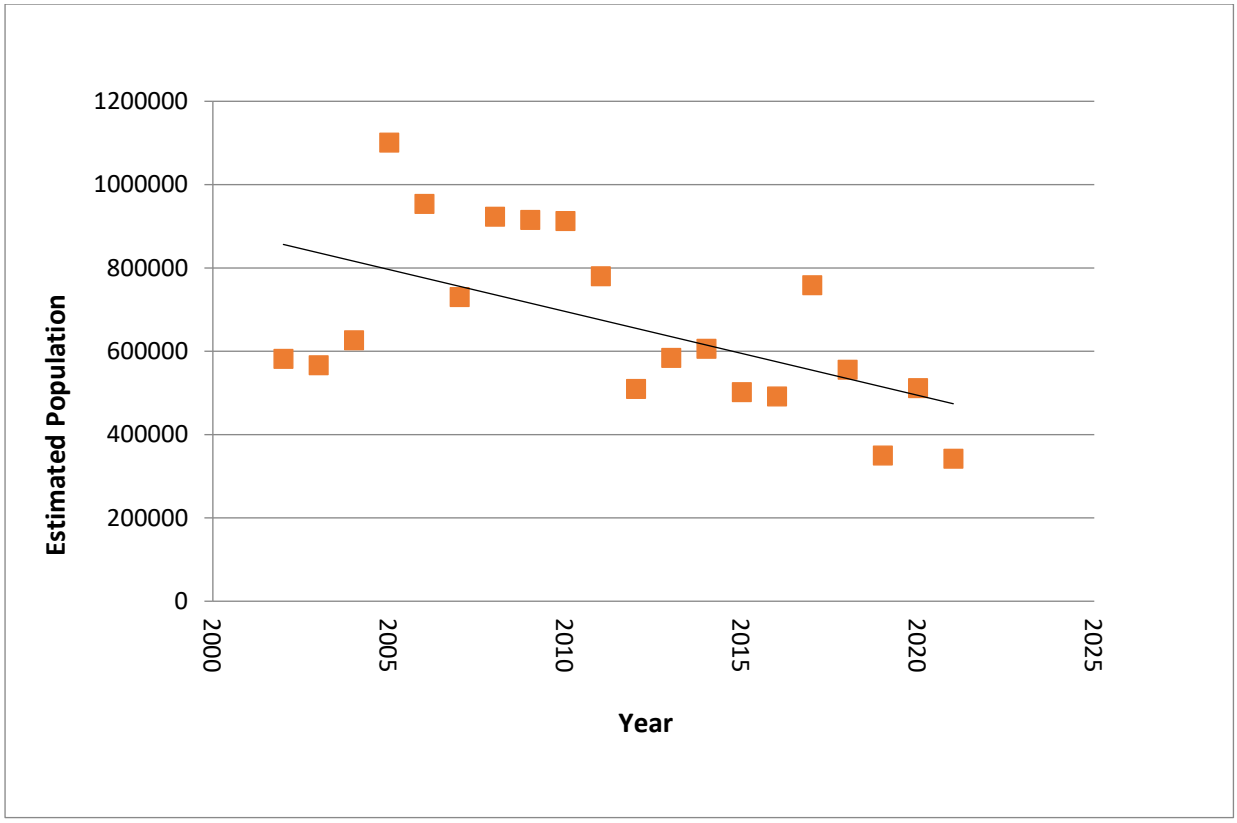

Figure 4: population estimates for mallard and grey duck in the Auckland/Waikato Region.

Table 2: Annual survival rates of mallard and grey ducks in the Auckland Waikato Fish and Game Region.

Year	Adult Female	Juvenile Female	Adult Male	Juvenile Male
2002	0.50	0.29	0.59	0.37
2003	0.51	0.30	0.60	0.39
2004	0.48	0.27	0.58	0.35
2005	0.51	0.31	0.61	0.40
2006	0.50	0.30	0.60	0.39
2007	0.52	0.31	0.61	0.40
2008	0.53	0.33	0.62	0.42
2009	0.50	0.29	0.59	0.37
2010	0.51	0.29	0.60	0.38
2011	0.50	0.30	0.59	0.38
2012	0.49	0.28	0.59	0.36
2013	0.52	0.33	0.62	0.41
2014	0.53	0.32	0.62	0.41
2015	0.52	0.32	0.61	0.41
2016	0.52	0.31	0.61	0.40
2017	0.52	0.33	0.61	0.42
2018	0.47	0.26	0.56	0.33
2019	0.51	0.30	0.61	0.39
2020	0.53	0.33	0.62	0.42
2021	0.53	0.33	0.62	0.41
Average	**0.51**	**0.31**	**0.60**	**0.39**

Table 3: Harvest rates calculated by using direct band recovery rate from hunters and adjusting for non-reporting.

