MANAGEMENT PLAN

August 2022 – June 2024

Management Plan for Hooded Plover Recovery between Harmers Haven and Inverloch, Victoria

Contents

Photo: David Hartney

Summary

Hooded Plovers are a threatened shorebird species and in Victoria they breed exclusively on beaches. During spring and summer, they lay eggs in simple nest-scrapes and raise chicks that are flightless for five weeks. They experience extremely low egg and chick survival rates as they face a multitude of threats due to being ground-nesters and their nesting season coinciding with the busy holiday season. BirdLife Australia's Beach-nesting Birds (BnB) Program has been working closely with local communities and land managers since 2006 to protect these threatened birds by monitoring their breeding success, implementing breeding site management (e.g., protective fences and signs), and educating beach users about the plight of beach-nesting birds.

The Bass Coast – stretch of coastline between San Remo and Inverloch – is an important stronghold for Hooded Plovers as it has the second highest density of any regional Hooded Plover population in south-eastern Australia. However, it is quite popular among holidaymakers due to its proximity to Melbourne (less than a 2-hour drive) and as a result beaches become extremely busy during the Hooded Plover breeding season. Therefore, nearly all breeding sites require management in order to minimise risks from anthropogenic threats (e.g., human disturbance, off-leash dogs) and in turn improve breeding success of Hooded Plovers. As each breeding site is different in terms of threats present, their intensities, and regulations, it is imperative that site-specific threat mitigation actions are implemented for better breeding outcomes.

The BnB Program was funded by The Cape Sustainable Housing in Cape Paterson to develop a management plan that includes site-specific threat mitigation recommendations for Hooded Plover breeding sites in the region between Harmers Haven and Inverloch. Hooded Plover breeding and threat data collected by trained citizen scientists/nest monitors over the last ten breeding seasons (2014-15 to 2023-24) were analysed to evaluate breeding success and create site profiles for 20 breeding sites. The analysis revealed a high variation in hatching success and chick survival over the ten seasons, where some sites contributed consistently with recruitment of Hooded Plover juveniles into the population and some not experiencing any success at all. There were numerous pairs of breeding Hooded Plovers that used more than one site for breeding during a season and there were also instances of changing sites across breeding seasons. Threats were also exceedingly high at sites and varied in intensity. While many sites had similar threats profiles in terms of dominance of walkers and dog walkers, and frequent occurrence of silver gulls, magpies and foxes, there were a few that had distinctive profiles dominated by foxes. Overall, signage combined with fencing of nests had the greatest management benefit, particularly at the hatching stage where success significantly increased. Signage combined with fencing also resulted in a greater likelihood of fledging young, however chick survival still poses a significant challenge. The site-specific recommendations presented in this management plan will be useful in tackling the multitude of threats present at breeding sites and in turn improving Hooded Plover breeding success. The plan will also provide a useful baseline for future reviews of trends in threats and for adapting threat mitigation actions accordingly.

Introduction

Over 85% of Australia's population lives within 50 kms of the coast and coastal tourism continues to grow representing a multimillion-dollar investment. On the Bass Coast, these pressures are intensifying due to the proximity (only a 2-hour drive from the CBD) of this stunning coastline to Victoria's capital city, Melbourne. The coastline however also harbours unique and threatened wildlife that depend on the beach, intertidal and rocky habitats for their survival. In particular, these habitats between San Remo and Inverloch provide important foraging and roosting grounds for migratory shorebirds with high energetic requirements for making the long journey back to their breeding grounds in Northern Siberia and China, and for one migratory species, the double-banded plover that visits from New Zealand. The value of these coastal habitats is even more significant for resident shorebirds which settle on distinct 'territories' (sections of beach that are maintained over time through heated competition!) and depend on them for all their survival needs, including breeding. It is during the spring and summer months that the beaches become critical breeding and foraging habitats, and yet it is at this time, when the weather is warmest, that the beaches are at their busiest with people recreating. There is one species of beach-nesting bird which is especially vulnerable to the impacts of intensive beach use, the Hooded Plover *Thinornis cucullatus*.

Hooded Plovers are listed as threatened in Victoria under the *Flora and Fauna Guarantee Act 1988* and classified as Vulnerable in its Threatened List (DEECA 2024). Hooded Plovers (Eastern) are also listed as Vulnerable under National legislation, the *Environment Protection and Biodiversity Conservation Act 1999*. This listing occurred in 2015 after over a decade of detailed data collection that was able to provide evidence for the species eligibility for meeting threatened criteria.

Hooded Plovers are the most threatened of beach-nesting resident shorebirds because they are habitat specialists (Ehmke *et al.* 2016). They are limited to breeding exclusively on ocean beaches, including estuaries, in Victoria from early August (occasionally late July) to March (but in some locations into April). Hooded Plovers make simple nest-scrapes in the sand and nest anywhere above the high-tide mark that has an expansive view of approaching threats, including the mid to upper beach, and on bare to sparsely vegetated foredunes and dunes (including rocky substrate). Their well-camouflaged eggs are extremely difficult to spot, and due to their location, are at great risk of being trampled by visitors to the beach. People, unleashed dogs, horses and vehicles on beaches not only pose a direct threat of crushing, but they also disturb incubating adults, resulting in temporary nest abandonment (where the adults leave the nest so as to maximise camouflage and wait for the threat to depart the area; Weston 2000, Weston *et al.* 2011) which exposes the eggs to harsh temperatures, and predators such as ravens, gulls, foxes and cats (see threat reviews in Maguire 2008; Maguire *et al.* 2014). This is particularly true of disturbances caused by unleashed dogs, where adults spend long periods away from the nest (Weston and Elgar 2007).

Hooded Plover chicks cannot fly for 5 weeks and need to forage on the beach and intertidal rock platforms in order to survive. This places them in harm's way, and they are easily crushed or disturbed by people, dogs, horses and vehicles on the beach. If they spend too much time in hiding,

they can starve to death or be exposed to harsh temperatures in the absence of brooding. The parent birds try to distract potential threats, which separates them from the chicks, meaning they are further exposed to predators (Weston and Elgar 2005). In addition, vehicles and horses on beaches compact the sand, crushing the bulk of prey items in the upper sand layer that these shorebirds rely on (Schlacher *et al.* 2008; Taylor *et al.* 2012).

Given the severe pressures placed on coastal breeding birds, in particular the threatened status of the Hooded Plover, BirdLife Australia embarked on a project to 'Promote Coexistence between Recreationists and Beach-nesting Birds' in 2006. Beaches will always be popular places for recreation within Australian culture, and the best solution to a problem which is very much human-generated, is to try and engage people to change their behaviours and help protect these birds so they have a future. This project has been funded over the years by the Australian Government's Natural Heritage Trust, Caring for our Country and National Landcare Programs, The State Government of Victoria, several Natural Resource Management Boards (now Landscape Boards) throughout South Australia and Catchment Management Authorities throughout Victoria, The NSW Environmental Trust, and various philanthropic trusts and donors including the Hugh D. T. Williamson Foundation and the Letcombe Foundation. Local councils such as the Bass Coast Shire Council have also contributed funding to developing key resources for the program and to deliver local workshops and events.

The main aim of the Beach-nesting Birds (BNB) Program is to involve coastal communities and land managers in monitoring and protection of breeding sites to mitigate the key threats of recreation and to result in improved breeding success of the birds. Hooded Plover recovery takes an adaptive management approach to improve on-ground management and community awareness strategies over time by reviewing successes and failures annually and monitoring how threats respond to investment in mitigation. The Hooded Plover is used as a flagship for educating communities about coastal conservation issues and engaging them in improving these habitats overall.

Aims of the Hooded Plover Recovery Program

The national objectives of the Hooded Plover recovery program are to:

1. Improve breeding success and population resilience of Hooded Plovers through:
   - On-ground threat mitigation at priority sites across the species range
   - Research to overcome key knowledge gaps and to evaluate and adapt best practice for Hooded Plover recovery
   - Education to shape sustainable beach use behaviours
2. Protect and restore critical habitat so that the current (and recent historical) distribution is maintained and protected
3. Develop tools, resources, capacity and supportive policy to ensure long-term sustainability and consistent delivery of recovery actions

On the Bass Coast, our aims are specifically to:

1. Improve breeding success and population resilience of Hooded Plovers

- Monitor the breeding status of all known pairs along this coastline during the breeding months (August-March). Seek to maintain monitoring of these sites over

time for a comparison of site-based threat profiles and to quantify improvements in breeding success related to management. Monitoring is primarily by citizen scientists who have high skill sets, undergo training and follow strict protocols to ensure risks of disturbance are mitigated. All data are entered into the MyBeachBird portal (https://portal.mybeachbird.com.au/);

- For sites where we have been collecting threat data, seek to assess changes in the occurrence and severity of threats over time and the impact of threats on breeding outcomes;
- Carry out on-ground management of vulnerable breeding sites following management directions outlined in 'A practical guide to managing beach-nesting birds in Australia' (Maguire 2008);
- Investigate the effectiveness of nest site protection (does management work?) and make modifications (subject to approvals) for subsequent seasons (e.g., Weston *et al.* 2012; Maguire *et al.* 2011, 2013). Management needs to adapt to local site and beach user specifications;
- Use nest cameras at sites where nests repeatedly fail to detect and identify nest predators and to determine nest fates (see Mead 2012; Weston *et al.* 2017). This is done following strict BirdLife Australia protocols and to a limited degree to avoid any potential for training predators to associate cameras with nests;
- Carry out targeted research to overcome key knowledge gaps (e.g., sources of chick mortality) or to identify and test new threat mitigation methods;
- Band a sample of Hooded Plovers and maintain a resighting database to track movements, dispersal and document survival rates and site fidelity (e.g., Weston *et al.* 2009). This will lead to better knowledge about exchange of birds between the Bass Coast and other parts of Victoria, enabling a better idea of what we consider (and therefore manage as) a population. Blood samples are taken and contribute to a collaborative study of population genetics carried out by Museums Victoria, Deakin University and BirdLife Australia, and;
- Engage communities in Hooded Plover conservation via organised events or activities such as the biennial count, scope viewing, dogs' breakfasts, school visits, craft stalls, etc. Awareness raising and opportunities to participate are carried out with the aim of overcoming knowledge barriers (see Maguire *et al.* 2015) and changing beach user behaviours to promote coexistence and long-term sustainable beach use.

2. Protect and restore critical habitat so that the current distribution is maintained and protected

- Maintain a distribution map and database of location of breeding pairs of Hooded Plovers over time;
- Estimate population numbers of Hooded Plovers through a mainland census every two years (e.g., November 2022, November 2024, and so on);
- At the time of each biennial count, assess the threats to each pair in a snapshot assessment and any management in place to alleviate these threats;

- Assess occurrence of threats at breeding sites from data collected during the biennial count and map sites according to threat status, and;
- Advocate for protection of key sites and seek to ensure that they are managed in a way that maintains or improves current habitat values.

3. **Develop tools, resources, capacity and supportive policy to ensure long-term sustainability and consistent delivery of recovery actions**
    - Establish the 'Friends of the Hooded Plover' regional volunteer group on the Bass Coast to encourage community ownership and long-term sustainability of the program;
    - Develop new resources and materials to support volunteers and land managers in monitoring and recovery actions for the Hooded Plover;
    - Hold regular meetings, workshops, training opportunities and support communications between volunteers, land managers and program coordinators so that all participants share feedback and work collaboratively towards improved recovery outcomes;
    - Maintain and adapt the online MyBeachBird portal to support data collection, viewing and extraction;
    - Work in partnership with land managers to deliver consistent on-ground recovery actions, signage and messaging, and;
    - Engage with local, state and federal government policy, planning and decision makers to ensure threats to Hooded Plovers and their habitat are acknowledged, and managed accordingly.

Program partners

Hooded Plover recovery is multi-faceted and involves multiple stakeholders working together towards common aims and recovery targets. On the Bass Coast, the following stakeholders participate in the program:

BirdLife Australia

- Develop and guide strategic direction, prioritisation and coordination of the recovery of the Hooded Plover (Eastern) across the species range
- Define and adapt population level, regional and local priority actions for species recovery. This is often independent of current recovery actions defined by Federal and State governments as these are largely outdated and often inaccurate due to the time lag in policy updates
- Define and uphold best practise protocols for monitoring, management and conservation messaging. Any change to current practises must be initially approved by BirdLife Australia in addition to land manager approvals
- Maintain ethics and permit approvals for monitoring, on-ground interventions and research techniques such as capture and banding of the birds, use of remote cameras, floating eggs, etc.

- Centralised data collection – operate citizen science program, standardised collection of different data (population count and breeding/threat data), training, analysis and reporting
- Develop, maintain and vet the national MyBeachBird portal database
- Register, induct, mentor and support volunteers/citizen scientists
- Provide advice, training and technical support for participants in the program including volunteers, land managers, bylaws officers and educators
- Run at least one workshop every season for Bass Coast participants to train new and existing volunteers, build capacity and adapt approach
- Analyse and review data to maintain an adaptive management recovery approach
- Engage all stakeholders in adaptive management approach through a start-of-season planning meeting, an end-of-season debrief, and regular reporting
- Carry out research to improve recovery efforts which includes research into species ecology, behavioural ecology, threat ecology, social science, human behaviour and conservation investment effectiveness, and connecting researchers across Australia to advance our knowledge of Hooded Plover recovery
- Initiate and maintain a national network for information sharing and supporting recovery of the Hooded Plover which includes a biannual newsletter, social media (Facebook, X, and Instagram), events and biennial conference
- Coordinate the national mainland census of the Hooded Plover, map and report on findings
- Advocate for better habitat management, policy and planning that secure long-term protection of the species and their habitats
- Banding program across Victoria and South Australia for Population Viability Analysis and tackling key knowledge gaps. This includes permits, ethics approvals, banding, collection of morphometric data and genetic samples, as well as having responsibility for maintaining sightings database
- Emergency response action for bird injuries, entanglements or oil spill. Joint communication required between all levels of coordination to ensure timely response
- Develop resources for volunteers, education and awareness raising materials and events including initiating Plover Appreciation Day on September 16 each year, and apply for grants to fund local projects that improve habitat or beach user behaviours

Land Management Agencies

On the Bass Coast, Hooded Plovers predominantly occur on sites managed by Parks Victoria and there are a handful of sites that occur on land managed by the Bass Coast Shire Council.

These agencies actively:

- Implement and/or assist with nest protection responses
- Monitor breeding birds and site-based threats
- Invest in local on-ground works that improve breeding success or habitat condition including fencing, signage, fox control and weed control
- Work closely with BirdLife Australia and volunteers, and provide support
- Host meetings and provide logistical support with venues etc. for events and meetings

- Work with other departments to ensure the species and their habitats are considered in relevant policies, planning, communications and bylaws
- Mentor new staff and ensure succession planning
- Engage their local communities and raise awareness through events, competitions, advertisements, print media and social media
- Engage key stakeholder groups and work towards improved beach user behaviours

Volunteer groups

In 2006, BirdLife Australia (then Birds Australia) began a Victoria-wide Hooded Plover monitoring and conservation program. The program began with around 40 volunteers across Victoria, many who were committed to biennial counts from the 1980s onward and by 2009, volunteer numbers had grown to 400 and the program had expanded to South Australia. From 2009, BirdLife Australia developed a regional model whereby individual volunteers that were coordinated centrally by BirdLife staff from 2006 were organised into geographic groups and regional coordinators were established. These hereby became known as Friends of the Hooded Plover groups.

Friends of the Hooded Plover Bass Coast is a BirdLife Australia friends group, headed currently by Kasun Ekanayake of the Beach-nesting Birds Team. Up until the end June 2023, it was headed by the incredibly experienced long-standing volunteer regional coordinator Steve Johnson, who has been part of the program since its inception in 2006. Three volunteer beach leaders, Janine Thomas, David Hartney and Warwick Mears assist with coordinating the monitoring and management of nesting sites in the areas, San Remo to Williamsons Beach, Harmers Haven to Undertow Bay, and The Oaks Bay to Inverloch respectively. David Hartney also actively manages the Friends of the Hooded Plover Bass Coast and South Gippsland Facebook page. The group undertake monitoring and assist with protection of breeding sites. They are very active in their local community in terms of establishing connections with local businesses, sharing information and learnings with other environment/conservation groups, participating in events (e.g. Inverloch Farmers Market) and speaking to the media. The group works closely with land managers, Parks Victoria and the Bass Coast Shire Council. Several of the volunteers are also members of BirdLife Bass Coast and the South Gippsland Conservation Society.

There are other key groups who play a role in Hooded Plover conservation in the area and they are:

- **BirdLife Bass Coast**
- **South Gippsland Conservation Society**

Any volunteers from the aforementioned groups who actively participate in Hooded Plover monitoring or site protection are formally registered as part of the Friends of the Hooded Plover groups in their area due to the strict ethical protocols and permit conditions that require volunteers to have formal inductions, training and to be identifiable as Beach-nesting Bird volunteers. Members of the above groups however also participate in events, sharing information about the birds, fundraising, media, and advocacy connected to their specific groups.

Other Agencies/Partners

Department of Energy, Environment and Climate Action is responsible for regulating and enforcing regulations across the coast, as well as setting policy around threatened species and coastal management. Through the Conservation Regulator Branch they have initiated Operation SoHo (Saving our Hooded Plovers) whereby authorised officers conduct patrols to educate beachgoers about protecting hooded plovers and their eggs and chicks.

West Gippsland Catchment Management Authority (WGCMA) provides funding through their localised projects such as the Powlett River/Kugerungmome Partnerships Project and acts as the regional delivery partner for the federal government's Natural Heritage Trust funding scheme through which funding is provided for Hooded Plover recovery across a broader landscape encompassing their catchment area.

Bass Coast Landcare Network delivers introduced predator control programs across different land tenures on the Bass Coast that is beneficial to Hooded Plovers. They collaborate with BirdLife Australia to strategically align the predator control program so that it coincides with critical stages of the Hooded Plover breeding season to maximise benefits for the birds.

The Cape Sustainable Housing (The Cape) engages in educating the residents at their housing estate in Cape Paterson about Hooded Plovers and other wildlife via signage and by building an off-leash dog park which provides dog walkers with an alternative to walking their dogs on beaches. Since August 2022, The Cape has assumed custodianship of Hooded Plover breeding sites between Harmers Haven and Undertow Bay being responsible for monitoring, management and equipment provision. They also provided BirdLife Australia with funding to install breeding update signs at beach access points, purchase more temporary breeding signs and fencing equipment, deliver education and awareness raising events, conduct fieldwork to capture and flag Hooded Plovers to investigate movements and partner and site fidelity, and to vet and analyse ten years of nest monitoring data to produce this management plan.

Aims of this management plan

The Beach-nesting Birds program has been running since 2006 on the Bass Coast and given it has its foundations in adaptive management, it was timely that a review was undertaken of the intensive recovery effort to develop a management plan. As per the funding proposal, the region between Harmers Haven and Inverloch will be the focus of this review and thus, the aims of this management plan are to:

- Document changes in breeding site occupancy within the region over the last ten years
- Report on Hooded Plover breeding success and explore trends in breeding parameters
- Compile threat profiles for each breeding site across the region (this report does not seek to review threats or their relative importance as there are extensive reviews available in Maguire 2008 and Maguire *et al.* 2014)
- Explore trends in threats over the last ten-year period
- Formulate management recommendations to address key threats identified for each site

Methods

Historically, volunteers on the Bass Coast have been involved in biennial Hooded Plover population counts, surveying the entire ocean beach coastline in November in 'even' years since 1980. From 2006, standardised monitoring of breeding sites was introduced to the region when the Beach-nesting Birds program was initiated. Here, trained citizen scientists follow strict protocols for monitoring the birds over the course of the entire breeding season (August to March). As monitoring commenced with just over ten volunteers only a subset of breeding sites was chosen for intensive monitoring. As the volunteer group grew over the years, more and more sites were incorporated into the monitoring program to gain a better understanding of the breeding success of the birds and the threats impacting success.

During each visit to a Hooded Plover breeding site, the observer/s thoroughly searched the length of the territory for the breeding pair. Pairs needed to be monitored regularly at least monthly with a minimum of seven visits throughout the season spanning from August/September to March. Each breeding attempt would be followed through time with the aim of determining the success of each attempt in particular for both the egg and chick phases. During these monitoring visits, Hooded Plover breeding data (e.g., number of birds, behaviour, evidence of nesting, etc.) was collected. Additionally, a rapid threat assessment of the sites was completed on every visit, which facilitated the collection of data on threats such as, beach users, off-leash dogs, mammalian, and avian predators as well as evidence in the form of tracks, prints and traces. This was a critical component of the data collection, enabling us to assess trends in threats over time and their response to mitigation efforts, and also to be able to interpret breeding success and failure in relation to these threats. Data from monitoring visits was entered by volunteers into BirdLife Australia's MyBeachBirds data portal.

From 2010 onwards, a subset of birds was flagged with unique engraved leg flags on the tibia (upper leg). Flags were orange with black engraving, or white with black engraving, with two alpha-alpha combinations. Also on the Bass Coast, there were several individuals with colour band (study in the 1990s by Mike Weston) or colour flag (Phillip Island fledglings up until February 2012 when the switch to yellow with black engraving numerical flags were introduced) combinations on the tarsi (lower legs). Several of these birds were recaptured and given a single engraved flag for both ethical reasons and because the loss of a colour band/flag had meant they were no longer identifiable in the field. Banded and flagged bird sightings enabled us to better understand site movements, recognise cases of divorce and partnership changes, to identify floaters in the population and to identify disappearances of long-lived individual birds (suspected to have died).

All data used in this report was heavily vetted by BirdLife Australia's Beach-nesting Birds experts for accuracy and breeding summaries were generated using standardised decision-making rules including minimum sample sizes for inclusion. Data of Hooded Plover breeding sites between Harmers Haven and Inverloch over the last ten breeding seasons (2014-15 to 2023-24) were extracted and analysed using Microsoft Excel. Maps were created using Geographical Information Systems (GIS) software ArcGIS Pro.

Key Findings

Breeding sites and monitoring effort

Twenty Hooded Plover breeding sites in total have been monitored over the last ten breeding seasons in the region between Harmers Haven and Inverloch (Figure 1). Some of these sites have been occupied by Hooded Plover pairs every season whereas others have been either used irregularly or established later. Only six sites (30%) have been occupied for all ten seasons and the shortest duration of occupancy of a site has been two seasons. Some Hooded Plover pairs either moved between sites or disappeared from their sites in one season and returned in the next, resulting in shorter occupancies (Table 1). For example, the site 'Coal Creek Estuary – 1st Point East' was established in the 2018-19 season only to be vacated for four seasons until the 2023-24 season where it was reoccupied for breeding. Some pairs also switched sites mid-season using two or more sites for breeding during one season.

Table 1. Details of Hooded Plover breeding sites between Harmers Haven and Inverloch for the ten breeding seasons between 2014-15 and 2023-24.

Site name	Season first established	# seasons occupied
Cape Paterson - 2nd Surf Beach	2014-15	10
Cape Paterson - 2nd Surf Beach West	2018-19	2
Cape Paterson - Pea Creek Estuary & Undertow Bay	2014-15	10
Coal Creek Estuary - 1st Point East	2018-19	2
Coal Creek Estuary - 2nd Bay East	2014-15	7
Coal Creek Estuary Mouth - Harmers Haven	2014-15	10
Inverloch - Abbott St	2016-17	7
Inverloch - Abbott St East	2016-17	5
Inverloch - Point Norman East	2014-15	4
Inverloch - Point Norman West	2014-15	2
Inverloch - Screw Creek West	2014-15	9
The Oaks Bay - Cape Paterson	2014-15	10
Twin Reefs -Bunurong Coast Rd	2014-15	10
Waterfall Creek - Harmers Haven	2014-15	9
Wilsons Rd 1st & 2nd Bays West	2014-15	8
Wilsons Rd 2nd Bay West End	2014-15	10
Wilsons Rd 3rd Bay West	2014-15	4
Wilsons Rd Eastward 2nd Drain	2015-16	3
Wilsons Rd Eastward 3rd drain	2015-16	9
Wreck Beach - Harmers Haven	2014-15	8

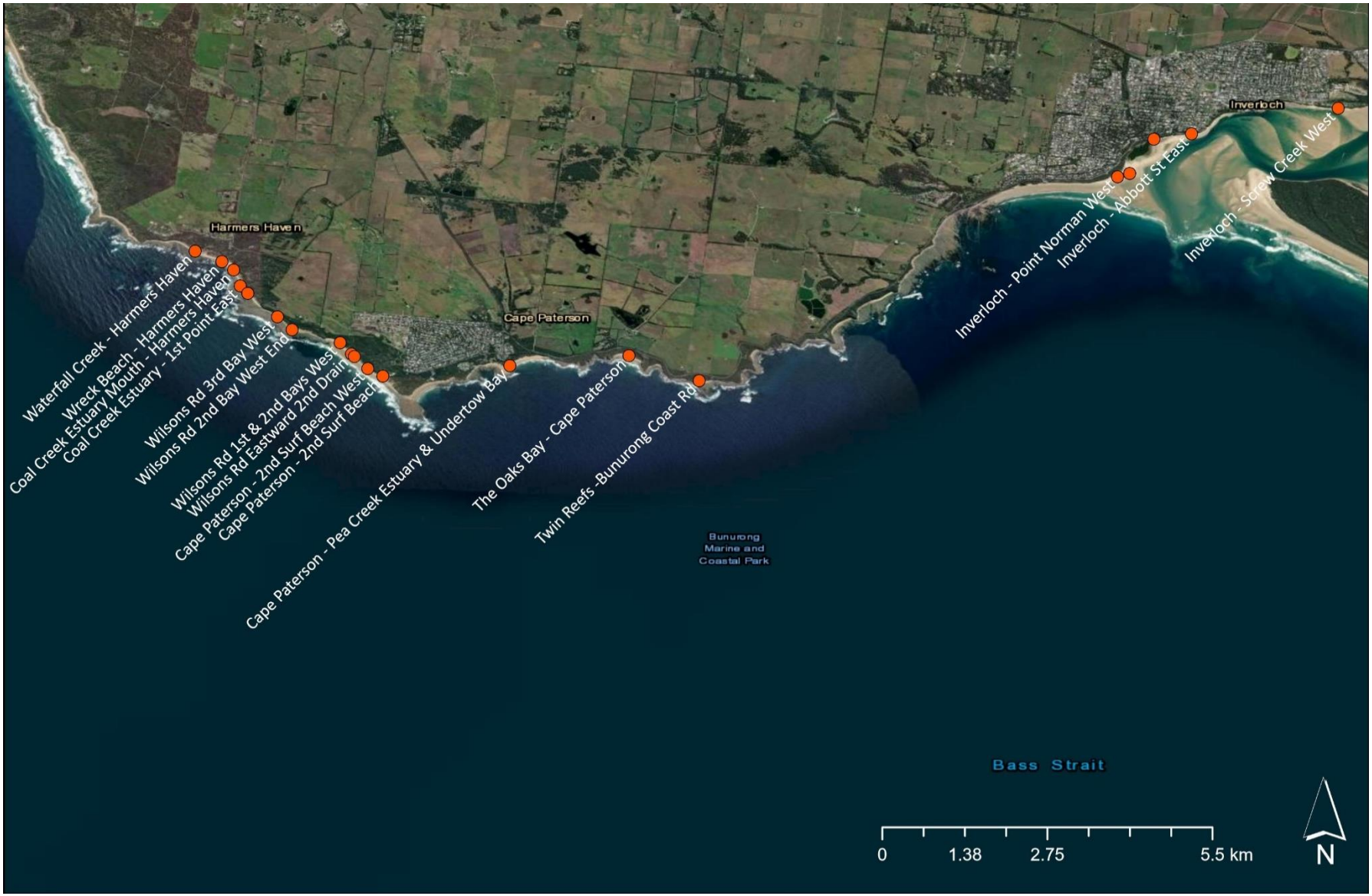

Figure 1. Hooded Plover sites that have been used by breeding pairs over the ten breeding seasons between 2014-15 and 2023-24, between Harmers Haven and Inverloch on the Bass Coast.

It is important to clarify that the number of breeding sites does not equate to the number of breeding pairs of Hooded Plovers within the region. Breeding sites have been identified as separate management units due to variations in regulations, and occurrence and abundance of threats. Therefore, a large breeding territory of a Hooded Plover pair can encompass two or more breeding sites. For example, 'Wilsons Rd 1st & 2nd Bays West' and 'Wilsons Rd Eastward 2nd Drain' sites are adjacent sites that are generally used by one pair of breeding Hooded Plovers. These two sites have different regulations (no dogs allowed in 1st and 2nd Bays West and dog on leash in 2nd Drain) giving rise to different management requirements and therefore it is important to maintain them as two distinct sites even though they typically belong to a single Hooded Plover pair's large breeding territory. In the 2014-15 breeding season, a single pair of Hooded Plovers occupied both the 'Wreck Beach – Harmers Haven' and 'Coal Creek Estuary – 2nd Bay East' sites where they alternated between the two sites laying the first clutch of eggs at Wreck Beach before moving to 2nd Bay East for their second clutch. There have also been deaths of adult birds as well as partner-swaps, resulting in changes to pairs present at sites over time (see Site Descriptions pp. 44-98).

Over the last 10 years, the number of active nest monitors have gradually increased and this in turn has resulted in a significant increase in the number of monitoring visits to breeding sites (Figure 2). The data collected on these visits have been used to gain an understanding of the threat profiles of breeding sites and to develop this management plan.

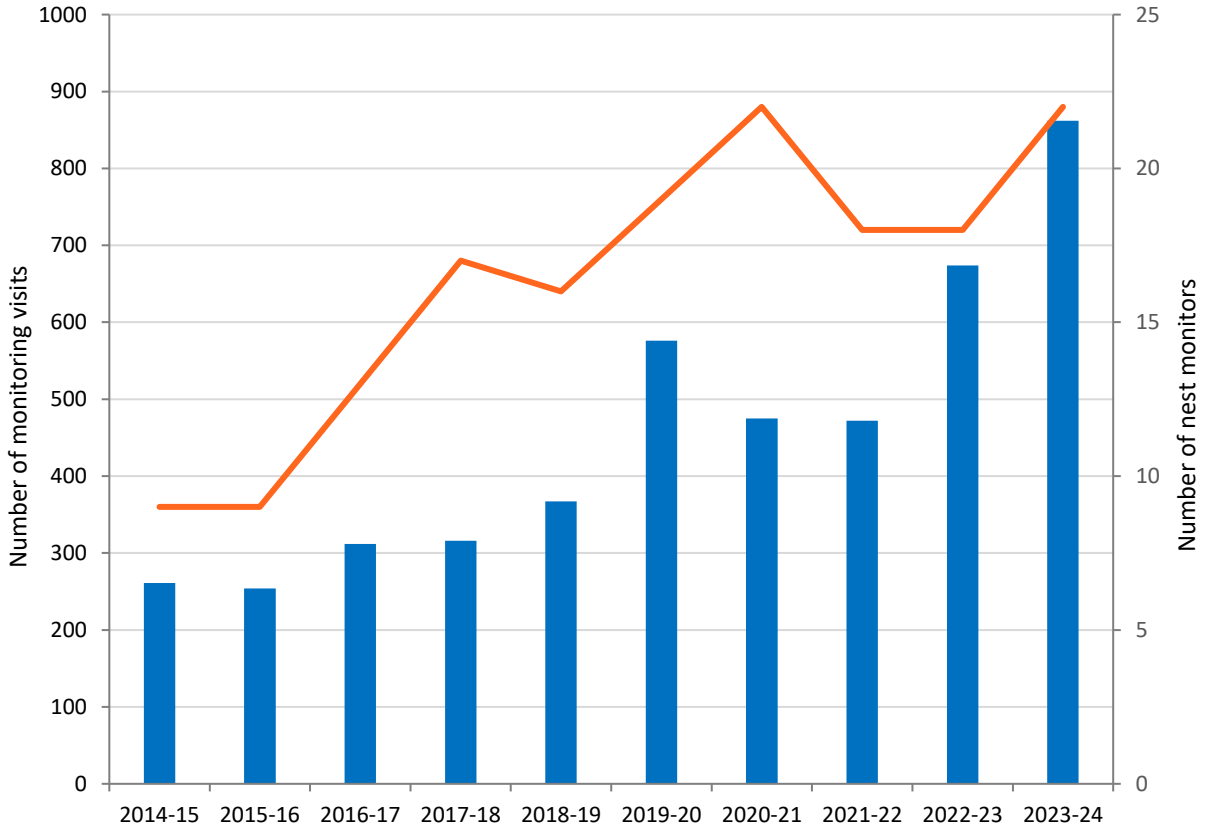

Figure 2. The number of nest monitors submitting data (orange line) and the number of monitoring visits (blue) to Hooded Plover sites, across ten breeding seasons (2014-15 to 2023-24) in the Harmers Haven to Inverloch region.

Breeding season and temporal variation in success

Hooded Plovers have a long breeding season where some pairs can start nesting as early as August and some can lay their last clutch of eggs as late as April. The length of the season is considered an adaptation to high levels of nest failure related to the naturally dynamic coastal environment, enabling pairs to have multiple nest attempts in one season. Furthermore, the length of season will vary for pairs occupying different sites based on the suitability of those coastal sites for nesting, where high tides and storm surges can delay the start of the season due to limited availability of habitat. Given the incubation period spans 28 days and the chick phase another 35 days, the maximum success a pair can feasibly have in a season is two successful broods. Pairs that experience failure during the chick phase will have less time in the season for repeated nesting compared with pairs that have most failures occurring during the egg phase. Typically, the average number of nests detected across the season follows a bell curve pattern where there are fewer pairs that start early in the season, working towards a peak toward the middle of the season around November - December, and then decreasing as the season winds down toward March.

Across the Harmers Haven to Inverloch region, very few pairs began nesting as early as August, with most pairs beginning in September and the remaining attempting their first nests in October. December was the peak time for relaying, and relaying had mostly ceased by February, with only two nests recorded in March over ten breeding seasons (Figure 3).

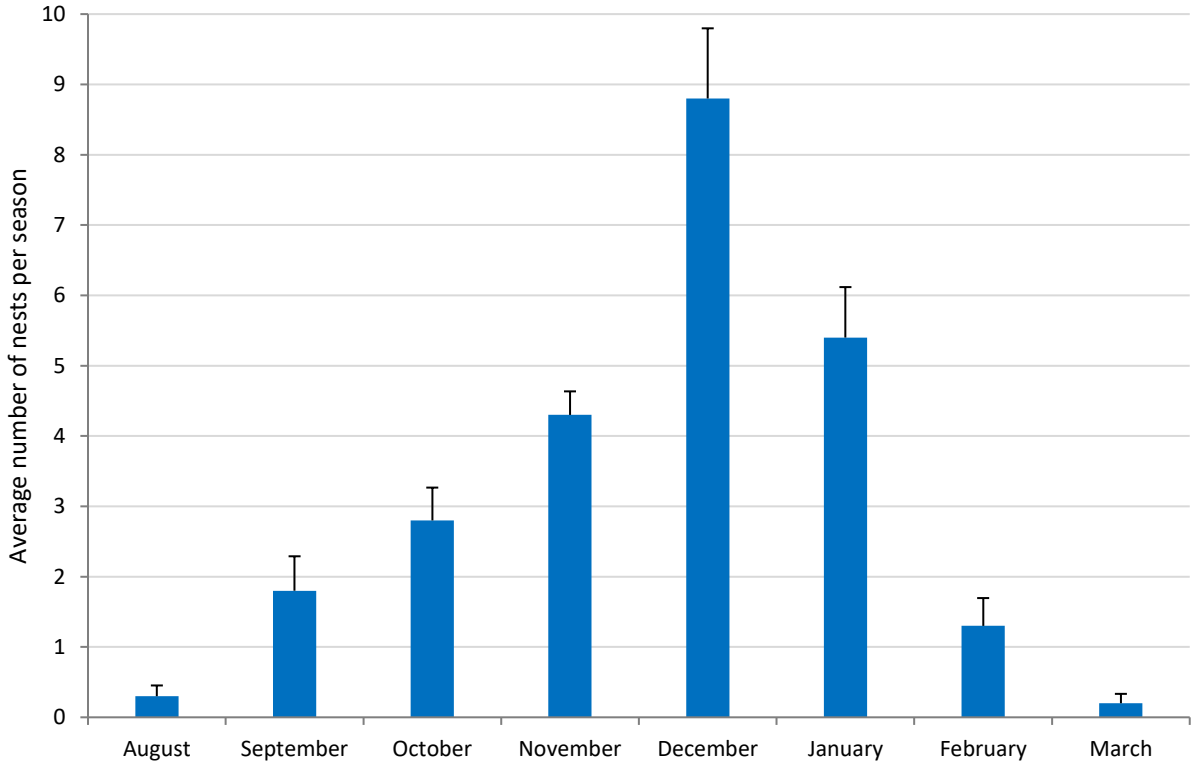

Figure 3. The average number of Hooded Plover nests (first detected) per month (+ standard error) across ten breeding seasons (2014-15 to 2023-24) in the Harmers Haven to Inverloch region.

Clutch size was on average 2.48 ± 0.05 eggs, and the average number of eggs per clutch did not vary significantly for most of the breeding season, except for March clutches at the end of the season that

had an average of 2.0 eggs per clutch. Pairs can vary greatly in their breeding effort in terms of the number of clutches (nests) laid in a season. The average number of clutches a pair has in a breeding season is 1.7 ± 0.4 (Figure 4). The highest number of nests by a given pair in a season was seven. Some pairs can have high relaying rates associated with high rates of failure, while others can fail but may not relay again that season (Figure 4). We are uncertain of the factors influencing the likelihood of pairs relaying, but suspect it relates to quality of the territory and energy available for egg production and parental care.

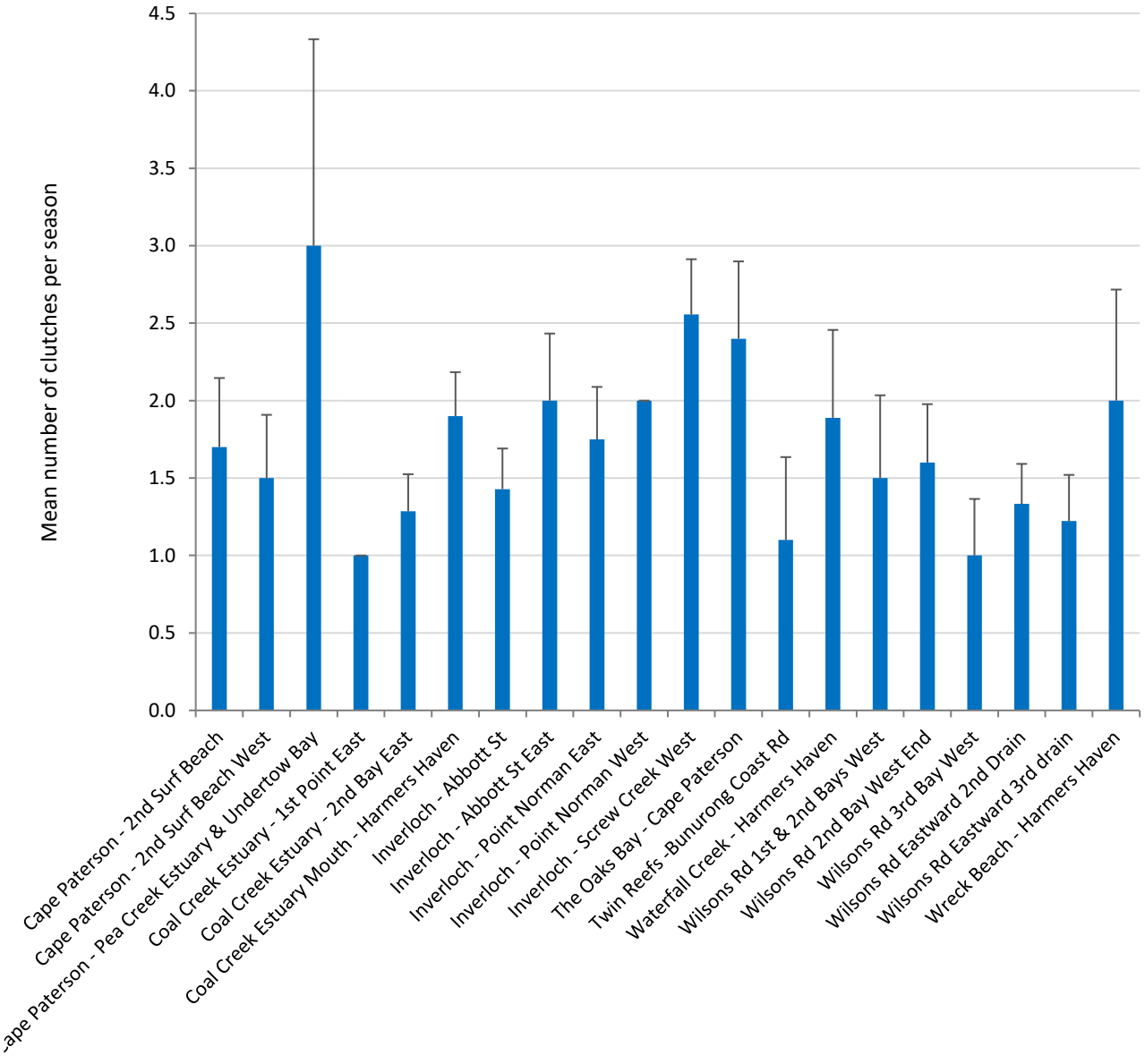

Figure 4. The mean number of clutches (+ standard error) for each Hooded Plover breeding site across ten breeding seasons (2014-15 to 2023-24) in the Harmers Haven to Inverloch region.