Year	Adult male harvest rate	Adult female harvest rate	Juvenile male harvest rate	Juvenile female harvest rate
2002	0.12	0.12	0.26	0.21
2003	0.10	0.11	0.23	0.23
2004	0.16	0.13	0.23	0.23
2005	0.12	0.09	0.18	0.17
2006	0.09	0.09	0.18	0.15
2007	0.12	0.16	0.20	0.18
2008	0.12	0.15	0.16	0.16
2009	0.12	0.12	0.16	0.15
2010	0.05	0.07	0.13	0.12
2011	0.10	0.06	0.12	0.15
2012	0.17	0.07	0.16	0.12
2013	0.12	0.12	0.24	0.19
2014	0.08	0.04	0.19	0.15
2015	0.10	0.08	0.16	0.12
2016	0.06	0.12	0.19	0.16
2017	0.15	0.13	0.12	0.11
2018	0.11	0.13	0.17	0.15
2019	0.13	0.11	0.23	0.20
2020	0.09	0.08	0.21	0.20
2021	0.14	0.10	0.24	0.16
Average	**0.11**	**0.10**	**0.19**	**0.17**

8. Setting Mallard and Grey Duck Harvest Regulations

As outlined in the policy section, council currently reviews the regulations on a tri-annual basis with the next review scheduled for 2022. We seek remits from clubs and individuals to ensure licence holders have an opportunity to review information and provide feedback. The final decisions are ratified by council at the November meeting. Staff prepare a report on all remits received or any regulation changes they believe to be prudent. The report outlines the key biological and social considerations associated with any proposed changes. If any new councilors wish to review the report from 2019 it can be sent to them. It covers the following topics in more detail than this report.

Based on feedback from previous councilors and hunter satisfaction surveys, staff have viewed a 6-bird daily limit and 4-weeek season as getting toward the more restrictive end of the regulation continuum whilst a 10 bird daily limit and 8 week season is considered liberal for the main dabbling duck season. It may be helpful for councilors to consider based on their own personal experiences and feedback from hunters, what they would consider to be restrictive, intermediate and liberal conditions. In general, it is acknowledged that the tools we have available to regulate harvest within the social constraint of facilitating sufficient hunter opportunity are limited in achieving harvest reductions. For example, regardless of season length, approximately 50%-60% of the entire season harvest occurs in the first two weeks and if seasons get shortened significantly there is a chance that effort will be redistributed. Similarly, bag limits are relatively ineffective at reducing harvest with a reduction to 8 or 6 birds achieving a circa 4% or 10% reduction in harvest respectively. A 50% reduction in harvest would require a daily bag limit of less than 2. Neither season length nor bag limits have been found to significantly influence survival rates of the population in our regions. Season length is currently favoured in the Auckland/Waikato region as it does appear to have some influence on hunter effort i.e. in shorter seasons average hours hunted tends to be lower than an in

longer seasons and may benefit reproductive output by reducing the effects of hunting at the onset of the breeding season. There is also a negative relationship for all 4 banded cohorts showing that as total hunter effort increases, survival decreases. This relationship is more significant for Juveniles than Adults but is not statistically significant.

9. Other Species

9.1. Paradise Shelduck:

These are our second most harvested species behind grallards and overall there is a slight increasing trend in total harvest across the region during the main waterfowl hunting season. Aerial moult counts have been conducted in the King Country during the middle of January since 1983 and more recently in the North Auckland Region. Overall, main season harvest of paradise shelduck is showing a slight increase over time. Anecdotally, based on staff conducting the surveys, some hunters have switched their focus to targeting paradise ducks, but the hunter survey does not differentiate between the activity status of the various types of waterfowl hunting.