In terms of a temporal trend in failure and success across the season, the number of nest failures appears to increase from September to December, with December and January representing a peak time for nest failure (Figure 5). Although January has the highest number of hatched nests, nest

survival is greatest in February with more nests surviving to hatching compared with failures (Figure 5). Overall, the likelihood of hatching is greatest in February, followed by March, October and January.

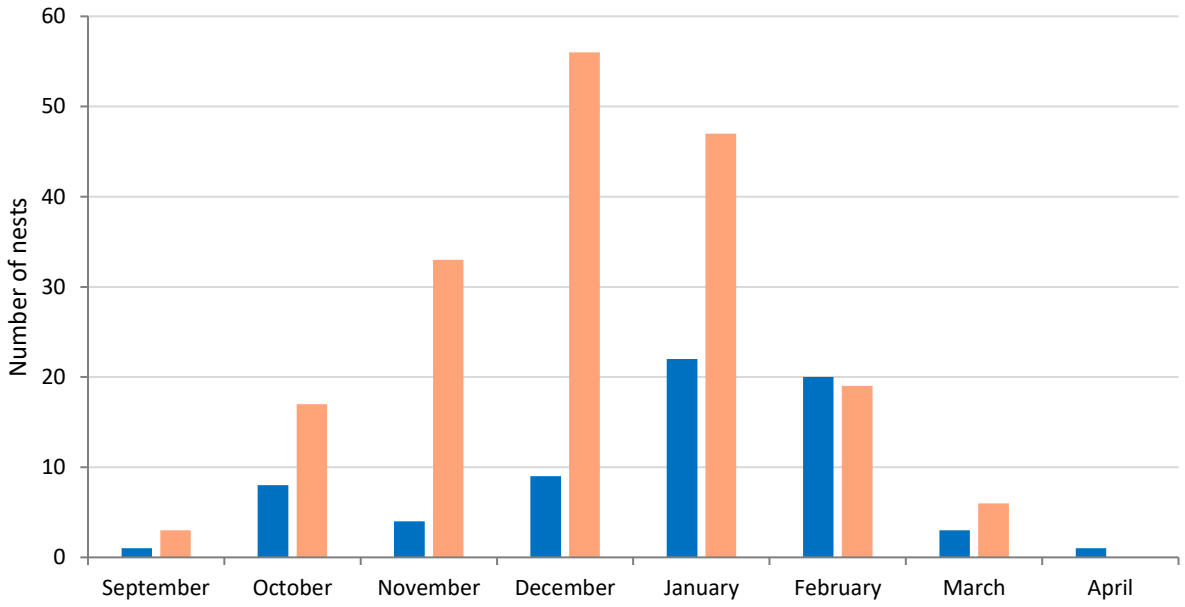

Figure 5. The total number of nests that hatched (blue) or failed (orange) per month across ten breeding seasons (2014-15 to 2023-24) in the Harmers Haven to Inverloch region.

Nest fates

Determining cause of nest failure is inherently difficult based on observational only data and the best way to determine nest fate is to deploy motion-sensing remote cameras at the breeding site. Investigation of the suspected causes of nest failure based on evidence recorded by nest monitors over the last ten breeding seasons, reveals that the cause could not be determined in 46% of nests from a total of 181 nests that failed (Table 2). While some causes of failure such as abandonment or tide washouts are easier to determine than others, it is more difficult to detect predation of nests. Foxes were the dominant predator followed by ravens and magpies.

Table 2. Suspected causes of failure of Hooded Plover nests that failed to hatch chicks in the Harmers Haven to Inverloch region over the ten breeding seasons between 2014-15 and 2023-24.

Cause of failure	Percentage of nests failed
Unknown	46.4
Fox	18.8
Tide	17.7
Raven or Magpie	9.9
Abandoned	3.9
Human	1.7
Gull	1.1
Other predator	0.6

Determining chick fates of Hooded Plovers is even harder, as rarely are nest monitors present at the precise moment to observe the fate of the chicks. There have been few observations of chick fates in the Harmers Haven to Inverloch region and a study by Schmidt (2017) involving radiotracking of chicks provided more insight into the causes of chick mortality. We therefore will not attempt to speculate on causes of chick mortality in this management plan.

Breeding success rates

Breeding success of Hooded Plovers can be measured based on a number of parameters, including hatching success (egg survival), chick survival (the number of chicks that survive to fledge) and the proportion of nests fledging young. Each of these parameters is valuable for interpreting the nesting effort of each pair and for determining the phase (egg or chick) in which failure is more likely, and thus adapt management investment accordingly. However, the most powerful breeding success parameter is the fledglings produced per breeding pair because this best reflects recruitment capacity of the current population and is a proxy for future recruitment into the breeding population.

The average fledgling production per breeding pair occupying remote sites with no to very few anthropogenic threats in Victoria is around 0.4-0.5, and this has been set as a target for fledgling production for the rest of the population that experience high anthropogenic threats. This is the best proxy for a recovery target until a Population Viability Analysis has been carried out. Over ten breeding seasons, the Harmers Haven to Inverloch region has managed to produce an average of 0.36 ± 0.08 fledglings per breeding pair which sits just under the expected target, successfully achieving or exceeding the target in five out of ten seasons (Table 3). The best seasons for productivity appear to be 2015-16, 2017-18, and 2022-23, while the worst season on record was in 2020-21 during which no fledglings were recruited into the population (see Table 3). From a reproductive effort perspective, both 2015-16 and 2022-23 seasons have been equally favourable to the birds where only 19 clutches (the lowest number of clutches over the ten-year period) were laid and out of those 42% hatched. High hatching success usually translate to a reduction in the number of clutches laid which in turn preserves energy of reproducing adult birds. Both these seasons had relatively high percentages of chicks reaching the fledgling age (42% and 35% respectively) which again is beneficial to the birds' wellbeing. The percentage of chicks fledging was also relatively high in the 2019-20 season although the percentage of nests hatching was relatively low (Table 3).

Over the ten seasons, the number of chicks produced per pair varied greatly, experiencing an all-time low in 2020-21 and three peaks in chick production (2015-16, 2017-18 and 2022-23; Figure 6). The lowest number of chicks produced per breeding pair was recorded in the 2020-21 season which was reflected by the lowest recorded hatching success of 9.7%. Interestingly it was one of the seasons during which the highest number of breeding pairs was recorded in the region.

Table 3. Hooded Plover breeding results of the seasons between 2014-15 and 2023-24 in the Harmers Haven to Inverloch region. The average and standard error across ten seasons is presented at the bottom of the table. The highlighted figures are those that have exceeded the ideally expected values for each category (percentage nests hatched > 40%, percentage nests fledged > 20%, percentage chicks fledged > 30%).

Breeding season	# breeding pairs	# nests	% nests hatched	% nests fledged	# eggs	# chicks	# fledglings	% chicks fledged	Fledglings/ breeding pair
2014-15	11	21	23.81	9.52	52	9	2	22.22	0.18
2015-16	11	19	42.11	26.32	49	19	8	42.11	0.73
2016-17	10	30	26.67	10.00	80	19	4	21.05	0.40
2017-18	14	29	37.93	17.24	77	28	8	28.57	0.57
2018-19	13	32	31.25	3.13	71	17	2	11.76	0.15
2019-20	10	23	26.09	13.04	56	10	4	40.00	0.40
2020-21	14	31	9.68	0.00	66	6	0	0.00	0.00
2021-22	11	23	17.39	4.35	62	9	2	22.22	0.18
2022-23	10	19	42.11	31.58	52	20	7	35.00	0.70
2023-24	11	22	22.73	9.09	53	14	3	21.43	0.27
Average (se)	*12 (0.50)*	*25 (1.60)*	*27.98 (3.34)*	*12.43 (3.19)*	*62 (3.55)*	*15 (2.13)*	*4 (0.88)*	*24.44 (4.04)*	*0.36 (0.08)*

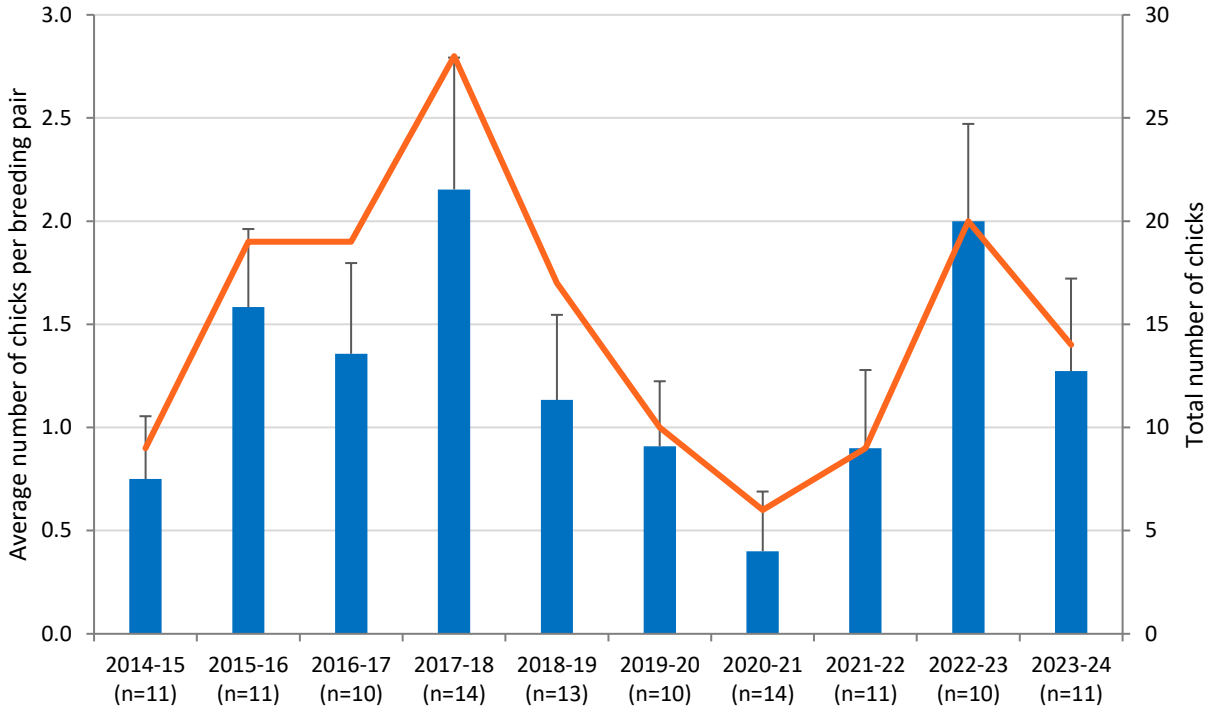

Figure 6. The average number of chicks that hatched per breeding pair (blue) and total number of chicks hatched (orange line) over ten breeding seasons (n = total number of breeding pairs per season) in the Harmers Haven to Inverloch region.

Similar to the low hatching success, an all-time low in fledgling production was recorded in 2020-21, however the rest of the trend does not closely match that of chicks produced per pair (Figures 6 and 7). There appears to be consistency at the beginning of the project period, a marked decline, and then an improvement in fledgling production over the final three seasons (Figure 7).

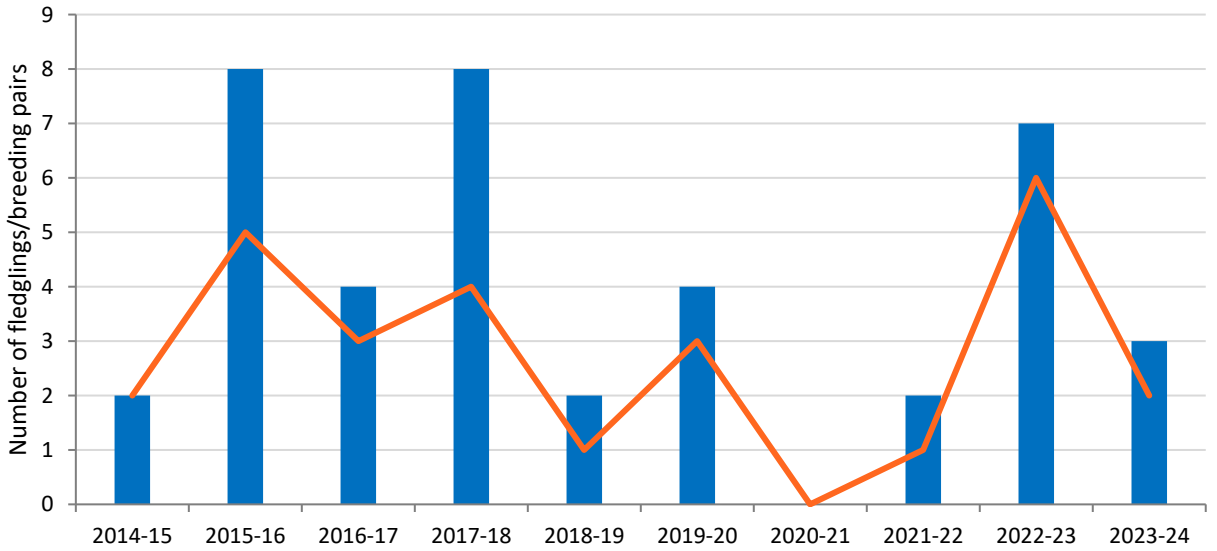

Figure 7. The total number of fledglings (blue column) and the number of pairs that produced fledglings (orange line) across ten breeding seasons in the Harmers Haven to Inverloch region.

The number of nesting pairs of Hooded Plovers in the Harmers Haven to Inverloch region has remained somewhat constant in the ten years of monitoring, with the highest number of breeding pairs present in 2017-18 and 2020-21 seasons (Table 3). Across the ten seasons, mean hatching success of nests was 27.98 ± 3.34%, mean chick survival (the number of chicks that survived to fledge) was 24.44 ± 4.04%, and mean fledging success of nests (the number of nests that produced at least one fledgling) was 12.43 ± 3.19% (Table 3). Unsurprisingly, the best seasons were typically those that had the highest chick survival rates (above 30%) and hatching success rates (above 40%), except for 2016-17 and 2017-18 seasons. In 2016-17, the number of breeding pairs was at the lowest, giving rise to a high fledglings/breeding pair value and in 2017-18, the hatching success was relatively high although it was just below 40%. Overall, the hatching success and chick survival rates in the Harmers Haven to Inverloch region appear to fluctuate significantly from season to season.

When reviewing the number of fledglings produced across breeding sites over the decade, eight sites in the Harmers Haven to Inverloch region (40%) have not had a single fledgling produced in the seasons they have been occupied by breeding Hooded Plovers (Table 4). Of concern is that two of those eight sites, the 'Harmers Haven – Waterfall Creek' and 'Wilsons Rd 1st and 2nd Bays West' have been occupied in nine and eight breeding seasons respectively, producing 29 nests and seven chicks, yet not a single fledgling. Similarly, the 'Inverloch – Abbott St' and 'Inverloch – Abbott St East' sites that are adjacent to each other, have been occupied for seven and five breeding seasons respectively, producing 20 nests and ten chicks but no fledglings. However, the other four sites, 'Cape Paterson – 2nd Surf Beach West', 'Coal Creek Estuary – 1st Point East', 'Inverloch – Point Norman West', and 'Wilsons Rd 3rd Bay West' have only been occupied for two, two, two, and four seasons respectively. The 'Wilsons Rd Eastward 2nd Drain' site has been the most successful, producing 0.67 fledglings/season over three seasons (two fledglings), closely followed by 'Coal Creek Estuary Mouth – Harmers Haven' and 'Wilsons Rd 2nd Bay West End' with 0.6 fledglings/season over ten seasons (six fledglings each).

Table 4. The overall breeding success of Hooded Plover breeding sites in the Harmers Haven to Inverloch region across ten breeding seasons (2014-15 to 2023-24).

Site	# breeding seasons	# fledglings	Fledglings/ seasons monitored	# seasons that produced fledglings
Cape Paterson - 2nd Surf Beach	10	5	0.50	3
Cape Paterson - 2nd Surf Beach West	2	0	0.00	0
Cape Paterson - Pea Creek Estuary & Undertow Bay	10	2	0.20	2
Coal Creek Estuary - 1st Point East	2	0	0.00	0
Coal Creek Estuary - 2nd Bay East	7	1	0.14	1
Coal Creek Estuary Mouth - Harmers Haven	10	6	0.60	4
Inverloch - Abbott St	7	0	0.00	0
Inverloch - Abbott St East	5	0	0.00	0

Site	# breeding seasons	# fledglings	Fledglings/ seasons monitored	# seasons that produced fledglings
Inverloch - Point Norman East	4	1	0.25	1
Inverloch - Point Norman West	2	0	0.00	0
Inverloch - Screw Creek West	9	1	0.11	1
The Oaks Bay - Cape Paterson	10	5	0.50	3
Twin Reefs -Bunurong Coast Rd	10	5	0.50	3
Waterfall Creek - Harmers Haven	9	0	0.00	0
Wilsons Rd 1st & 2nd Bays West	8	0	0.00	0
Wilsons Rd 2nd Bay West End	10	6	0.60	4
Wilsons Rd 3rd Bay West	4	0	0.00	0
Wilsons Rd Eastward 2nd Drain	3	2	0.67	1
Wilsons Rd Eastward 3rd drain	9	5	0.56	3
Wreck Beach - Harmers Haven	8	1	0.13	1

Nest habitat

Most nests in the Harmers Haven to Inverloch region were on the beach itself with lower occurrences of foredune and dune nests (Figure 8). Estuaries and spits represented the second highest habitat used for nesting by Hooded Plovers. This mostly relates to the availability of habitats, especially in the case of estuary as there are four estuaries and one spit in this region. Also, the choice between beach and foredune/dune nesting habitats can often occur within the same site in one breeding season, where a pair nests in the dune but loses the nest to a predator, and then shifts to the beach for nesting. A study by Mead (2012) revealed that beach and dune nests had a higher range of causes of failure compared with foredune nests, for example beach nests are most susceptible to tide while dune nests have a greater range of predators and are at risk of egg roll out.

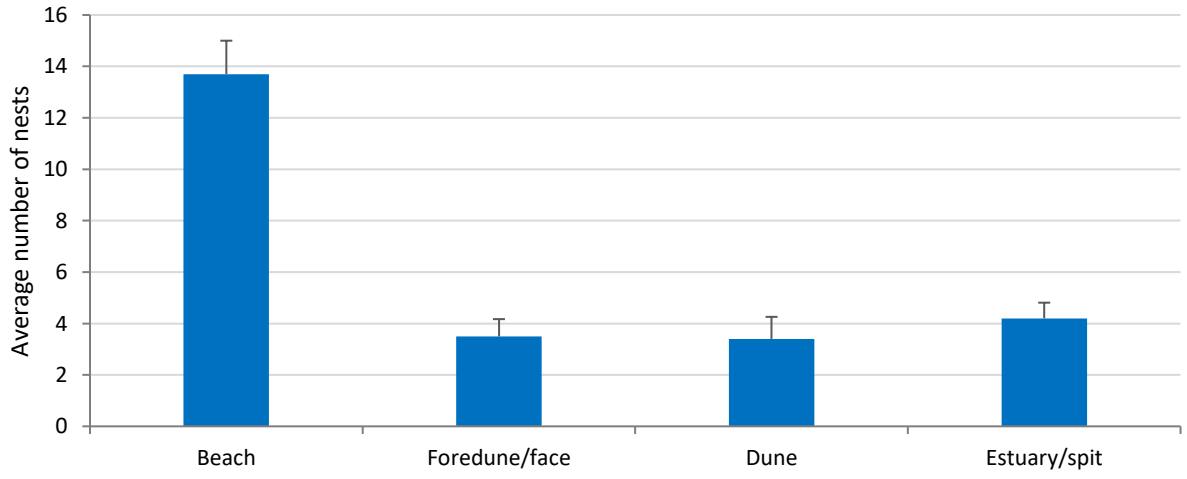

Figure 8. The average number of nests (+ standard error) in each habitat type across ten breeding seasons (2014-15 to 2023-24) in the Harmers Haven to Inverloch region.

Protection of nest and chick sites

The on-ground management of nests and chick sites is a critical component of the Beach-nesting Birds Program and decisions on the need for management are made by trained volunteers and land managers who follow best practice protocols prescribed in the Beach-nesting Bird manual, "A practical guide for managing beach-nesting birds in Australia" (Maguire 2008). Management ranges from installing signs at the access point or on the beach flanking the nest/chick site, to installing signs and a fence enclosing the nest/chick site. This management of breeding sites has been occurring since 2006 and over time, different levels of nest site protection have been implemented at sites according to the perceived vulnerability of those sites and their morphology.

Over the ten breeding seasons, the percentage of nests hatching was highest at nests where a fence was installed and the lowest where only signs were installed (Figure 9). Interestingly, sites where no management was implemented had higher hatching success than at sites where only signs were installed. However, it should be noted that not all nests require management as some that are located in the dune are less likely to be disturbed by humans and off-leash dogs hence it is likely that the nests that succeeded in this region were those that were located in the dune. Overall, the percentage of nests that failed was still higher than the percentage of hatched nests at sites where fences were erected (Figure 9).

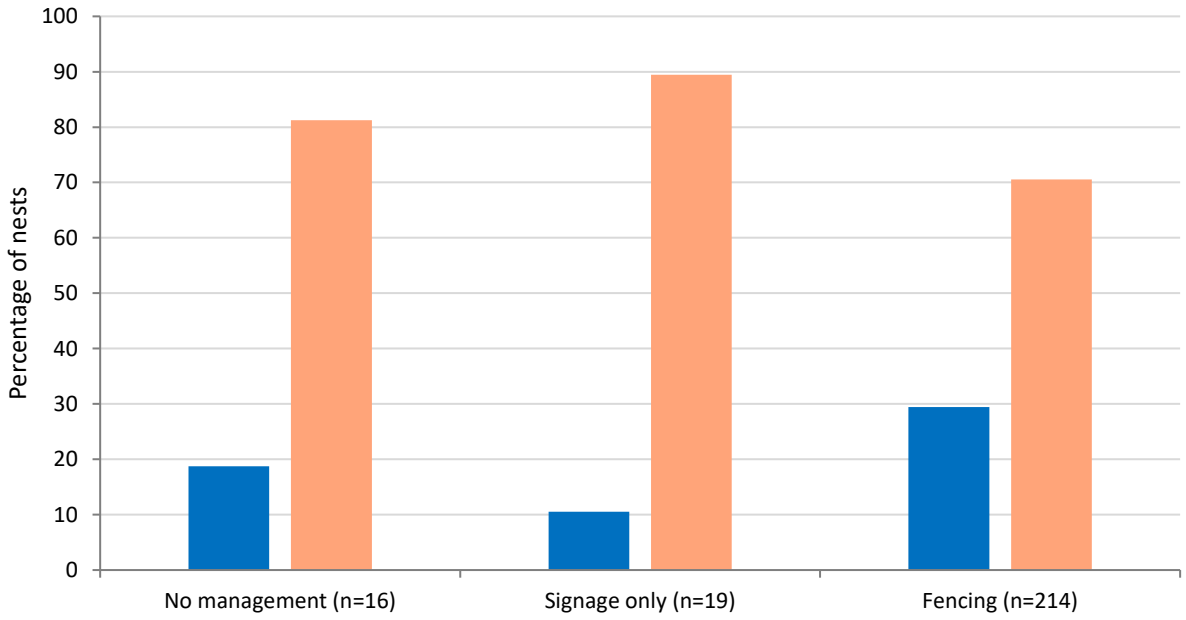

Figure 9. The percentage of Hooded Plover nests that hatched chicks (blue) or failed (orange), categorised according to level of on-ground management implemented, across ten breeding seasons (2014-15 to 2023-24) in the Harmers Haven to Inverloch region.

Similar to the relationship between management intervention and hatching success, the percentage of Hooded Plover nests that fledged chicks was significantly higher for fenced sites (Figure 10). The percentage of nests failing to produce any fledglings was high across all treatments, and while it was lowest where fencing was installed, failure rates still exceeded success rates similar to the egg phase (Figure 10). This indicates that managing threats is critical at both the egg and chick phases for

improved success. Especially during the chick phase, the configuration of fencing becomes very important so that the public do not assume the chicks stay within the fenced area. Access to shelter is also important, as well as clear and visible signage (particularly at times of low tide) and rapid management adaptation in response to movement of the chicks to a different part of the territory. 'Wardening' or being site guardians during this phase is also particularly important, as there is a real lack of awareness about the survival requirements of chicks, with most members of the public not realising the chicks are flightless, their need to roam large distances to find food, and the need to access the water's edge for feeding (Maguire *et al.* 2015).

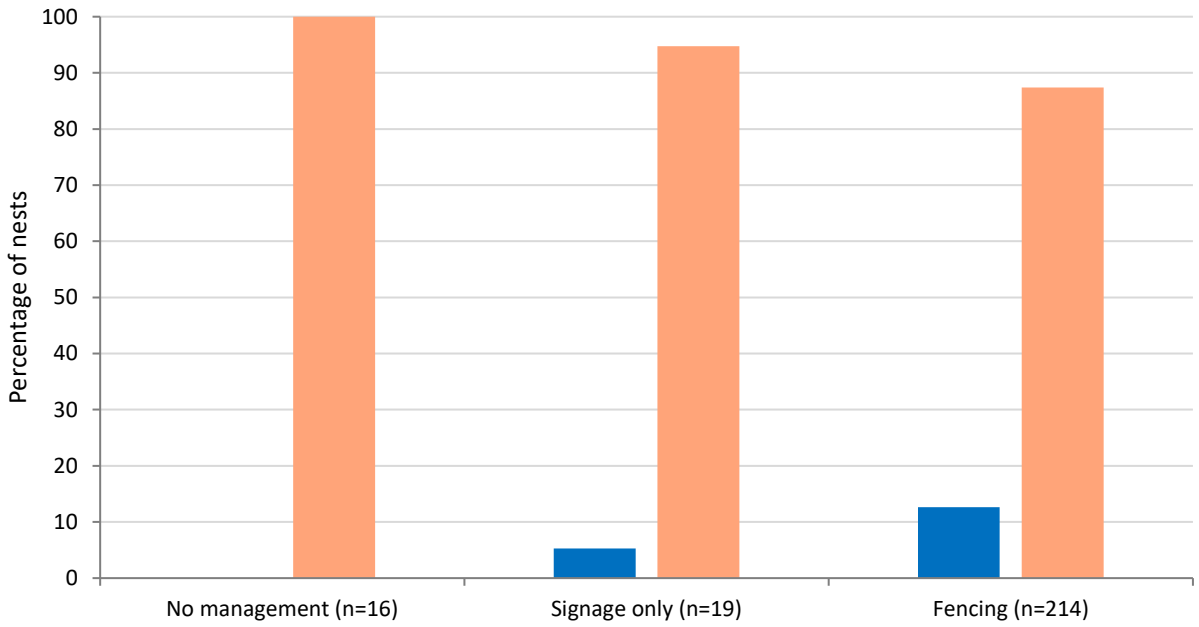

Figure 10. The percentage of Hooded Plover nests that fledged chicks (blue) or failed (orange), categorised according to level of on-ground management implemented, across ten breeding seasons (2014-15 to 2023-24) in the Harmers Haven to Inverloch region.

Threats to breeding pairs

This management plan does not seek to review threats or their relative importance as there are extensive reviews available in Maguire (2008) and Maguire *et al.* (2014).

It has taken time to build a strong citizen science monitoring program on the Bass Coast. Initially, observers were more focused on recording and reporting data on the birds and their breeding stage/success but overlooked the simultaneous assessment of threats present at the sites (Figure 11). This unfortunately has led to gaps in our knowledge and limits our capacity to interpret trends in success and failure within the region. Threat can vary greatly in their detectability and intensity, for example, related to time of day of the sighting or day of the week. Thus, in order to accurately report on threats at sites, we need to exercise caution and work only with very large sample sizes of observations. Threat data collection has been a priority for improvement in recent years and as evident below, the number of monitoring visits where threat assessments were completed has been greater than when they were not completed since 2015-16 in the Harmers Haven to Inverloch region.

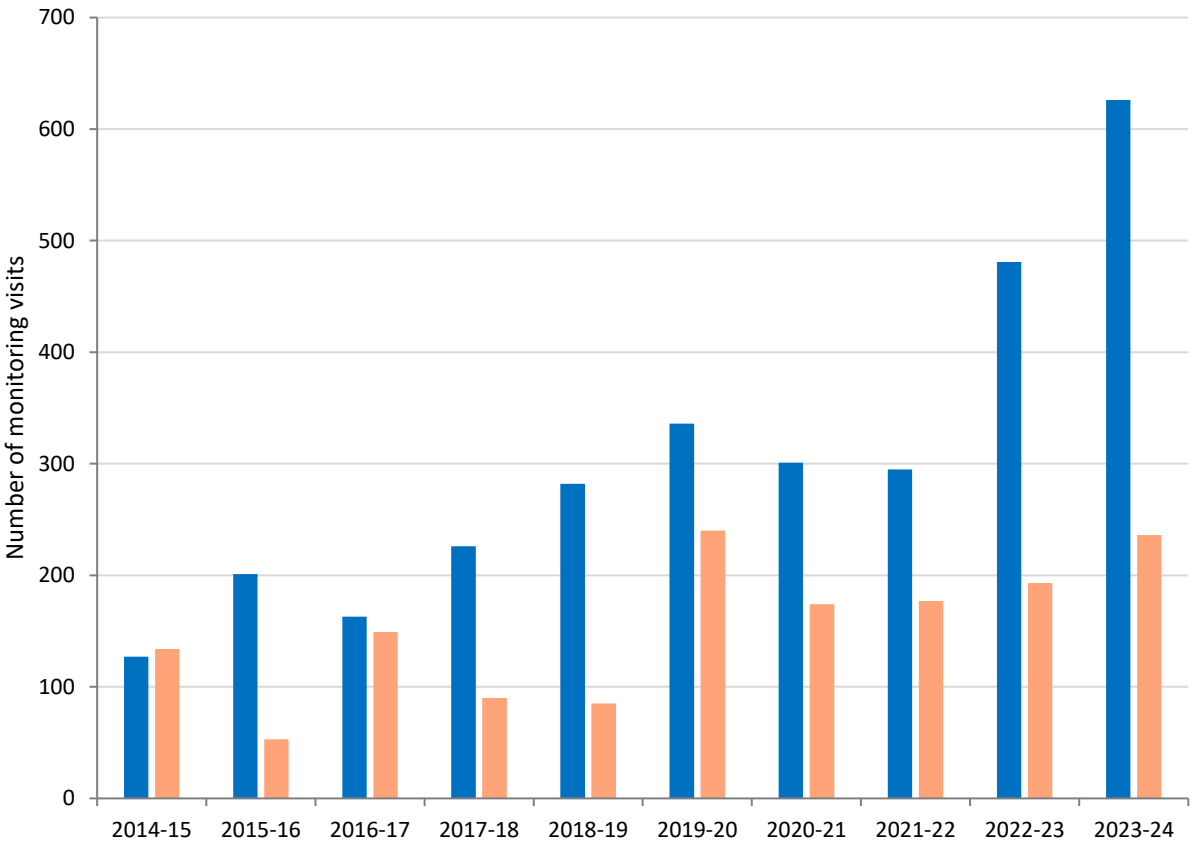

Figure 11. The number of monitoring visits where threat assessments were recorded (blue) and not recorded (orange) across ten breeding seasons in the Harmers Haven to Inverloch region.

When a threat assessment is carried out at a site, the type of recreational activity any people observed on the beach are engaging in, is recorded. Different user groups can have varying impacts on the birds (for example if it is a mobile versus static activity, see Weston *et al.* 2011), and identifying the beach user groups that use each site can greatly assist with tailoring of educational messaging. In Table 5 we describe the main 'beach user' groups for each site based on the total number of people undertaking the different recreational activities of all people observed at those sites. Typically, walkers/joggers are the dominant user group and dog walkers the second most dominant user group for most sites in the Harmers Haven to Inverloch region. Interestingly, dog walkers were recorded as a common beach user group at several sites where dogs are prohibited, such as 'Wilsons Rd 1st & 2nd Bays West', 'Wilsons Rd 2nd Bay West End', 'Wilsons Rd 3rd Bay West', and 'Inverloch – Screw Creek West' (Table 5).

There are sites which differ markedly in their beach user group profiles. Sites that are closer to beach access points such as 'Coal Creek Estuary Mouth – Harmers Haven' and 'Wreck Beach – Harmers Haven' had more people sunbaking/sitting compared with sites that were somewhat distant from access points such as 'Coal Creek Estuary – 1st Point East' and 'Coal Creek Estuary – 2nd Bay East'. Surfers/swimmers featured heavily at sites that are closer to popular surf beaches such as the 2nd Surf Beach at Cape Paterson. The key sites used for fishing were 'Coal Creek Estuary Mouth – Harmers Haven', 'Coal Creek Estuary – 1st Point East' and 'Coal Creek Estuary 2nd Bay East' (14%, 16%, and 13% of beach users respectively) and they were all adjacent to each other (Table 5).

Table 5. The main recreational activities people were participating in for each breeding site in the Harmers Haven to Inverloch region from 2014-15 to 2023-24. Green shading indicates the most common beach user groups (>5% occurrence).

Site (n = number of threat assessments)	Recreational activity	Percentage occurrence (total number of people)
Cape Paterson - 2nd Surf Beach (n=322)	Walkers/Joggers	41% (1098)
	Surfers/Swimmers	26% (708)
	Dog Walkers	19% (524)
	People sunbaking/sitting	9% (231)
	People Playing Games	4% (102)
	People Fishing	1% (30)
Cape Paterson - 2nd Surf Beach West (n=97)	Walkers/Joggers	59% (240)
	Dog Walkers	24% (99)
	Surfers/Swimmers	10% (40)
	People sunbaking/sitting	6% (23)
	People Playing Games	0.5% (2)
	People Fishing	0.2% (1)
Cape Paterson - Pea Creek Estuary & Undertow Bay (n=418)	Walkers/Joggers	58% (1779)
	Dog Walkers	24% (721)
	People sunbaking/sitting	7% (215)
	People Fishing	6% (168)
	Surfers/Swimmers	3% (97)
	People Playing Games	2% (72)
Coal Creek Estuary - 1st Point East (n=22)	Walkers/Joggers	68% (17)
	Dog Walkers	16% (4)
	People Fishing	16% (4)
Coal Creek Estuary - 2nd Bay East (n=53)	Walkers/Joggers	55% (22)
	Dog Walkers	33% (13)
	People Fishing	13% (5)
Coal Creek Estuary Mouth - Harmers Haven (n=177)	Walkers/Joggers	40% (191)
	Dog Walkers	21% (100)
	People Fishing	14% (66)
	People sunbaking/sitting	12% (59)
	Surfers/Swimmers	7% (34)
	People Playing Games	5% (26)
Inverloch - Abbott St (n=142)	Walkers/Joggers	56% (609)
	Dog Walkers	34% (372)
	People Fishing	4% (40)
	People sunbaking/sitting	4% (40)
	Surfers/Swimmers	1% (13)

Site (n = number of threat assessments)	Recreational activity	Percentage occurrence (total number of people)
	People Playing Games	1% (14)
Inverloch - Abbott St East (n=110)	Walkers/Joggers	50% (921)
	People sunbaking/sitting	21% (396)
	Dog Walkers	18% (330)
	People Fishing	6% (120)
	Surfers/Swimmers	3% (60)
	People Playing Games	1% (22)
Inverloch - Point Norman East (n=107)	Walkers/Joggers	63% (532)
	Dog Walkers	35% (293)
	Surfers/Swimmers	1% (12)
	People sunbaking/sitting	0.5% (4)
	People Fishing	0.4% (3)
	People Playing Games	0.1% (1)
Inverloch - Point Norman West (n=30)	Walkers/Joggers	48% (177)
	Dog Walkers	21% (78)
	Surfers/Swimmers	15% (53)
	People sunbaking/sitting	13% (47)
	People Fishing	3% (10)
Inverloch - Screw Creek West (n=392)	Walkers/Joggers	55% (1498)
	People sunbaking/sitting	15% (394)
	Dog Walkers	14% (389)
	People Fishing	6% (155)
	Surfers/Swimmers	5% (128)
	People Playing Games	5% (141)
The Oaks Bay - Cape Paterson (n=199)	Walkers/Joggers	40% (211)
	People sunbaking/sitting	34% (182)
	Surfers/Swimmers	21% (111)
	Dog Walkers	3% (14)
	People Playing Games	3% (14)
Twin Reefs -Bunurong Coast Rd (n=171)	Walkers/Joggers	51% (150)
	People sunbaking/sitting	22% (64)
	Surfers/Swimmers	20% (58)
	Dog Walkers	4% (12)
	People Playing Games	3% (9)
Waterfall Creek - Harmers Haven (n=82)	Walkers/Joggers	50% (110)
	Dog Walkers	30% (66)
	People Playing Games	10% (23)
	Surfers/Swimmers	5% (11)

Site (n = number of threat assessments)	Recreational activity	Percentage occurrence (total number of people)
	People sunbaking/sitting	2% (5)
	People Fishing	2% (5)
Wilsons Rd 1st & 2nd Bays West (n=171)	Walkers/Joggers	53% (224)
	Dog Walkers	24% (101)
	Surfers/Swimmers	13% (53)
	People sunbaking/sitting	5% (21)
	People Fishing	3% (14)
	People Playing Games	1% (6)
Wilsons Rd 2nd Bay West End (n=163)	Walkers/Joggers	61% (132)
	Dog Walkers	25% (54)
	People sunbaking/sitting	6% (14)
	People Playing Games	6% (13)
	Surfers/Swimmers	1% (3)
	People Fishing	1% (2)
Wilsons Rd 3rd Bay West (n=49)	Walkers/Joggers	76% (39)
	Dog Walkers	16% (8)
	People sunbaking/sitting	4% (2)
	People Fishing	4% (2)
Wilsons Rd Eastward 2nd Drain (n=51)	Dog Walkers	39% (112)
	Walkers/Joggers	30% (85)
	Surfers/Swimmers	20% (56)
	People sunbaking/sitting	11% (32)
Wilsons Rd Eastward 3rd drain (n=168)	Walkers/Joggers	49% (326)
	Dog Walkers	27% (183)
	Surfers/Swimmers	15% (103)
	People sunbaking/sitting	6% (43)
	People Playing Games	1% (9)
	People Fishing	0.4% (3)
Wreck Beach - Harmers Haven (n=114)	Walkers/Joggers	39% (131)
	Dog Walkers	25% (84)
	People sunbaking/sitting	14% (47)
	People Playing Games	11% (37)
	Surfers/Swimmers	6% (21)
	People Fishing	6% (19)

Table 6 presents the frequency of occurrence of threats at breeding sites where threat assessments were carried out. We used a subset of data to generate this table, based on full threat assessments (observations and prints/tracks).