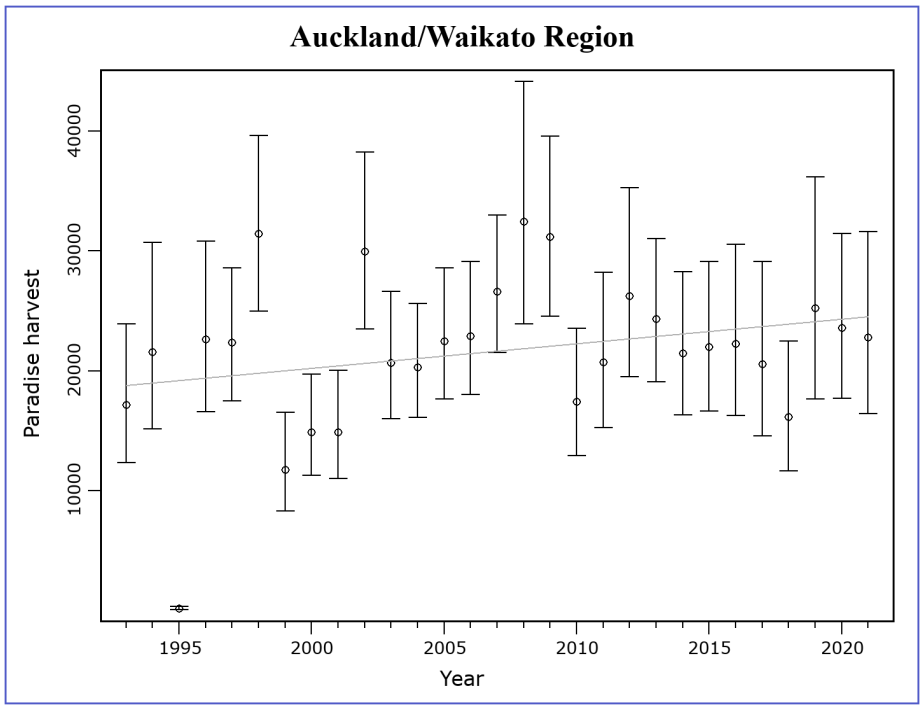

Figure 5: Paradise shelduck total season harvest

9.1.1. King Country:

A historical stronghold for paradise shelduck in our region. the rolling hill country, river flats and stock ponds provide good habitat for this species. The king country flights have been occurring since 1983 and the 26 sites counted have remained consistent throughout that period. We have conducted further surveys periodically to ensure moult populations have not shifted and are confident that the sites we count capture the majority of moulting birds in that sub-region. The moult count was largely stable or increasing up until 2008 when we witnessed a large and sudden drop off (see Figure 5). At this point I prepared a paper for council which evaluated the potential impacts on the special season based on hunter diary returns. The paper reached the following conclusions;

- Setting low bag limits (7 birds per hunter per day) did not appear to impact hunter participation, however a threshold is likely to exist and this should be taken into account when setting harvest regulations.
- There are two apparent ways to regulate harvest. The overriding factor appears to be the number of permits issued and this could be regulated under some form of balloting system but may not be realistic.
- Season length and bag limits appear to impact on harvest as hunters have a high probability of shooting their limit and the use of restrictive conditions during decreases in local populations is an effective management tool to regulate harvest during the King Country special paradise shelduck season.

Historically the King Country had a special paradise shelduck season which fluctuated in length and bag limits but by 2010 ran for first weekend in March. The season was run through permitting system and was implemented to alleviate concerns over pasture and crop damage. In 2011 after several low count years the decision was made to cancel the season in order to allow the population to recover. In 2013 council decided to move away from the previous more arbitrary decision-making process and in 2014 set thresholds for when a special season would occur in order to give hunters and landowners more certainty.

Policy

12/4/14	10	Thresholds for the King Country special season	The thresholds for having a special paradise shelduck season in the King Country is set at: • 8,000 birds and up: 10 bird limit, 1 week (2 weekends) • 5,000 to 7,999 birds: 10 bird limit, 1 weekend only • below 5,000 birds: no season.	Reaffirmed 17/10/20