People, dogs, magpies and silver gulls were the most prevalent threats across sites. When dogs were detected, dogs off leash were more prevalent at sites than dogs on leash, and on average, this was in the order of 10% more dogs off leash. The only sites where proportions of dogs off and on leash were similar were 'Inverloch – Abbott St' (61% and 59% respectively), 'The Oaks Bay – Cape Paterson' (3% and 3% respectively) and 'Twin Reefs – Bunurong Coast Rd' (2% and 1% respectively). Note the latter two sites are dog prohibited areas and while dogs were detected at these sites, the levels of dog use were significantly lower than all other sites. The only site where dogs on leash were more prevalent than dogs off leash was 'Inverloch – Abbott St East' (73% and 4% respectively). The sites with the worst ratios of off to on leash dogs were 'Cape Paterson – 2nd Surf Beach', 'Wilsons Rd Eastward 3rd Drain' and 'Wilsons Rd Eastward 2nd Drain' (with 21-27% more dogs off leash). Sites with the greatest occurrence of dogs off leash were 'Cape Paterson – 2nd Surf Beach', 'Inverloch – Abbott St', 'Inverloch – Abbott St East', 'Inverloch – Point Norman East', 'Inverloch – Point Norman West' and 'Wilsons Rd Eastward 2nd Drain' (present on 50% or more visits).

Magpies were slightly more prevalent than ravens (12 out of 20 sites had more magpies). The 'Coal Creek Estuary – 1st Point East', 'Coal Creek Estuary – 2nd Bay East', and 'Inverloch Point Norman – East and West' sites had the highest number of Magpies (present on 28-49% of visits) out of the 20 breeding sites. Ravens were most commonly detected at 'Wilsons Rd Eastward 2nd Drain', 'Wilsons Rd 2nd Bay West End', and 'Coal Creek Estuary – 2nd Bay East' (present on 23-26% of visits). Silver gulls were commonly detected at all 20 sites however, they were most common at ''Coal Creek Estuary – 1st Point East', 'Coal Creek Estuary – 2nd Bay East', 'Coal Creek Estuary Mouth – Harmers Haven', 'Inverloch – Abbott St East' and 'Waterfall Creek – Hamers Haven' (present on 28% or more visits).

Fox prints were detected at all 20 Hooded Plover breeding sites in the Harmers Haven to Inverloch region. They were detected on 50% or more visits at 'Wilsons Rd Eastward 2nd Drain', 'Wilsons Rd 1st & 2nd Bays West', 'Wilsons Rd 2nd Bay West End', 'Coal Creek Estuary Mouth – Harmers Haven', and 'Coal Creek Estuary – 2nd Bay East' sites. Cat prints were very rarely detected, and these were only ever recorded at five sites: 'Cape Paterson – 2nd Surf Beach West', 'Twin Reefs – Bunurong Coast Rd', 'Wilsons Rd 1st & 2nd Bays West', 'Wilsons Rd 2nd Bay West End' and 'Wilsons Rd Eastward 3rd Drain'.

Table 6. The main threats observed at Hooded Plover breeding sites in the Harmers Haven to Inverloch region across ten breeding seasons. Green shading highlights the most frequently detected threats (> 10%).

Site (n = total number of full threat assessments at site)	Threat	% occurrence (# threat assessments present)
Cape Paterson - 2nd Surf Beach (n=249)	Human prints	99% (246)
	Dog prints	88% (219)
	People observed	85% (212)
	Dog off leash	51% (128)
	Passerine prints	35% (86)

Site (n = total number of full threat assessments at site)	Threat	% occurrence (# threat assessments present)
	Dog on leash	31% (76)
	Magpies	21% (53)
	Fox prints	19% (48)
	Ravens	16% (39)
	Silver Gulls	16% (39)
	Pacific/Kelp Gulls	10% (24)
	Other bird of prey	1% (3)
	Vehicle tracks	1% (3)
	Trail bike tracks	1% (3)
	Nankeen Kestrels	1% (2)
Cape Paterson - 2nd Surf Beach West (n=70)	Human prints	96% (67)
	Dog prints	94% (66)
	People observed	80% (56)
	Dog off leash	39% (27)
	Passerine prints	34% (24)
	Fox prints	33% (23)
	Dog on leash	21% (15)
	Magpies	19% (13)
	Silver Gulls	13% (9)
	Ravens	11% (8)
	Pacific/Kelp Gulls	6% (4)
	Cat prints	1% (1)
Cape Paterson - Pea Creek Estuary & Undertow Bay (n=295)	Human prints	98% (288)
	People observed	87% (258)
	Dog prints	86% (255)
	Dog off leash	38% (113)
	Dog on leash	29% (87)
	Fox prints	27% (81)
	Passerine prints	23% (68)
	Silver Gulls	19% (56)
	Pacific/Kelp Gulls	14% (42)
	Vehicle tracks	6% (18)
	Ravens	6% (17)
	Magpies	3% (10)
	Other bird of prey	1% (2)
Coal Creek Estuary - 1st Point East (n=21)	Human prints	90% (19)
	Dog prints	90% (19)
	Passerine prints	71% (15)

Site (n = total number of full threat assessments at site)	Threat	% occurrence (# threat assessments present)
	Fox prints	43% (9)
	People observed	33% (7)
	Magpies	29% (6)
	Silver Gulls	29% (6)
	Pacific/Kelp Gulls	24% (5)
	Dog off leash	14% (3)
	Ravens	10% (2)
	Dog on leash	5% (1)
Coal Creek Estuary - 2nd Bay East (n=47)	Human prints	94% (44)
	Dog prints	81% (38)
	Fox prints	60% (28)
	Passerine prints	49% (23)
	Magpies	47% (22)
	People observed	34% (16)
	Silver Gulls	30% (14)
	Ravens	26% (12)
	Pacific/Kelp Gulls	11% (5)
	Dog off leash	9% (4)
	Dog on leash	4% (2)
	Trail bike tracks	4% (2)
	Other bird of prey	2% (1)
Coal Creek Estuary Mouth - Harmers Haven (n=163)	Human prints	98% (160)
	Dog prints	83% (135)
	People observed	61% (99)
	Fox prints	52% (85)
	Passerine prints	36% (58)
	Silver Gulls	29% (48)
	Dog off leash	25% (41)
	Pacific/Kelp Gulls	20% (33)
	Dog on leash	18% (29)
	Magpies	17% (27)
	Ravens	15% (24)
	Nankeen Kestrels	2% (3)
	Other bird of prey	2% (3)
	Trail bike tracks	1% (2)
Inverloch - Abbott St (n=105)	Human prints	96% (101)
	Dog prints	94% (99)
	People observed	86% (90)

Site (n = total number of full threat assessments at site)	Threat	% occurrence (# threat assessments present)
	Dog off leash	61% (64)
	Dog on leash	59% (62)
	Silver Gulls	17% (18)
	Magpies	16% (17)
	Passerine prints	13% (14)
	Pacific/Kelp Gulls	10% (10)
	Ravens	7% (7)
	Fox prints	7% (7)
	Other bird of prey	1% (1)
	Vehicle tracks	1% (1)
	Trail bike tracks	1% (1)
Inverloch - Abbott St East (n=95)	Human prints	98% (93)
	People observed	94% (89)
	Dog prints	87% (83)
	Dog on leash	73% (69)
	Dog off leash	54% (51)
	Silver Gulls	40% (38)
	Passerine prints	23% (22)
	Magpies	15% (14)
	Pacific/Kelp Gulls	14% (13)
	Fox prints	12% (11)
	Ravens	4% (4)
	Trail bike tracks	3% (3)
	Vehicle tracks	1% (1)
Inverloch - Point Norman East (n=78)	Human prints	100% (78)
	Dog prints	91% (71)
	People observed	90% (70)
	Dog off leash	67% (52)
	Dog on leash	56% (44)
	Magpies	49% (38)
	Fox prints	19% (15)
	Silver Gulls	13% (10)
	Pacific/Kelp Gulls	8% (6)
	Ravens	3% (2)
	Passerine prints	3% (2)
	Vehicle tracks	1% (1)
	Trail bike tracks	1% (1)
Inverloch - Point Norman West (n=27)	Human prints	100% (27)

Site (n = total number of full threat assessments at site)	Threat	% occurrence (# threat assessments present)
	People observed	93% (25)
	Dog prints	93% (25)
	Dog off leash	70% (19)
	Dog on leash	63% (17)
	Magpies	48% (13)
	Fox prints	26% (7)
	Ravens	11% (3)
	Silver Gulls	11% (3)
	Passerine prints	7% (2)
	Pacific/Kelp Gulls	4% (1)
Inverloch - Screw Creek West (n=342)	Human prints	98% (335)
	Dog prints	82% (282)
	People observed	77% (263)
	Dog off leash	32% (108)
	Silver Gulls	27% (93)
	Dog on leash	23% (79)
	Pacific/Kelp Gulls	19% (66)
	Passerine prints	13% (43)
	Fox prints	8% (29)
	Ravens	4% (12)
	Magpies	3% (11)
	Vehicle tracks	1% (4)
	Other bird of prey	1% (2)
The Oaks Bay - Cape Paterson (n=182)	Human prints	89% (162)
	Fox prints	47% (86)
	People observed	46% (83)
	Dog prints	29% (53)
	Silver Gulls	12% (21)
	Pacific/Kelp Gulls	11% (20)
	Other bird of prey	11% (20)
	Dog off leash	3% (6)
	Ravens	3% (6)
	Passerine prints	3% (6)
	Dog on leash	3% (5)
	Nankeen Kestrels	1% (2)
	Magpies	1% (1)
Twin Reefs -Bunurong Coast Rd (n=160)	Human prints	89% (142)
	Fox prints	49% (79)

Site (n = total number of full threat assessments at site)	Threat	% occurrence (# threat assessments present)
	People observed	33% (53)
	Dog prints	33% (53)
	Pacific/Kelp Gulls	16% (25)
	Silver Gulls	13% (21)
	Passerine prints	6% (9)
	Ravens	5% (8)
	Dog off leash	2% (3)
	Dog on leash	1% (2)
	Magpies	1% (2)
	Other bird of prey	1% (2)
	Cat prints	1% (1)
Waterfall Creek - Harmers Haven (n=76)	Human prints	99% (75)
	Dog prints	86% (65)
	People observed	71% (54)
	Fox prints	41% (31)
	Passerine prints	36% (27)
	Dog off leash	29% (22)
	Silver Gulls	29% (22)
	Dog on leash	16% (12)
	Ravens	12% (9)
	Magpies	12% (9)
	Pacific/Kelp Gulls	11% (8)
Wilsons Rd 1st & 2nd Bays West (n=131)	Human prints	100% (131)
	Dog prints	99% (130)
	People observed	65% (85)
	Fox prints	53% (70)
	Passerine prints	50% (66)
	Magpies	25% (33)
	Dog off leash	24% (32)
	Silver Gulls	24% (32)
	Pacific/Kelp Gulls	23% (30)
	Ravens	16% (21)
	Dog on leash	10% (13)
	Nankeen Kestrels	5% (6)
	Other bird of prey	1% (1)
	Cat prints	1% (1)
	Trail bike tracks	1% (1)
Wilsons Rd 2nd Bay West End (n=148)	Human prints	96% (142)

Site (n = total number of full threat assessments at site)	Threat	% occurrence (# threat assessments present)
	Dog prints	85% (126)
	Fox prints	51% (76)
	People observed	49% (73)
	Passerine prints	40% (59)
	Pacific/Kelp Gulls	32% (48)
	Ravens	24% (35)
	Magpies	20% (29)
	Silver Gulls	18% (26)
	Dog off leash	16% (24)
	Dog on leash	11% (16)
	Other bird of prey	3% (5)
	Vehicle tracks	1% (2)
	Nankeen Kestrels	1% (1)
	Cat prints	1% (1)
	Trail bike tracks	1% (1)
Wilsons Rd 3rd Bay West (n=49)	Human prints	94% (46)
	Dog prints	76% (37)
	Fox prints	47% (23)
	People observed	45% (22)
	Passerine prints	24% (12)
	Pacific/Kelp Gulls	22% (11)
	Dog off leash	12% (6)
	Ravens	12% (6)
	Silver Gulls	10% (5)
	Magpies	8% (4)
	Dog on leash	4% (2)
	Other bird of prey	2% (1)
	Vehicle tracks	2% (1)
Wilsons Rd Eastward 2nd Drain (n=44)	Human prints	100% (44)
	Dog prints	89% (39)
	People observed	86% (38)
	Dog off leash	57% (25)
	Fox prints	55% (24)
	Dog on leash	30% (13)
	Passerine prints	30% (13)
	Ravens	23% (10)
	Silver Gulls	23% (10)
	Magpies	20% (9)

Site (n = total number of full threat assessments at site)	Threat	% occurrence (# threat assessments present)
	Pacific/Kelp Gulls	11% (5)
	Other bird of prey	2% (1)
	Vehicle tracks	2% (1)
Wilsons Rd Eastward 3rd drain (n=131)	Human prints	98% (128)
	Dog prints	93% (122)
	People observed	76% (100)
	Dog off leash	42% (55)
	Fox prints	36% (47)
	Passerine prints	26% (34)
	Magpies	23% (30)
	Silver Gulls	22% (29)
	Dog on leash	15% (20)
	Pacific/Kelp Gulls	11% (15)
	Ravens	7% (9)
	Vehicle tracks	2% (3)
	Trail bike tracks	2% (3)
	Other bird of prey	2% (2)
	Nankeen Kestrels	1% (1)
	Cat prints	1% (1)
Wreck Beach - Harmers Haven (n=101)	Human prints	99% (100)
	Dog prints	86% (87)
	People observed	69% (70)
	Passerine prints	34% (34)
	Dog off leash	31% (31)
	Fox prints	29% (29)
	Silver Gulls	27% (27)
	Dog on leash	13% (13)
	Pacific/Kelp Gulls	11% (11)
	Ravens	10% (10)
	Magpies	8% (8)

While previous tables have explored the prevalence of threats based on the frequency of their occurrence, we also explored the intensity of threats at sites by pooling threat data across all seasons for each given site and then comparing total numbers observed relative to other sites. The total number of different types of threats observed were first standardised by the total number of threat assessments for that site in order to be comparable (Table 7). For print data (e.g., fox prints), the intensity of these threats is collected under categories and to generate intensity values for these threats, we assigned each category a value (light = 1, moderate = 2, heavy = 3) and summed the total

across sightings. Finally, all sites were ranked for each given threat according to their intensity (1 being the highest intensity across visits). This allows the identification of threats that are more prevalent at one site relative to the other which in turn enables the implementation of targeted management responses and education/awareness raising initiatives (e.g., fox control at sites where the fox threat is more intense).

This combination of the number of a particular threat detected and its occurrence revealed some interesting results (Table 7). The 'Inverloch – Abbott St East' site was ranked first in the people, dogs on leash, and silver gulls threat categories which reflected the site's popularity (closest site to Inverloch township) and increased compliance with the existing 'dogs on leash at all times' regulation. The 'Inverloch – Point Norman East' site was ranked first in the dogs off leash threat category reflecting the low levels of compliance with existing 'dogs on leash at all times' regulation. The 'Coal Creek Estuary Mouth – Harmers Haven' site was ranked first in the foxes threat category and 'Coal Creek Estuary – 2nd Bay East' was ranked first in the Magpies threat category. For Ravens, three adjacent sites, 'Wilsons Rd 1st & 2nd Bays West', 'Wilsons Rd 2nd Bay West End', and 'Wilsons Rd 3rd Bay West' were ranked 1st, 2nd, and 3rd respectively. This suggests that their collective impact on Hooded Plover breeding success at these three adjacent sites may potentially be greater compared with some other sites. Unsurprisingly, some of the least successful breeding sites such as 'Inverloch – Abbott St', 'Inverloch – Abbott St East', and 'Inverloch - Point Norman – East and West' were ranked within the top five for six out of the eight threat categories. It reflects the correlation between low breeding success and the high prevalence of threats at Hooded Plover breeding sites.

Table 8 summarises the average number of people, dogs off leash and on leash for each site. In terms of human use, the sites with the highest rates of visitation were 'Inverloch - Abbott St East', 'Inverloch – Point Norman West', and 'Cape Paterson – 2nd Surf Beach'. Dogs off leash occurred in highest numbers on average at 'Inverloch – Point Norman East', 'Wilsons Rd Eastward 2nd Drain', 'Inverloch – Abbott St', and 'Cape Paterson – 2nd Surf Beach' sites. This indicates high rates of non-compliance at sites with leash access requirements during the Hooded Plover breeding season (see also a study by Schneider 2013). While dogs on leash occurred in highest numbers at 'Inverloch – Abbott St and Abbott St East', and 'Inverloch - Point Norman – East and West' sites, overall, these sites appear to have the highest numbers of dogs (both on leash and off leash) and this is undoubtedly linked to the fact that it is a popular stretch of beach that is easily accessible to both Inverloch residents and holidaymakers.

Photo: David Hartney

Table 7. The relative intensity of threats at Hooded Plover breeding sites based on the total number of that threat observed standardised by the total number of threat assessments for that site. The sites have then been ranked for each given threat according to their intensity (1 being the highest intensity across visits). The top three ranks of each threat are presented in red bold font. Foxes were ranked based on percentage of prints recorded where each level of print intensity was assigned a corresponding value (light = 1, moderate = 2, heavy = 3).

Site	Ranks							
	People	Dogs off leash	Dogs on leash	Foxes	Silver gulls	Pacific gulls	Ravens	Magpies
Cape Paterson - 2nd Surf Beach	5	**3**	6	17	14	14	6	8
Cape Paterson - 2nd Surf Beach West	10	9	10	14	18	19	12	11
Cape Paterson - Pea Creek Estuary & Undertow Bay	7	7	5	16	8	9	18	18
Coal Creek Estuary - 1st Point East	18	16	16	10	**3**	6	11	4
Coal Creek Estuary - 2nd Bay East	20	18	18	**2**	13	13	5	**1**
Coal Creek Estuary Mouth - Harmers Haven	13	14	12	**1**	5	5	7	14
Inverloch - Abbott St	4	**2**	**3**	20	10	10	15	9
Inverloch - Abbott St East	**1**	6	**1**	18	**1**	**3**	19	13
Inverloch - Point Norman East	**3**	**1**	**2**	15	15	8	20	**2**
Inverloch - Point Norman West	**2**	4	4	13	17	20	14	**3**
Inverloch - Screw Creek West	6	11	8	19	4	**2**	17	17
The Oaks Bay - Cape Paterson	14	20	17	**3**	20	15	16	20
Twin Reefs -Bunurong Coast Rd	16	19	20	5	19	11	10	19
Waterfall Creek - Harmers Haven	12	13	9	7	9	17	13	10
Wilsons Rd 1st & 2nd Bays West	15	12	15	6	11	7	**1**	5
Wilsons Rd 2nd Bay West End	17	15	14	9	12	**1**	**2**	7
Wilsons Rd 3rd Bay West	19	17	19	8	16	4	**3**	16
Wilsons Rd Eastward 2nd Drain	8	5	7	4	7	18	4	12
Wilsons Rd Eastward 3rd drain	9	8	11	12	6	12	9	6
Wreck Beach - Harmers Haven	11	10	13	11	**2**	16	8	15

Table 8. The average number of people, dogs off leash and on leash at each Hooded Plover breeding site (± standard error) in the Harmers Haven to Inverloch region.

Site name (# threat assessments)	average ± s.e. people	average ± s.e. dogs off leash	average ± s.e. dogs on leash
Cape Paterson - 2nd Surf Beach (n=322)	8.36 ± 0.61	1.43 ± 0.13	0.58 ± 0.08
Cape Paterson - 2nd Surf Beach West (n=97)	4.18 ± 0.52	0.93 ± 0.15	0.25 ± 0.06
Cape Paterson - Pea Creek Estuary & Undertow Bay (n=418)	7.3 ± 0.49	1.11 ± 0.11	0.67 ± 0.08
Coal Creek Estuary - 1st Point East (n=22)	1.14 ± 0.53	0.18 ± 0.1	0.05 ± 0.04
Coal Creek Estuary - 2nd Bay East (n=53)	0.75 ± 0.26	0.17 ± 0.08	0.06 ± 0.03
Coal Creek Estuary Mouth - Harmers Haven (n=177)	2.69 ± 0.35	0.47 ± 0.08	0.24 ± 0.04
Inverloch - Abbott St (n=142)	7.66 ± 0.86	1.58 ± 0.22	1.5 ± 0.22
Inverloch - Abbott St East (n=110)	16.81 ± 2.71	1.25 ± 0.18	2.42 ± 0.3
Inverloch - Point Norman East (n=107)	7.9 ± 1.09	2.34 ± 0.38	1.61 ± 0.27
Inverloch - Point Norman West (n=30)	12.17 ± 3.42	1.6 ± 0.3	1.7 ± 0.4
Inverloch - Screw Creek West (n=392)	6.9 ± 0.58	0.65 ± 0.06	0.4 ± 0.05
The Oaks Bay - Cape Paterson (n=199)	2.67 ± 0.33	0.04 ± 0.01	0.05 ± 0.02
Twin Reefs -Bunurong Coast Rd (n=171)	1.71 ± 0.24	0.05 ± 0.03	0.02 ± 0.02
Waterfall Creek - Harmers Haven (n=82)	2.68 ± 0.32	0.57 ± 0.11	0.27 ± 0.08
Wilsons Rd 1st & 2nd Bays West (n=171)	2.45 ± 0.26	0.66 ± 0.12	0.13 ± 0.03
Wilsons Rd 2nd Bay West End (n=163)	1.34 ± 0.15	0.26 ± 0.05	0.15 ± 0.04
Wilsons Rd 3rd Bay West (n=49)	1.04 ± 0.22	0.16 ± 0.07	0.04 ± 0.03
Wilsons Rd Eastward 2nd Drain (n=51)	5.59 ± 0.86	1.63 ± 0.3	0.61 ± 0.18
Wilsons Rd Eastward 3rd drain (n=168)	3.97 ± 0.41	0.95 ± 0.12	0.23 ± 0.05
Wreck Beach - Harmers Haven (n=114)	2.97 ± 0.36	0.68 ± 0.14	0.23 ± 0.06

The average numbers of off leash and on leash dogs were investigated further to detect any temporal trends across the ten breeding seasons. Four sites were selected based on the high number of threat assessments over the breeding seasons they were monitored (Figure 12). Out of the four selected sites, 'Coal Creek Estuary Mouth – Harmers Haven' was the only site where the average number of on leash dogs has increased over time to be greater than the average number of off leash dogs by the end of the 2023-24 season. The other three sites have experienced fluctuations in the number of on leash dogs across breeding seasons where in some seasons they have outnumbered off leash dogs. The 'Inverloch – Screw Creek West' is a dogs prohibited site and interestingly, dog walkers appear to use this site regularly with roughly a similar average of dogs being off and on leash. It appears that more awareness needs to be raised among dog walkers to improve compliance and their understanding of the importance of habitat needs of beach-nesting birds such as the Hooded Plover.

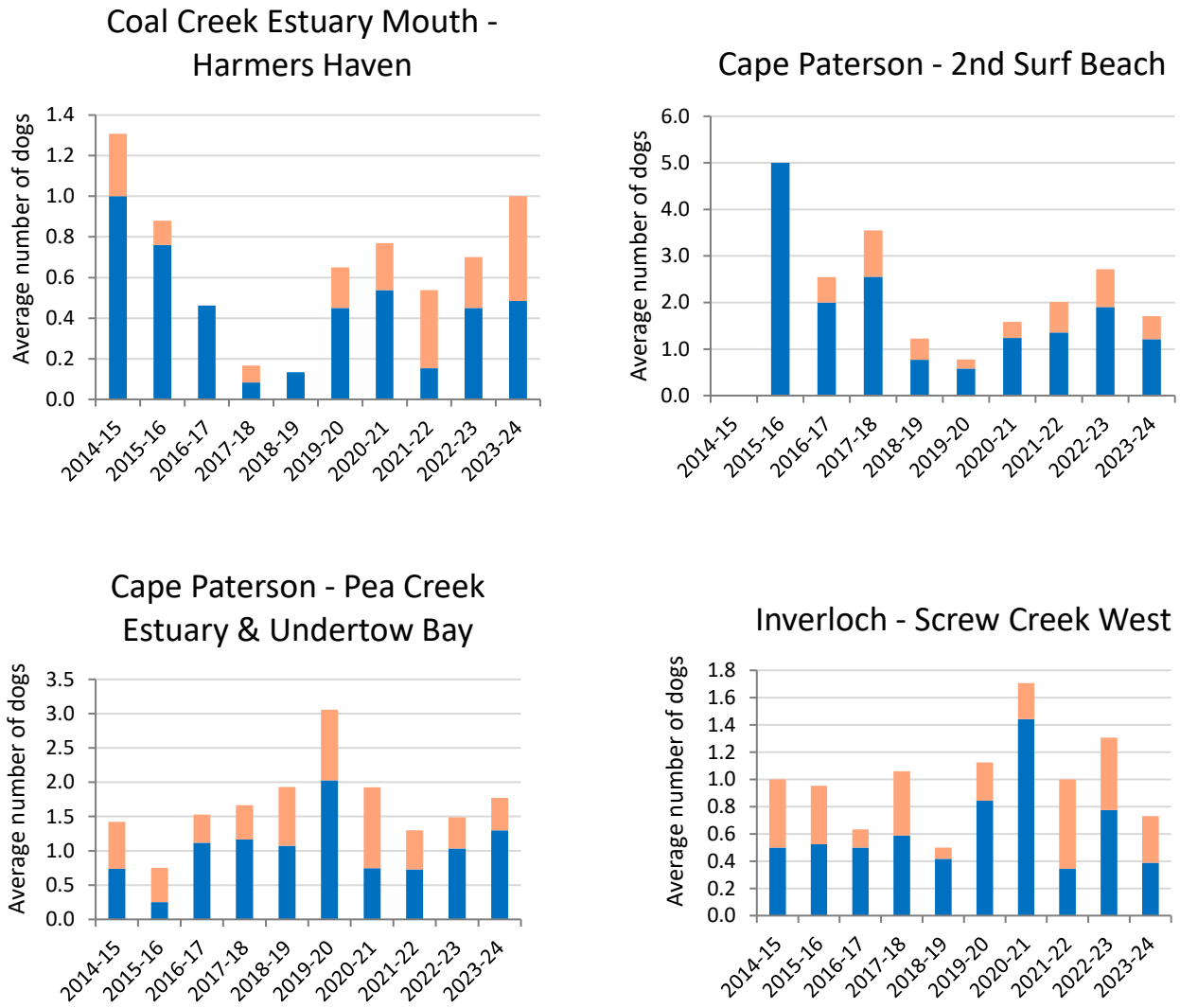

Figure 12. The average numbers of dogs off leash (blue) and on leash (orange) across ten breeding seasons, at four sites in the Harmers Haven to Inverloch region.

Abundance of other threats such as ravens, magpies and birds of prey (kestrels, falcons, kites, etc.) was investigated for temporal trends and as these threats typically occur in low frequencies, data across all sites were pooled for each season (Figure 13). Raven and magpie numbers appear to fluctuate across seasons with raven numbers peaking during the 2016-17 and 2020-21 seasons and magpies during the 2021-22 season. Raven and magpie abundance can be influenced by a number of different factors such as the amount of wrack and litter on beaches, proximity of site to townships/residential areas, and also the abundance of berries of dune plants (e.g., Coast Beard-heath *Leucopogon parviflorus*, Seaberry Saltbush *Rhagodia candolleana*). Hooded Plover breeding success in the 2020-21 and 2021-22 breeding seasons was reasonably low (0.00 and 0.18 fledglings/breeding pair) and interestingly, it coincided with the aforementioned peaks in numbers of ravens and magpies. However, the breeding success and aggregate of threats do not show any clear association in any of the other breeding seasons. In fact, the highest aggregate of threats which occurred in the 2016-17 breeding season (highest number of ravens) was a relatively productive

Hooded Plover breeding season (0.40 fledglings/breeding pair). It is also interesting to note that the overall birds of prey numbers have remained stable across the ten breeding seasons.

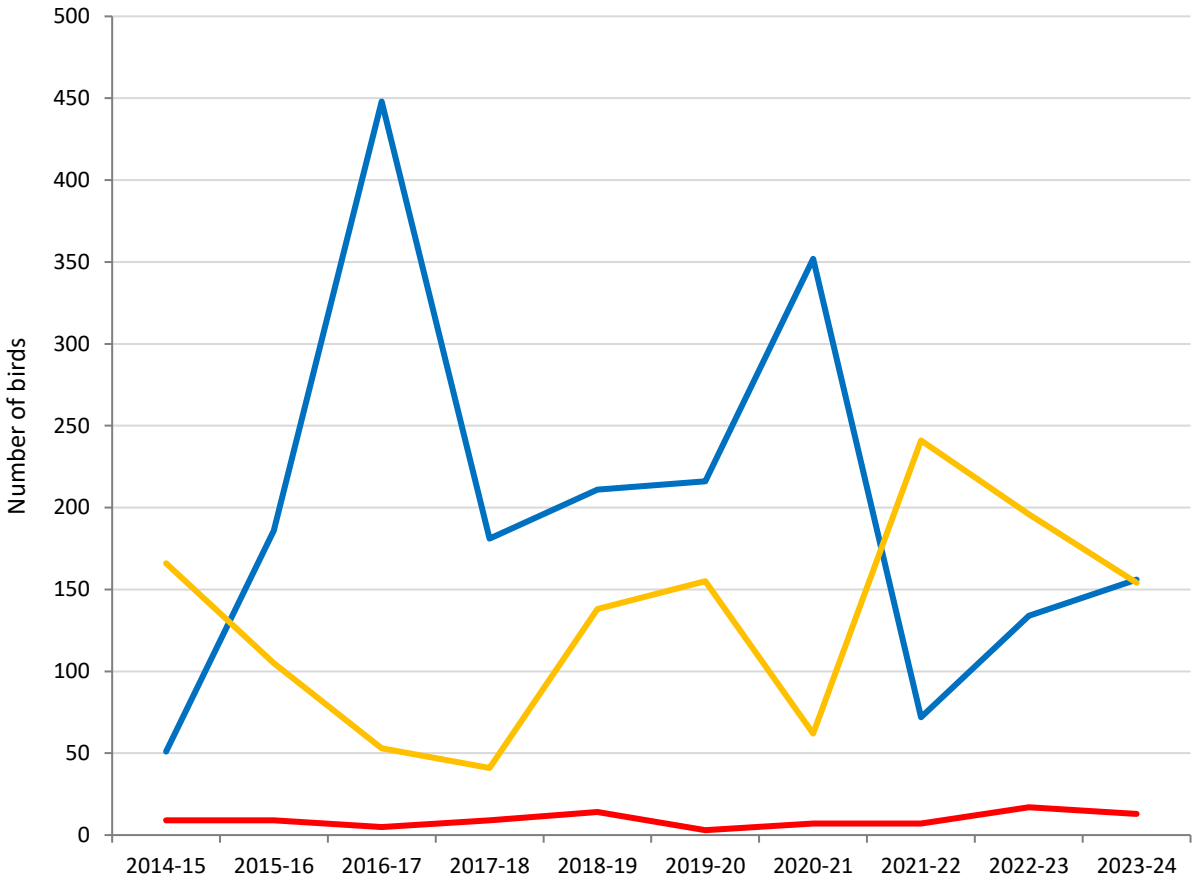

Figure 13. The total number of ravens (blue), magpies (yellow), and birds of prey (red) detected at Hooded Plover breeding sites across ten breeding seasons in the Harmers Haven to Inverloch region.

Abundance of silver gulls shows a gradual increase over the ten breeding seasons (Figure 14), The peak in silver gull abundance which occurred in the 2018-19 breeding season coincided with the second lowest Hooded Plover breeding success in the ten seasons monitored. However, similar to raven and magpie trends, none of the other seasons showed any clear associations between silver gull abundance and Hooded Plover breeding success. Silver gull numbers can be influenced by the amount of wrack, offal discarded by fishers and litter on beaches, as well as the occurrence of shearwater wrecks, and they are sometimes found in flocks of hundreds in sites such as 'Cape Paterson - Pea Creek Estuary & Undertow Bay' (see site descriptions below). Pacific/Kelp gulls occurred in low numbers and frequencies at sites in the Harmers Haven to Inverloch region and the highest number (232 birds) was recorded in the 2022-23 breeding season.

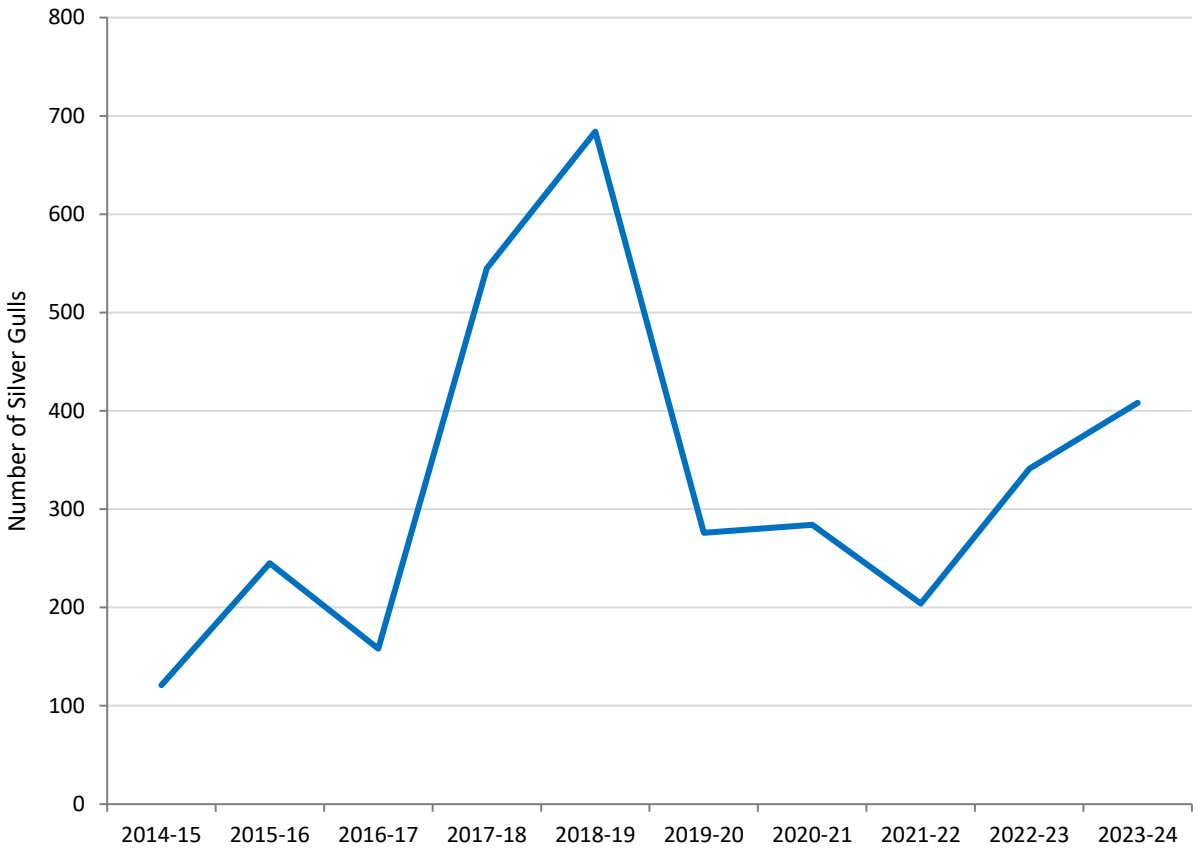

Figure 14. The total number of silver gulls detected at Hooded Plover breeding sites across ten breeding seasons in the Harmers Haven to Inverloch region.

Site Descriptions and Management Recommendations

The following pages provide descriptions of each of the sites in this report including the geomorphology of the site, history of the pair that have occupied the site, key breeding summary statistics, key beach user groups (as per Table 9, showing only those user groups making up ≥ 5% of visitors to the sites), key threats (as per Table 10, showing only those threats present in ≥ 10% of threat assessments) and recommendations for threat mitigation at the site. Table 13 summarises the sites according to their land tenure, identifies the responsible land manager and outlines the current dog regulations for the site.

Symbols used for threats are as follows:

	**People walking**		**Foxes (prints)**
	**People sitting/ sunbaking**		**Dogs off lead**
	**Surfers/swimmers**		**Dogs on lead**
	**Dog walker**		**Ravens**
	**People Fishing**		**Magpies**
	**Games**		**Silver Gulls**
	**Pacific Gulls**		**Nankeen Kestrel**
	**People overall**		**Other birds of prey**

Cape Paterson – 2nd Surf Beach

Managed by Parks Victoria (PV). Current dog regulations are "No dogs between 9am-6pm from 1 December to 14 April. Dogs on lead at all other times". Access at First Surf Beach managed by Bass Coast Shire (BCS).

Access via:

- Wilsons Road / F Break Beach, from the north-west (managed by PV)
- Second Surf Beach Carpark, from the south-east (managed by PV)
- First Surf Beach, from the far west (managed by BCS). Note that the Second Surf Beach can only be accessed via this route at low tide.

 Beach Morphology	Linear beach with rock platforms at the south-eastern end exposed at low tide. Backed by a large dune blowout with sparse to no vegetation, highly suitable for nesting.
 Ease of Detection	Moderate to difficult. At low tide the birds may be harder to spot on the rock platforms. This pair typically nests in the large dune blowout where they are usually found. Can easily be missed especially when they are nesting.
 Pair Identity	2016-17 | 13 Yellow x Unbanded 2017-18 – 2019-20 | Unbanded x Unbanded 2020-21 – 2013-24 | RY Orange x Unbanded

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	8	47	23	5	2016-17 2018-19 2022-23

Key user groups (>10% occurrence):

		
41%	26%	19%

Key threats:

					
85%	51%	31%	21%	19%	16%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest (nests in the dune blowout need to be enclosed from all sides as people access via informal routes) Temporary signage flanking nest/chick site Education and awareness raising events (e.g., surfers about impacts of leaving their dogs on the beach)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed especially at the boundary between First Surf and Second Surf Beaches Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one in The Cape Eco Village
 	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Install permanent fencing to protect dune blowout Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Jan 2018 – Nesting site in the dune blowout

Dec 2019 – View from top of the dune blowout

Jan 2018 – Rock platforms at the south-western end

Jan 2023 – Managed nest on the dune

Feb 2024 – T-shirt placed over the temporary nest sign

Jan 2024 – Human disturbance inside the fenced area

Dec 2022 - Adult Hooded Plover on nest

Jan 2024 – Two 3-day old Hooded Plover chicks

Cape Paterson – 2nd Surf Beach West

Managed by Parks Victoria (PV). Current dog regulations are "No dogs between 9am-6pm from 1 December to 14 April. Dogs on lead at all other times". Access at First Surf Beach managed by Bass Coast Shire (BCS).

Access via:

- Wilsons Road / F Break Beach, from the north-west (managed by PV)
- Second Surf Beach Carpark, from the south-east (managed by PV)
- First Surf Beach, from the far west (managed by BCS). Note that the Second Surf Beach can only be accessed via this route at low tide.

 Beach Morphology	Linear beach with rock platforms at the eastern end exposed at low tide. Backed by heavily vegetated dune and a large dune blowout to the east (used by 2nd Surf Beach pair). Narrow upper beach suitable for nesting.
 Ease of Detection	Easy to moderate. At low tide the birds may be harder to spot on the rock platforms. This pair nests on the narrow upper beach just to the west of the large dune blowout.
 Pair Identity	2018-19 – 2019-20 | RY Orange x 13 Yellow

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	2	7	5	0	-

Key user groups (>10% occurrence):

		
59%	24%	10%

Key threats:

					
80%	39%	33%	21%	19%	13%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest Temporary signage flanking nest/chick site Education and awareness raising events (e.g., surfers about impacts of leaving their dogs on the beach)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed especially at the boundary between First Surf and Second Surf Beaches Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one in The Cape Eco Village
 	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Jan 2018 – View from nesting site towards the west

Sep 2019 – Nest scrape on the upper beach

Dec 2019 – One-egg nest on the exposed upper beach

Jan 2021 – Off-leash dog about to be leashed on the beach

RY Orange x Unbanded roosting in the foredune

Cape Paterson - Pea Creek Estuary & Undertow Bay

Managed by Parks Victoria (PV). Current dog regulations are "No dogs between 9am-6pm from 1 December to 14 April. Dogs on lead at all other times". Access at Wonthaggi Royal Life Saving Club managed by Bass Coast Shire (BCS).