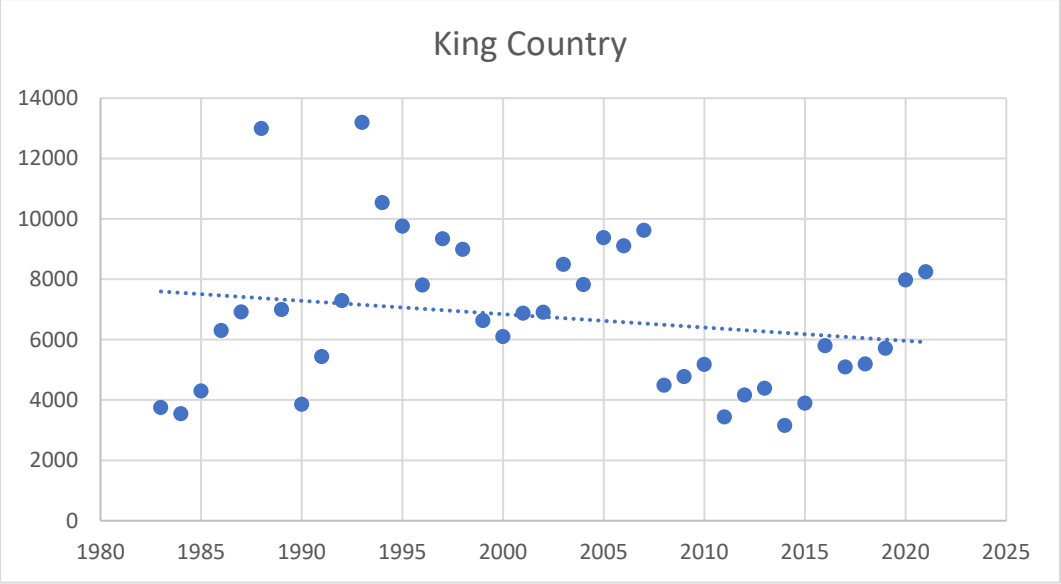

Figure 6: King Country total count of 26 moult sites counted since 1983.

9.1.2. North Auckland:

This count has been occurring since 2011 as there was perceived increase in the local population in this area and the potential for a special season which began in 2012. The season has recently moved away from a permit structure to being gazetted. Counts In that time have fluctuated between 3 and 15 sites with only 4 being counted relatively consistently. This has led to issues with data interpretation. John Dyer is consulting with Matt McDougall to explore alternative methodologies based on a variation of the route regression method. For now, moult trends and regulation decisions are being based on changes at 4 sites, until the alternative method is established and used. This is a very small sample size, and we are uncertain how reflective it is of the moult population as unlike in the King Country no formal survey has been conducted to try and identify all of the moult locations.

Historically, Northland F&G conducted the flights as they could add it on to the end of their counts and in return, we conducted the aerial transect surveys from mallards in the Northland Region. As of last year Northland are apparently no longer able to conduct the flights over parts of our region and John has started doing ground counts at some sites. The large increase witnessed in the 2021 count may be an artefact of a change in count methodology as ground counts can have significantly different detection rates than aerial counts. In order to determine what the detection bias between the two techniques is, John will need to ensure concurrent aerial and ground counts are conducted which may allow us to develop a correction factor should there be a large amount of bias between techniques.

There are currently no threshold limits that set season length and bag limits which may partly be due to issues with determining appropriate levels based on current data. Once John has established the methodology for analyzing the more sporadic dataset and ensuring that detection bias is accounted for, it should be feasible to set thresholds in the same manner as in the King Country.