Access via:

- Undertow Bay carpark steps, from the east (managed by PV)
- Wonthaggi Royal Life Saving Club, from the west (managed by BCS)

 Beach Morphology	Linear beach with rock platforms at the western and eastern ends exposed at low tide. Backed by sparsely vegetated dune and the Peak Creek estuary at the western end. Pea Creek mouth remains closed for most of the spring and summer. Spit at the estuary, upper beach and dune suitable for nesting.
 Ease of Detection	Easy to moderate. At low tide the birds may be harder to spot on the rock platform at the western end. This pair almost always nests on the spit at the Pea Creek estuary, and sometimes on the upper beach at the eastern end.
 Pair Identity	2014-15 | KY Orange x Orange/metal, Black/Yellow 2016-17 – 2023-24 | YW Orange x Unbanded (banded UV White in Mar 2024)

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	10	71	12	2	2022-23 2023-24

Key user groups (>10% occurrence):

	
58%	24%

Key threats:

					
87%	38%	29%	27%	19%	14%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest (nests on the estuary spit need to be enclosed from all sides as people access via informal routes) Temporary signage flanking nest/chick site Education and awareness raising events
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed especially at the south-western point just west of the Pea Creek estuary where jurisdiction changes from Bass Coast Shire to Parks Victoria Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one in The Cape Eco Village
 	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Jan 2024 – View of site from Undertow Bay carpark

Jan 2018 – Nesting site at Pea Creek estuary on the left

Jan 2018 – Fenced nesting area (see difference in prints)

Jan 2024 – Fox sighted through spotting scope at daytime

Feb 2024 – Prints inside fenced area.

Feb 2023 – Recently hatched chick with adult still on nest

Feb 2024 – YW Orange (partner of UV White)

Feb 2024 – Recently fledged juvenile

Coal Creek Estuary - 1st Point East

Managed by Parks Victoria (PV). Current dog regulations are "Dogs prohibited".

Access via:

- Wreck Beach carpark, from the west (managed by PV)
- Wilsons Road / F Break Beach, from the east (managed by PV)

 Beach Morphology	Point between two linear beaches with rock platforms exposed at low tide. Narrow upper beach suitable for nesting, backed by a heavily vegetated sloping dune.
 Ease of Detection	Easy to moderate. At low tide the birds may be harder to spot on the rock platforms. This pair nests on the narrow upper beach at the point where they are usually found.
 Pair Identity	2018-19 | Unbanded x Unbanded (pair also used 'Coal Creek Estuary Mouth – Harmers Haven' site for nesting) 2023-24 | DZ White x Unbanded (banded RP White in Mar 2024)

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	2	3	0	0	-

Key user groups (>10% occurrence):

		
68%	16%	16%

Key threats:

					
43%	33%	29%	29%	24%	14%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest Temporary signage flanking nest/chick site Education and awareness raising events (e.g., fishers about setting up camp away from fenced sites)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed especially just west of the point where it changes to dogs prohibited Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one in The Cape Eco Village
  	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

	
Jan 2024 – Fenced nesting site at the point.	Mar 2024 – RP White (partner of DZ White)

Coal Creek Estuary – 2nd Bay East

Managed by Parks Victoria (PV). Current dog regulations are "Dogs prohibited".

Access via:

- Wreck Beach carpark, from the west (managed by PV)
- Wilsons Road / F Break Beach, from the east (managed by PV)

 Beach Morphology	Linear beach with extensive rock platforms exposed at low tide. Narrow upper beach suitable for nesting, backed by a heavily vegetated dune.
 Ease of Detection	Easy to moderate. At low tide the birds may be harder to spot on the rock platforms. This pair nests on the narrow upper beach where they are usually found.
 Pair Identity	2014-15 – 2016-17 | EA Orange x Orange/metal; Orange (later became 'Metal only') 2018-19 | WD Orange x Unbanded 2020-21 – 2021-22 | EA Orange x Metal only 2022-23 | Metal only x Unbanded

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	7	20	3	1	2016-17

Key user groups (>10% occurrence):

		
55%	33%	13%

Key threats:

					
60%	47%	34%	30%	26%	11%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest Temporary signage flanking nest/chick site Education and awareness raising events (e.g., fishers about setting up camp away from fenced sites)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Jan 2020 – Nesting site (looking towards east)</td><td>Dec 2020 – Litter on the beach</td></tr>
<tr><td colspan="2">  </td></tr>
<tr><td colspan="2">Dec 2018 – WD Orange nested at this site during the 2018-19 season</td></tr>
</table>

Coal Creek Estuary Mouth – Harmers Haven

Managed by Parks Victoria (PV). Current dog regulations are "No dogs between 9am-6pm from 1 December to 14 April. Dogs on lead at all other times".

Access via:

- Wreck Beach carpark, from the west (managed by PV)
- Wilsons Road / F Break Beach, from the east (managed by PV)

Beach Morphology	Spit surrounding the Coal Creek mouth and ocean beach with rock platforms exposed at low tide. Coal Creek mouth remains closed for most of the spring and summer. Spit at the estuary and upper beach suitable for nesting.
Ease of Detection	Easy to moderate. At low tide the birds may be harder to spot on the rock platforms. This pair almost always nests on the western side of the spit at the Coal Creek estuary where they are usually found.
Pair Identity	2014-15 – 2017-18 | HP Orange x Unbanded 2017-18 – 2018-19 | Unbanded x Unbanded 2019-20 – 2023-24 | WD Orange x Unbanded (banded YN White in Mar 2024)

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	10	46	10	6	2014-15 2019-20 2021-22 2022-23

Key user groups (>10% occurrence):

			
40%	21%	14%	12%

Key threats:

					
61%	52%	29%	25%	20%	18%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest (nests on the estuary spit need to be enclosed from all sides as people tend to walk all over the spit) Temporary signage flanking nest/chick site Education and awareness raising events (e.g., fishers and sunbakers about setting up camp away from fenced sites)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase

	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one in The Cape Eco Village
	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Dec 2023 – Fenced nesting site at the estuary

Dec 2019 – Fenced nesting site at the estuary

Dec 2020 – Nest on the estuary

May 2024 – YN White (partner of WD Orange) on rocks

Inverloch – Abbott St

Managed by Bass Coast Shire (BCS). Current dog regulations are "Dogs on leash at all times".

Access via:

- Track at the corner of Veronica Street and Surf Parade, from the west (managed by BCS)
- Steps at the corner of Abbott Street and Ramsey Boulevard, from the north (managed by BCS)
- Track at the Inverloch Parkrun facilities block, from the east (managed by BCS)

 Beach Morphology	Extensive spit east of the Ayr Creek lagoon bordered by ocean beach from the south. The spit is sparsely vegetated in most parts with heavy vegetation occurring close to the lagoon. Ayr Creek lagoon remains closed for most of the spring and summer. Spit and upper beach suitable for nesting.
 Ease of Detection	Difficult. Expansive territory and the pair can be hard to spot in amongst the large flocks of migratory shorebirds and Red-capped Plovers that occur around the lagoon. Nests on the spit are difficult to spot because of beach wrack and due to the presence of Red-capped Plover nests.
 Pair Identity	2016-17 | UZ Orange x 04 Yellow 2017-18 | 11 Yellow x Unbanded 2018-19 – 2020-21 | UH Orange x Unbanded 2023-24 | YJ Orange x YV Orange

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	7	24	3	0	-

Key user groups (>10% occurrence):

	
56%	34%

Key threats:

					
86%	61%	59%	17%	16%	10%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest (nests on the spit need to be enclosed from all sides as people walk through the spit using multiple routes to access the ocean beach) Temporary signage flanking nest/chick site Education and awareness raising events (e.g., the significance of the lagoon and the spit for all types of birds)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed using large signs Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one on Ullathornes Rd in Inverloch
  	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Jan 2018 – Nesting site with Inverloch in the background

Jan 2019 – Two-egg nest among beach wrack

Oct 2019 – Fenced and signed nest

Dec 2021 – Off-leash dogs running around on the spit

Feb 2022 – Two ravens and a magpie foraging on the spit

Sep 2020 – UH Orange nested here in 2018-19 – 2020-21

Inverloch – Abbott St East

Managed by Bass Coast Shire (BCS). Current dog regulations are "Dogs on leash at all times".

Access via:

- Steps at the corner of Abbott Street and Ramsey Boulevard, from the west (managed by BCS)
- Track at the Inverloch Parkrun toilet block, from the north (managed by BCS)
- Pensioners Point carpark at the corner of Ramsey Boulevard and Venus Street, from the east (managed by BCS)

 Beach Morphology	Narrow linear beach backed by a sparsely vegetated wide foredune. It is bordered by the expansive 'Inverloch – Abbott St' site from the west. Upper beach and foredune suitable for nesting.
 Ease of Detection	Moderate to difficult. The pair can mingle with the other shorebirds at the Ayr Creek lagoon making it hard to spot. Nests on the foredune are difficult to spot because of vegetation and beach wrack.
 Pair Identity	2016-17 | VT Orange x YV Orange 2017-18 | UZ Orange x YV Orange 2018-19 | YV Orange x Unbanded and YV Orange x UZ Orange 2019-20 – 2020-21 | UH Orange x Unbanded (pair also used 'Inverloch – Abbott St' site for nesting)

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	5	26	7	0	-

Key user groups (>10% occurrence):

		
50%	21%	18%

Key threats:

					
94%	73%	54%	40%	15%	14%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest (nests need to be enclosed from all sides as people walk through the foredune using multiple routes to access the ocean beach) Temporary signage flanking nest/chick site

		Education and awareness raising events (e.g., sunbakers about setting up camp away from fenced sites, the significance of the lagoon and the spit for all types of birds)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed using large signs Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one on Ullathornes Rd in Inverloch
  	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

	
Oct 2019 – Nesting site (looking towards the east)	Jan 2019 – Three-egg nest amongst the beach wrack
	
Jan 2020 – Driftwood shelter made by beachgoers	VT Orange that nested here in the 2016-17 season

Inverloch – Point Norman East

Managed by Bass Coast Shire (BCS). Current dog regulations are "Dogs on leash at all times".

Access via:

- Track from the carpark on Surf Parade between Ozone and Veronica Streets, from the west (managed by BCS)
- Track at the corner of Veronica Street and Surf Parade, from the north (managed by BCS)
- Steps at the corner of Abbott Street and Ramsey Boulevard, from the east (managed by BCS)

Beach Morphology	Extensive spit west of the Ayr Creek lagoon bordered by ocean beach from the south. The spit is sparsely vegetated in most parts with heavy vegetation occurring close to the lagoon. Ayr Creek lagoon remains closed for most of the spring and summer. Spit and upper beach suitable for nesting.
Ease of Detection	Difficult. Expansive territory and the pair can be hard to spot in amongst the large flocks of migratory shorebirds and red-capped plovers that occur around the lagoon. Nests on the spit are difficult to spot because of beach wrack and due to the presence of Red-capped Plover nests.
Pair Identity	2014-15 | XM Orange x UZ Orange 2015-16 – 2016-17 | UZ Orange x 04 Yellow 2022-23 | YV Orange x Unbanded

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	4	21	5	1	2014-15

Key user groups (>10% occurrence):

	
63%	35%

Key threats:

					
90%	67%	56%	49%	19%	13%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest (nests on the spit need to be enclosed from all sides as people walk through the spit using multiple routes to access the ocean beach) Temporary signage flanking nest/chick site Education and awareness raising events (e.g., the significance of the lagoon and the spit for all types of birds)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed using large signs Enforcement patrols Collect and review compliance data

		Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one on Ullathornes Rd in Inverloch
 	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

	
Mar 2024 – Access steps at the corner of Abbott Street	Mar 2024 – Vegetated part of spit that's used for nesting
	
Jan 2020 – Ayr Creek Lagoon almost inundating a nest	Jan 2022 – Red-capped Plovers also nest at this site

Inverloch – Point Norman West

Managed by Bass Coast Shire (BCS). Current dog regulations are "Dogs on leash at all times".

Access via:

- Track from the carpark on Surf Parade between Ozone and Veronica Streets, from the west (managed by BCS)
- Track at the corner of Veronica Street and Surf Parade, from the north (managed by BCS)
- Steps at the corner of Abbott Street and Ramsey Boulevard, from the east (managed by BCS)

 Beach Morphology	Extensive spit west of the Ayr Creek lagoon bordered by ocean beach from the south. It is bordered by the 'Point Norman East' site from the east. The spit is sparsely vegetated in most parts with heavy vegetation occurring close to the lagoon. Spit and upper beach suitable for nesting.
 Ease of Detection	Difficult. Expansive territory and the pair can be hard to spot in amongst the large flocks of migratory shorebirds and red-capped plovers that occur around the lagoon. Nests on the spit are difficult to spot because of beach wrack and due to the presence of Red-capped Plover nests.
 Pair Identity	2014-15 | VT Orange x 04 Yellow 2015-16 | VT Orange x YV Orange

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	2	12	1	0	-

Key user groups (>10% occurrence):

			
48%	21%	15%	13%

Key threats:

					
93%	70%	63%	48%	26%	11%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest (nests on the spit need to be enclosed from all sides as people walk through the spit using multiple routes to access the ocean beach) Temporary signage flanking nest/chick site Education and awareness raising events (e.g., surfers about impacts of leaving their dogs on the beach, sunbakers about setting up camp away from fenced sites)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed using large signs Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one on Ullathornes Rd in Inverloch
 	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Inverloch – Screw Creek West

Managed by Bass Coast Shire (BCS). Current dog regulations are "Dogs prohibited".

Access via:

- Multiple tracks through the Inverloch Foreshore Camping Reserve, from the west (managed by BCS)
- Track near the public amenities block of the Inverloch Foreshore Camping Reserve, from the north (managed by BCS)
- Carpark at the eastern end of The Esplanade, from the east (managed by BCS)

 Beach Morphology	Narrow linear beach with extensive tidal flats exposed at low tide. Backed by a sparsely vegetated foredune, a heavily vegetated dune and the Camping Reserve. The narrow upper beach and foredune suitable for nesting.
 Ease of Detection	Easy to moderate. At low tide the birds may be harder to spot on the rock platform at the western end. This pair nests on the upper beach and foredune next to the access track from the public amenities block.
 Pair Identity	2014-15 & 2016-17 | TK Orange x Unbanded 2015-16 & 2017-18 | TK Orange x Orange/metal, Red/Yellow 2019-20 | Orange/metal, Red/Yellow x Unbanded 2020-21 – 2021-22 | 55 Yellow x Orange/metal only 2022-23 – 2023-24 | 55 Yellow x Engraved Orange (illegible due to fading)

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	9	62	20	1	2015-16

Key user groups (>10% occurrence):

		
55%	15%	14%

Key threats:

				
77%	32%	27%	23%	19%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest (nests need to be enclosed from all sides as people from the foreshore reserve walk through the foredune to access the ocean beach) Temporary signage flanking nest/chick site Education and awareness raising events (e.g., sunbakers about setting up camp away from fenced sites, foreshore reserve patrons about using formal paths to access ocean beach)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed using large signs especially where it changes to dogs prohibited when walking along the beach from the west Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one on Ullathornes Rd in Inverloch
 	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Sep 2023 – Approaching nesting site from the west

Dec 2020 – One-egg nest on the foredune

Nov 2019 – Fenced nest on the foredune

Dec 2022 – Gazebo set up between signs and fenced area

Jan 2024 – Driftwood shelter made by beachgoers

Nov 2022 – High tide nearly reaching the fence and signs

The Oaks Bay – Cape Paterson

Managed by Parks Victoria (PV). Current dog regulations are "Dogs prohibited".

Access via:

- Main carpark off the Cape Paterson-Inverloch Road (managed by PV)

 Beach Morphology	A cove with rock platforms and rocky cliffs at either end. Ocean beach habitat backed by a sparsely vegetated foredune and a heavily vegetated dune. A small sparsely vegetated dune blowout just west of the access track. Upper beach, foredune and blowout suitable for nesting.
 Ease of Detection	Easy. This pair is usually found on the upper beach. When nesting the partner of the incubating bird will be on the upper beach while the other sits on the eggs.
 Pair Identity	2014-15 | Unbanded x Unbanded 2015-16 – 2017-18 | KY Orange x Orange/metal; Black/Yellow (later became 'Orange/metal only') 2018-19 – 2019-20 | KY Orange x Orange/metal only 2020-21 – 2022-23 | 13 Yellow x Orange/metal only 2023-24 | DZ White x Orange/metal only

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	10	63	15	5	2015-16 2017-18 2022-23

Key user groups (>10% occurrence):

		
40%	34%	21%

Key threats:

				
47%	46%	12%	11%	11%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest Temporary signage flanking nest/chick site Education and awareness raising events (e.g., sunbakers about setting up camp away from fenced sites)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Jan 2018 – View of The Oaks from the car park lookout.

Mar 2024 – Nesting site from access point (looking west)

Mar 2024 – Nesting site from access point (looking east)

Dec 2020 – 3-egg nest on foredune among sea spurge

Jan 2022 – Sunbakers camped away from the fenced area

Mar 2021 – High tide touching the lower fence posts

Nov 2021 – 13 Yellow x Orange/metal only on site

Nov 2017 – Two fledged juveniles tagged HR and HH

Twin Reefs - Bunurong Coast Rd

Managed by Parks Victoria (PV). Current dog regulations are "Dogs prohibited".

Access via:

- Main carpark off the Cape Paterson-Inverloch Road (managed by PV)

 Beach Morphology	A small cove with extensive rock platforms exposed at low tide and rocky cliffs at either end. Narrow ocean beach habitat backed by a sparsely vegetated foredune and a heavily vegetated dune. Upper beach and foredune suitable for nesting.
 Ease of Detection	Easy to moderate. This pair is usually found on the upper beach. They can be difficult to spot on the rock platforms at low tide. Usually nests on the narrow upper beach.
 Pair Identity	2016-17 | KY Orange x Orange/metal; Black/Yellow (pair also used 'The Oaks Bay – Cape Paterson' site for nesting) 2017-18 – 2020-21 | VT Orange x Unbanded 2023-24 | 13 Yellow x Unbanded

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	10	24	9	5	2017-18 2019-20 2023-24

Key user groups (>10% occurrence):

		
51%	22%	20%

Key threats:

			
49%	33%	16%	13%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest Temporary signage flanking nest/chick site Education and awareness raising events (e.g., sunbakers about setting up camp away from fenced sites)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Jan 2018 – View of Twin Reefs from the car park lookout

Mar 2024 – Nesting site from access track (looking west)

Dec 2018 – Two-egg nest on the upper beach

Feb 2021 – Human and dog prints on the beach

Sep 2020 – VT Orange on site

Feb 2020 – Two recent fledglings with unbanded adult

Waterfall Creek - Harmers Haven

Managed by Parks Victoria (PV). Current dog regulations are "No dogs between 9am-6pm from 1 December to 14 April. Dogs on lead at all other times".

Access via:

- Wreck Beach carpark, from the east (managed by PV)
- Carpark at the end of Olearia Street in Harmers Haven, from the west (managed by PV)

Beach Morphology	Linear beach with extensive rock platforms exposed at low tide. Narrow ocean beach habitat backed by a sparsely vegetated foredune and a heavily vegetated dune. Small dune blowout near Waterfall Creek mouth which remains closed permanently. Upper beach and foredune suitable for nesting.
Ease of Detection	Easy to moderate. At low tide the birds may be harder to spot on the rock platforms. This pair almost always nests on the narrow upper beach.
Pair Identity	2014-15 – 2019-20 | JS Orange x Unbanded 2020-21 | JS Orange x TP White and KK Orange x Unbanded 2021-22 | TP White x Unbanded 2023-24 | Unbanded x Metal only (banded AP White in Mar 2024, originally, Orange/metal; Light Green/Orange)

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	9	38	2	0	-

Key user groups (>10% occurrence):

		
50%	30%	10%

Key threats:

					
71%	41%	29%	29%	16%	12%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest Temporary signage flanking nest/chick site Education and awareness raising events (e.g., people playing games about setting up camp away from fenced sites)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed using large signs Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events

		Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one in The Cape Eco Village
	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

	
Jan 2024 – Fenced nest on the upper beach	Dec 2020 – One-egg nest on the foredune
	
Dec 2020 – One-egg nest fenced and signed	Dec 2023 – Metal left only (later flagged AP White)

Mar 2024 – AP White on site

Wilsons Rd 1st & 2nd Bays West

Managed by Parks Victoria (PV). Current dog regulations are "Dogs prohibited".

Access via:

- Wreck Beach carpark, from the west (managed by PV)
- Wilsons Road / F Break Beach, from the east (managed by PV)

Beach Morphology	Linear beach separated by a rocky bluff in the middle. Extensive rock platforms exposed at low tide, on the western side of the bluff. Narrow upper beach backed by a sloping sparsely vegetated foredune and dune. Upper beach and foredune suitable and used for nesting.
Ease of Detection	Easy to moderate. At low tide the birds may be harder to spot on the rock platforms. This pair typically nests on the foredune where they are usually found.
Pair Identity	2014-15 – 2016-17 | Orange/metal; Blue (later became 'Metal only') 2017-18 & 2020-21 | Metal only x Unbanded 2018-19 | Unbanded x Unbanded (pair also used 'Wilsons Rd Eastward 3rd drain' site for nesting) 2021-22 | AS White x Unbanded

Surveyed since	*Seasons occupied*	*Total eggs*	*Total chicks*	*Total fledglings*	*Seasons successful*
2014/15	8	32	5	0	-

Key user groups (>10% occurrence):

		
53%	24%	13%

Key threats:

					
65%	53%	25%	24%	24%	23%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest Temporary signage flanking nest/chick site Education and awareness raising events (e.g., dog walkers about dog regulations, surfers about impacts of leaving their dogs on the beach)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed at the Wilsons Rd access and where it changes to dogs prohibited when accessing from the west Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one in The Cape Eco Village

	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Jan 2018 – Site from Wilsons Rd access track (looking west)

Mar 2024 – View of the second bay from the rocky bluff

Dec 2018 – Three-egg nest among wrack on the upper beach

Jan 2020 – Signed and fenced nest on foredune in 1st bay

Apr 2024 – Vandalised dog regulation sign at access

Jan 2024 – Off-leash dog leaving the no dogs area

Apr 2024 – XR White (partner of AS White)

Mar 2023 – Recently fledged juvenile from Wilsons Rd 2nd Bay West End site.

Wilsons Rd 2nd Bay West End

Managed by Parks Victoria (PV). Current dog regulations are "Dogs prohibited".

Access via:

- Wreck Beach carpark, from the west (managed by PV)
- Wilsons Road / F Break Beach, from the east (managed by PV)

Beach Morphology	Point between two linear beaches with rock platforms exposed at low tide. Narrow upper beach suitable for nesting, backed by a sparsely vegetated foredune and heavily vegetated dune.
Ease of Detection	Easy to moderate. At low tide the birds may be harder to spot on the rock platforms. This pair nests on the narrow upper beach at the point where they are usually found.
Pair Identity	2014-15 | Metal only x Unbanded 2015-16 | Orange/metal; Blue x Unbanded and KK Orange x Unbanded 2016-17 – 2020-21 | KK Orange x Unbanded 2021-22 – 2022-23 | AW White x DZ White 2023-24 | KK Orange x AW White

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	10	39	15	6	2015-16 2016-17 2017-18 2022-23

Key user groups (>10% occurrence):

	
61%	25%

Key threats:

					
51%	49%	32%	24%	20%	18%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest Temporary signage flanking nest/chick site Education and awareness raising events (e.g., dog walkers about dog regulations)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase

	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Mar 2024 – Looking west at the nesting site on the point

Jan 2023 – Managed nest on the upper beach at the point

Dec 2023 – Large flock of ravens and magpies forage on the beach and foredune as the Hooded Plovers watch on

	
Feb 2024 – KK Orange x AW White on rock platform	Feb 2023 – 5-day old chick with adult on rock platform

Wilsons Rd 3rd Bay West

Managed by Parks Victoria (PV). Current dog regulations are "Dogs prohibited".

Access via:

- Wreck Beach carpark, from the west (managed by PV)
- Wilsons Road / F Break Beach, from the east (managed by PV)

Beach Morphology	Linear beach with extensive rock platforms exposed at low tide. Narrow upper beach suitable for nesting, backed by a sparsely vegetated foredune and heavily vegetated dune.
Ease of Detection	Easy to moderate. At low tide the birds may be harder to spot on the rock platforms. This pair typically nests on the narrow upper beach where they are usually found.
Pair Identity	2014-15 | UW Orange x Unbanded 2015-16 | KK Orange x Unbanded 2020-21 | Unbanded x Unbanded

Surveyed since	*Seasons occupied*	*Total eggs*	*Total chicks*	*Total fledglings*	*Seasons successful*
2014/15	4	10	0	0	-

Key user groups (>10% occurrence):

76%	16%

Key threats:

					
47%	45%	22%	12%	12%	10%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest Temporary signage flanking nest/chick site Education and awareness raising events (e.g., dog walkers about dog regulations)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed at the Wilsons Rd access and where it changes to dogs prohibited when accessing from the west Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one in The Cape Eco Village
	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)

	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

	
Mar 2024 – Nesting site (looking towards the west)	Mar 2024 – KK Orange nested here in 2015-16 season

Wilsons Rd Eastward 2nd Drain

Managed by Parks Victoria (PV). Current dog regulations are "No dogs between 9am-6pm from 1 December to 14 April. Dogs on lead at all other times".

Access via:

- Wilsons Road / F Break Beach, from the north-west (managed by PV)
- Second Surf Beach Carpark, from the south-east (managed by PV)

Beach Morphology	Linear beach with rock platforms at the north-western end exposed at low tide. Short stretch of beach between the 2nd and 3rd drain outlets south-east of the Wilsons Road access track. Backed by heavily vegetated dune and a sloping sparsely vegetated foredune. Upper beach and foredune suitable for nesting.
Ease of Detection	Easy. This pair is usually found near the high tide mark on the upper beach. They nest on the narrow upper beach or the foredune between the 2nd and 3rd drain outlets.
Pair Identity	2015-16 – 2016-17 | Orange/metal; Blue x Unbanded (pair also used 'Wilsons Rd 2nd Bay West End' and 'Wilsons Rd 1st & 2nd Bays West' for nesting) 2017-18 | 13 Yellow x Unbanded

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	3	10	4	2	2015-16

Key user groups (>10% occurrence):

			
39%	30%	20%	11%

Key threats:

					
86%	57%	55%	30%	23%	23%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest Temporary signage flanking nest/chick site Education and awareness raising events (e.g., surfers about impacts of leaving their dogs on the beach, sunbakers about setting up camp away from fenced sites)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed especially at the boundary between First Surf and Second Surf Beaches Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase

		Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one in The Cape Eco Village
	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Jan 2018 – Nesting site (looking towards the west)

Mar 2024 – Site with 3rd drain outlet in the foreground

13 Yellow nested here in the 2017-18 season

Wilsons Rd Eastward 3rd Drain

Managed by Parks Victoria (PV). Current dog regulations are "No dogs between 9am-6pm from 1 December to 14 April. Dogs on lead at all other times".

Access via:

- Wilsons Road / F Break Beach, from the north-west (managed by PV)
- Second Surf Beach Carpark, from the south-east (managed by PV)

Beach Morphology	Linear beach west of the 3rd drain outlet south-east of the Wilsons Road access track. Bordered by the 'Cape Paterson – 2nd Surf Beach West' site from the east. Backed by heavily vegetated dune and a sloping sparsely vegetated foredune. Upper beach and foredune suitable for nesting.
Ease of Detection	Easy. This pair is usually found near the high tide mark on the upper beach. They nest on the narrow upper beach or the foredune east of the 3rd drain outlet.
 Pair Identity	2015-16 | 13 Yellow x Unbanded 2106-17 | Orange/metal; Blue x Unbanded (pair also used the 'Wilsons Rd 1st & 2nd Bays West' and 'Wilsons Rd Eastward 2nd Drain' sites for nesting) 2018-19 | Unbanded x Unbanded (pair also used the 'Wilsons Rd 1st & 2nd Bays West' site for nesting) 2019-20 – 2020-21 & 2022-23 – 2023-24 | AS White x Unbanded 2021-22 | Unbanded x Engraved Orange (illegible due to fading)

Surveyed since	*Seasons occupied*	*Total eggs* 	*Total chicks* 	*Total fledglings* 	*Seasons successful*
2014/15	9	26	9	5	2015-16 2019-20 2022-23

Key user groups (>10% occurrence):

		
49%	27%	15%

Key threats:

					
76%	42%	36%	23%	22%	15%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest Temporary signage flanking nest/chick site Education and awareness raising events (e.g., surfers about impacts of leaving their dogs on the beach)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed especially at the boundary between First Surf and Second Surf Beaches Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one in The Cape Eco Village
 	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

Mar 2024 – Looking west at the site from the east

Mar 2024 – View from top (3rd drain outlet visible)

Dec 2018 – Two-egg nest on the upper beach

Jan 2024 – Fenced nest on the upper beach

Dec 2019 – Human prints near nest scrape

Dec 2023 – Adult on nest in the foredune

Jan 2024 – AS White x Unbanded have nested here since the 2022-23 season

Wreck Beach - Harmers Haven

Managed by Parks Victoria (PV). Current dog regulations are "No dogs between 9am-6pm from 1 December to 14 April. Dogs on lead at all other times".

Access via:

- Wreck Beach carpark, from the east (managed by PV)
- Carpark at the end of Olearia Street in Harmers Haven, from the west (managed by PV)

Beach Morphology	Linear beach with extensive rock platforms exposed at low tide. Narrow ocean beach habitat backed by a sparsely vegetated foredune and a heavily vegetated dune. Small dune blowout just west of the Wreck Beach carpark access track. Upper beach, foredune and small dune blowout suitable for nesting.
Ease of Detection	Easy to moderate. At low tide the birds may be harder to spot on the rock platforms. This pair almost always nests on the small dune blowout just west of the carpark access track.
Pair Identity	2014-15 – 2020-21 | EA Orange x Orange/metal; Orange (later became 'Metal; Orange' and then 'Metal only) (pair also used the 'Coal Creek Estuary – 2nd Bay East' site for nesting in the 2014-15 and 2020-21 seasons) 2020-21 | KK Orange x Unbanded (pair also used the 'Waterfall Creek – Harmers Haven' site for nesting) 2022-23 | TP White x Unbanded

Surveyed since	*Seasons occupied*	*Total eggs*	*Total chicks*	*Total fledglings*	*Seasons successful*
2014/15	8	37	3	1	2017-18

Key user groups (>10% occurrence):

39%	25%	14%	11%

Key threats:

69%	31%	29%	27%	13%	11%

Threat mitigation actions:

	Prevent crushing	Temporary fencing around nest Temporary signage flanking nest/chick site Education and awareness raising events (e.g., sunbakers and people playing games about setting up camp away from fenced sites)
	Minimise disturbance	Temporary signage flanking nest/chick site Temporary fencing around nest/chick site (large buffer zone) Temporary breeding update signage at access points Extend fence/signs at times of low tide in peak use periods Deploy chick shelters Temporary banners Education, awareness raising events and media Site guardians at peak beach use periods during chick phase
	Prevent crushing; Minimise disturbance; Prevent predation	Maintain current dog regulations as minimum protection Dog regulations clearly displayed using large signs Enforcement patrols Collect and review compliance data Site guardians at peak beach use times during chick phase Education and awareness raising events Media to encourage choosing appropriate beaches for dog walking and the need to leash dogs where permitted on leash Promote and encourage the use of inland off-leash dog parks such as the one in The Cape Eco Village
 	Minimise predation	Investigate impact of predators using remote cameras Investigate methods of reducing predation by native birds Reduce litter Discourage feeding wildlife
	Minimise predation	Investigate impact of predators using remote cameras Den searches Fox control (bait, trap, shoot, den fumigation)
	Habitat preservation	Avoid brush matting Control weeds such as Sea-wheat Grass, Marram Grass and Sea Spurge

	
Oct 2018 – The Coal Creek bridge at the Wreck Beach access	Oct 2018 – Looking west from the Wreck Beach access
	
Dec 2020 – Two-egg nest on the upper beach	Dec 2020 – Fenced and signed nest on the upper beach
	
Nov 2019 – Vehicle tracks on the beach near nesting site	KK Orange nested here in the 2020-21 season

Conclusions and Future Directions

The analysis of breeding effort over the last ten breeding seasons across 20 Hooded Plover breeding sites in the Harmers Haven to Inverloch region, reveals that pairs breeding at only 60% of sites have contributed juveniles to the population. Hooded Plover pairs breeding at some sites have not experienced any breeding success and failure has been attributed to natural as well as anthropogenic causes. As the Beach-nesting Birds Program strives to manage anthropogenic threats such as human disturbance and off-leash dogs, it is imperative that site-specific threat mitigation actions prescribed in this management plan are implemented to improve breeding success in the future. Ensuring recruitment of juveniles from different sites and breeding pairs will enhance the genetic diversity of the eastern Hooded Plover population.

The threat data collected by nest monitors further sheds light on the suite of threats present at Hooded Plover breeding sites. As expected, humans were the dominant key threat at most breeding sites, however, foxes overtook humans in a few sites where dogs were prohibited and the site was distant from an access point (e.g., Wilsons Rd 3rd Bay West). The threat data provided further evidence for low compliance of dog regulations especially at those sites where dogs were prohibited. To improve Hooded Plover breeding success at these sites, compliance must increase, and it warrants a two-pronged approach where on one hand, education and raising awareness is carried out throughout the breeding season and on the other hand, compliance patrols are conducted by land managers to expiate recalcitrant offenders.

Foxes have emerged as a major threat at most of the breeding sites between Harmers Haven and Inverloch and evidence of foxes preying on Hooded Plover eggs has been recorded on motion-sensing cameras installed at nests in other parts of the Bass Coast. A successful fox control program was delivered by the Bass Coast Landcare Network in the 2022-23 Hooded Plover breeding season and a clear improvement in breeding success was evident that year. As well as sourcing funding to continue fox control programs, new methods of fox control will need to be investigated to tackle this threat especially at sites close to townships (e.g., Inverloch) where the use of traditional fox control methods such as baiting may not be feasible due to risks to domestic dogs. Due to the nature of the landscape, owners of private land that abuts coastal reserves will need to be engaged in fox control programs to ensure that effective control occurs over a wider area in the future.

Superabundant native predators such as Magpies and Ravens also featured heavily in the threat profiles of Hooded Plover breeding sites. Numbers of these birds have increased exponentially in the recent past owing to their generalist feeding habits and an increase in the abundance of food facilitated by human presence. Managing the predatory impact of native predators can be challenging as they are a natural part of the ecosystem. However, their predatory impact needs to be thoroughly investigated and control methods experimented to test for efficacy. Their dominance may become more prominent in the future thus, they may need to be controlled to improve breeding success of Hooded Plovers.

It may also be prudent to focus on other natural values of Hooded Plover breeding sites to raise awareness about the importance of those sites. For example, the Abbott Street and Point Norman sites at Inverloch provide important habitat for numerous migratory shorebirds, wetland birds and other resident beach-nesting birds such as Red-capped Plovers and Australian Pied Oystercatchers. Sites such as these may benefit more from having interpretive signs containing information about all the different types of birds and other wildlife that use this habitat rather than signs just focusing on Hooded Plovers. It may also be beneficial for Hooded Plovers as the focus will shift from them to other species and the habitat as a whole.

From a program's perspective, it is critical to maintain an adaptive management approach for Hooded Plover recovery, and this should include regular reviews of the data and annual stakeholder meetings (including land managers) to track progress and to adapt our approach over time with the aim of improving outcomes. This management plan will be a useful baseline for future reviews of trends in threats and adapting threat mitigation actions accordingly.

Photo: Pete Hudson

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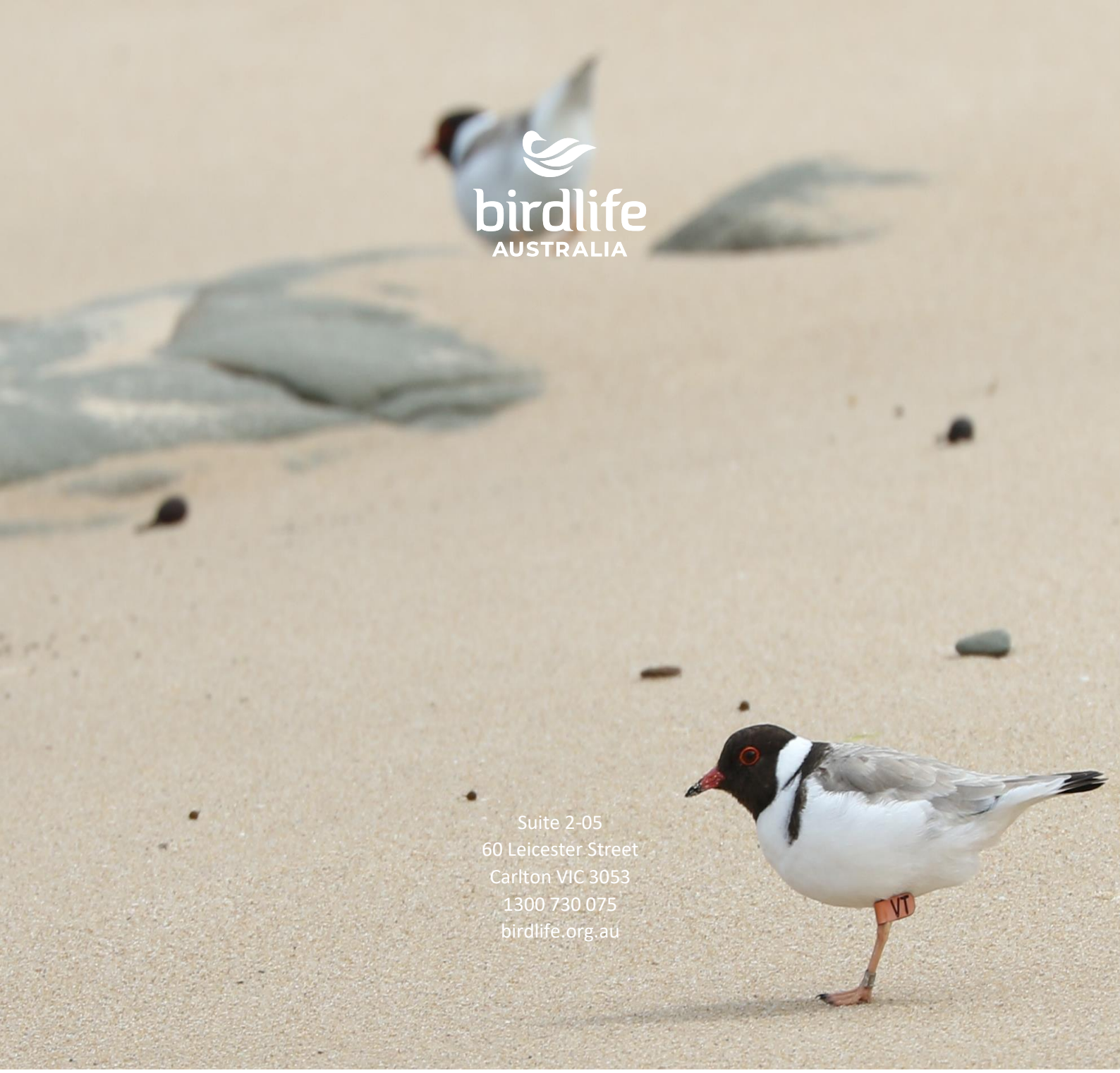

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Thank you

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