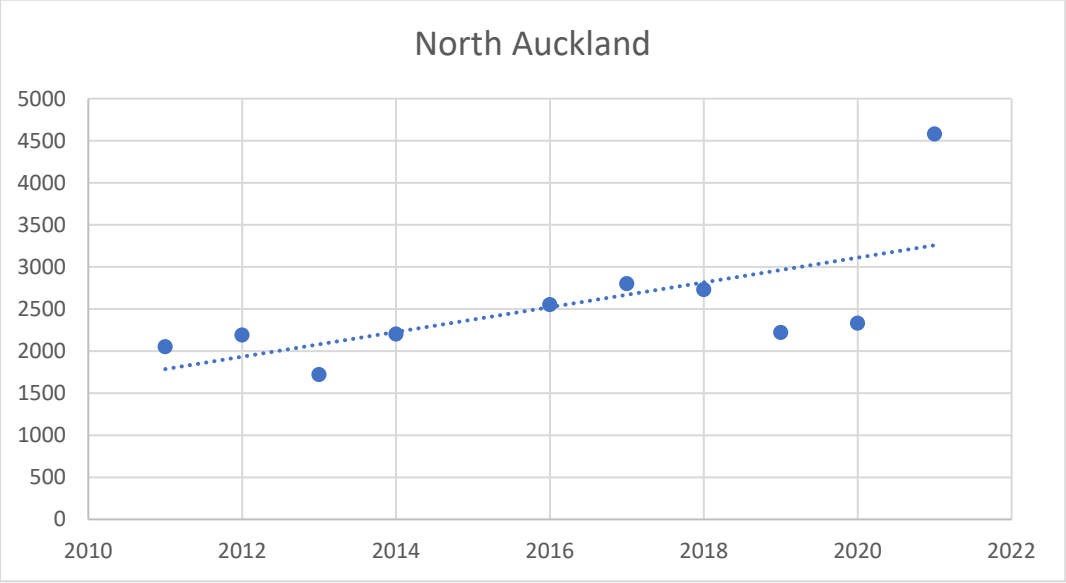

Figure 7: North Auckland aerial and ground count across 4 sites that have been counted every year since 2011. (Note; only one site was counted in 2015 and therefore this year has been excluded.)

9.2. Shoveler Duck

Based on historical banding data, shoveler appear to be the only truly mobile game bird species that we have in NZ and hence we conduct a national census which has been occurring for the past 22 year. Currently this is done via a ground count which occurs at the beginning of August each year.

At this time, shoveler tend to congregate in pre breeding staging areas and are relatively easy to locate and count. The population is examined Over this period the population at all the sites counted appears to be stable, (Short term (2020-2021) indicates the population has decrease) The 2021 total count for sites that have been counted every year (*n*=75) was 16% below the average (period 2000 – 2019), but was similar to last years count. The long-term trend at these 75 sites indicates no linear change over the last 22 years. Shoveler duck harvest has been declining and is very low in this region averaging less than 1000 birds total in recent years.

9.3. Black Swan

Aerial counts of Black Swan have been occurring across 26 sites in the Central Waikato and Western Harbours of Raglan, Aotea, Kawhia and the adjacent Taharoa lakes since 1983 . The survey occurs around the same time as paradise shelduck, although the exact timing is tidally dependent to avoid detection bias on the harbours where most of our birds are located. The population of black swan has decreased dramatically in the central Waikato due to lake collapse. Historical accounts suggest numbers in excess of 50,000 on the central Waikato Lakes. The effects can also be witnessed in our current dataset where we consistently counted up to 6000 birds on Lake Whangapae until 2004 when macrophytes finally completely collapsed in that system. Subsequently, we have not counted more than 300 swan on this lake and the surrounding farmland. Since 2005 the central Waikato's swan population has been largely confined to west coast harbours and has been relatively stable with a slight linear increase over that period (figure 8).

Data has also been collected sporadically on the Kaipara harbour by Northland F&G although only small parts of this system are usually surveyed. Auckland airport authority has conducted surveys on the Manukau Harbour and estimate that approximately 18,000 swan inhabit this area in some years. With lack of an accurate count across the range of habitat swan are using in this sub region it is difficult to know whether the observed sharp linear decline (figure 8) due to changes in population or simply dispersion away from the count sites in some years.

Regional swan harvest is low with around 2000 birds shot annually. There has been a small increase in harvest over time.

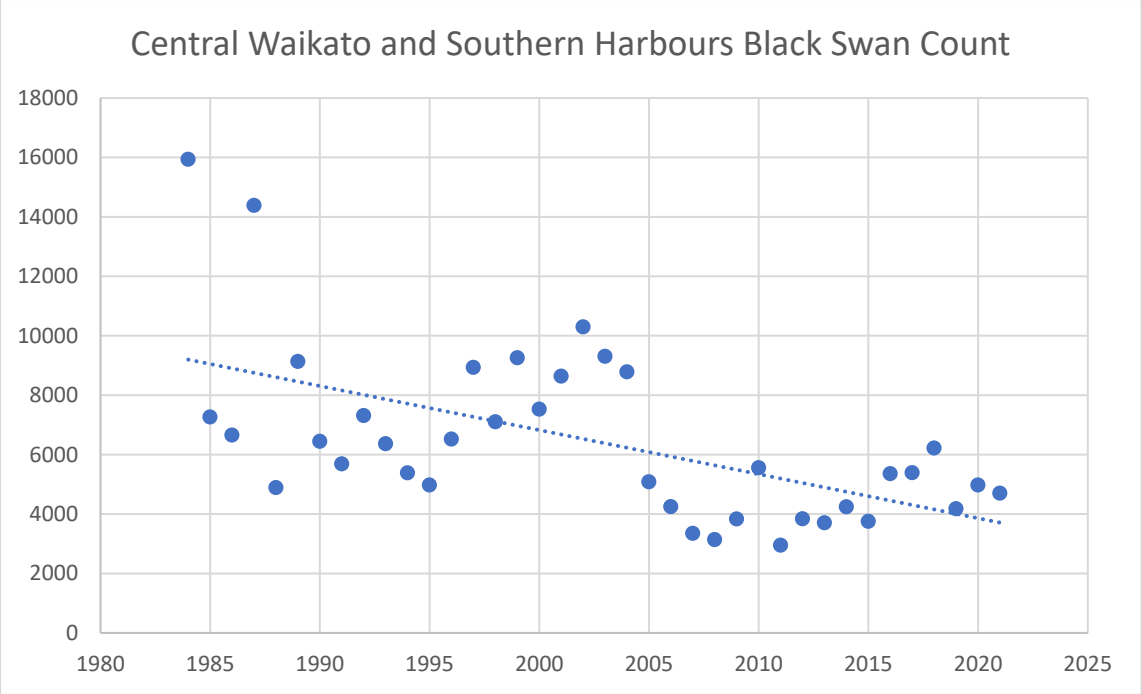

Figure 8: Annual swan count across 27 sites in the central Waikato and southwestern harbours.

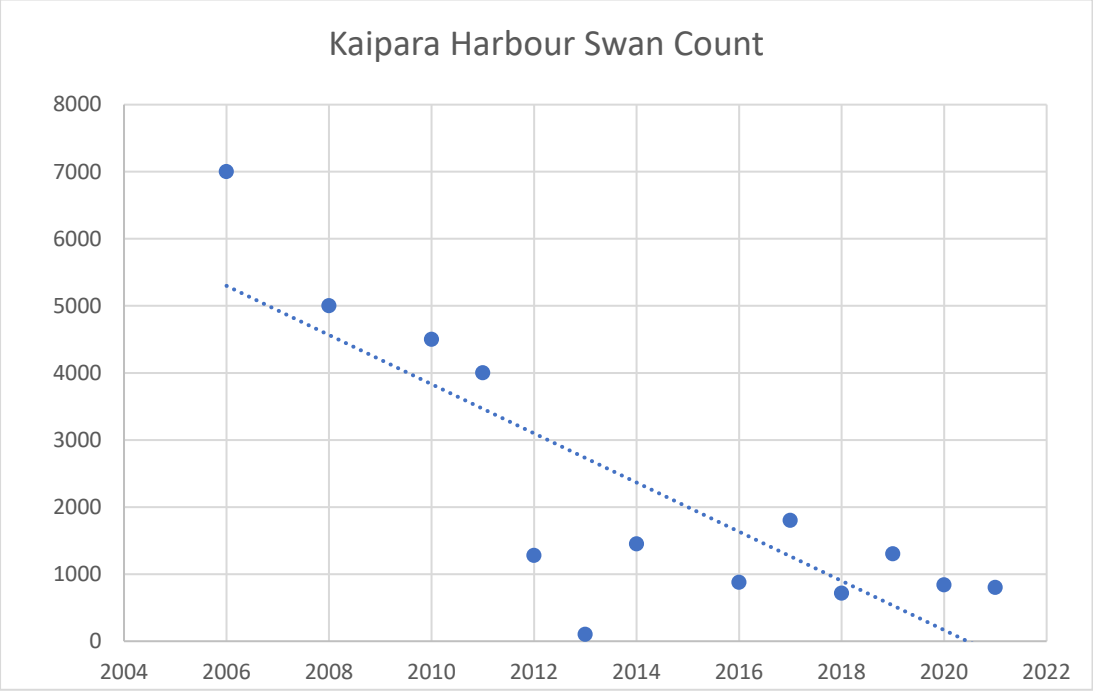

Figure 9: Total black swan counted on a portion of the Kaipara Harbour since 2003 (Note no data is available for 2007, 2009 and 2015)

9.4. Pheasants:

Apart from obtaining estimates of harvest in the annual GBHS there is no formal monitoring of this species. The average hours hunting upland game is and harvest of pheasants is relatively low around 15,000 and 6000 respectively in recent years. We recently analysed harvest dynamics of pheasants in order to assess the potential impact of raising the limit. In the 2019 GBHS over 750 surveys were completed recording 74 individual hunt days for upland game of which only 4 recorded a bag limit of 3. It is therefore unlikely that bag limits play a major role in structuring pheasant harvest.

9.5. Quail:

Normally the least harvested game bird in the region, averaging between 200-500 in total over recent years. No formal monitoring is conducted apart from getting harvest estimates during the annual game bird harvest surveys.

9.6. Pukeko:

Similar to pheasants there is no active monitoring for this species outside of the harvest surveys. Pukeko are our third most harvested bird behind mallards and paradise shelduck with around 10,000 birds shot across the region annually.

Policy:

23/11/13	Pukeko special season	Pukeko are included as a target species during any special shoot.

9.7. Canada Geese:

Although no longer classified a gamebird since the move from schedule 1 to schedule 5 of the wildlife act in 2011, we continue to count geese as this has always been done concurrently alongside swan. We also hypothesized that the management practices or lack thereof could lead to a population explosion and felt it would be helpful to have some data in case there were ever a push for F&G to take over the management of geese in the future. This has indeed been the case and geese have had an exponential growth period over this time. Up until 2020 council had a policy to lobby for a return of Canada geese to the game bird schedule but this has subsequently been amended.

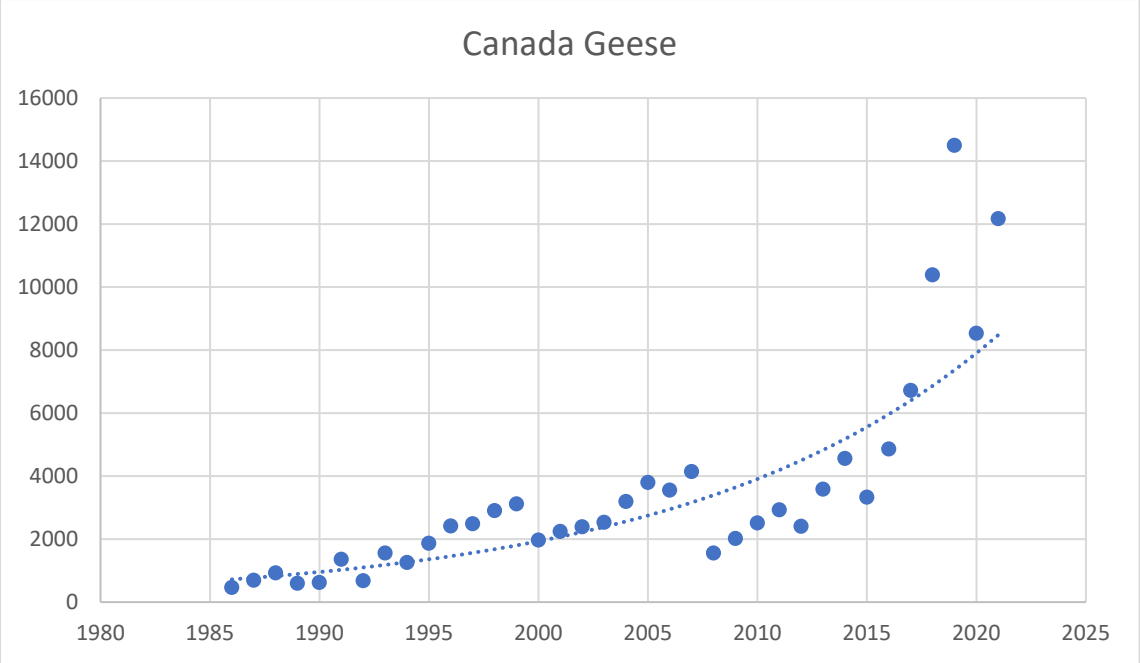

Figure 10: Total Canada geese count across 26 sites in the central Waikato and south western harbours.

Policy

5/05/2020	Canada geese	That Canada geese be returned to the First Schedule (wildlife declared to be game) only if sufficient external funding is provided to reduce and maintain numbers at manageable levels.