

Observations of the breeding behaviour of Beach Stone-curlew in Port Stephens, New South Wales

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Trail camera images of a Beach Stone-curlew *Esacus magnirostris* pair that nested on Corrie Island, Port Stephens in summer 2025/26, were analysed to record their behaviour during incubation and chick raising. Observations of egg rotation and incubation time were correlated with records of temperature, relative humidity, wind speed and rainfall to identify potential drivers of behaviour.

A moderately strong negative correlation between daily incubation and relative humidity was demonstrated. A moderately positive correlation between wind speed and daily incubation was also found. There was no correlation between temperature and daily incubation, although a positive trend was demonstrated by regression analysis. Frequency of egg rotation showed a weak correlation with temperature, but no correlation with relative humidity or wind speed was demonstrated.

The birds' selection of nest site, their interactions with other avian species and their diet are also discussed. Limitations of the use of trail cameras for behavioural studies were identified.

INTRODUCTION

The Beach Stone-curlew *Esacus magnirostris* is a relatively recent arrival in Port Stephens having first been recorded on Corrie Island in February 2006 (<https://birddata.birdlife.org.au/>). Since then, birds have been observed regularly, mainly around Soldiers Point and on Corrie Island (Figure 1). The species has been extending its range south along the New South Wales coast from Queensland, since a

nest was first recorded at Tweed Heads in 1930 (BirdLife Australia 2023). The species is resident along the entire northern Australian coastline, and has been recorded from southern New South Wales (NSW) to Carnarvon in Western Australia. It has a low population in NSW where its conservation status is critically endangered (NSW Scientific Committee 2008). It is an uncommon resident in the Hunter Region (Williams 2025).



Figure 1. Location map, Corrie Island, Port Stephens showing nest site. Image Google Earth.

In Port Stephens, a pair was first recorded breeding on Dowadee Island near Soldiers Point in 2011 (Murray 2019). This pair has continued to nest successfully at that location. Subsequently, another Beach Stone-curlew nest was located on the western end of Corrie Island in October 2017 (Fraser & Stuart 2018, Fraser 2020). This latter record was considered to indicate the likely presence of a second breeding pair in Port Stephens. The outcome of this nesting attempt is unknown. When birds were first reported nesting at Dowadee Island, they were the southernmost breeding pair in NSW (Mo 2016). More recently, a pair was located nesting near Eden in summer 2024/25 (C. Tourenq pers. comm.).

In October 2025 a new Beach Stone-curlew nest was located on Corrie Island (**Figure 2**), and a trail camera was installed to monitor the birds' activity. As the nesting ecology of the species is not well known, this became an opportunity to record insights into the birds' behaviour while incubating and chick raising.

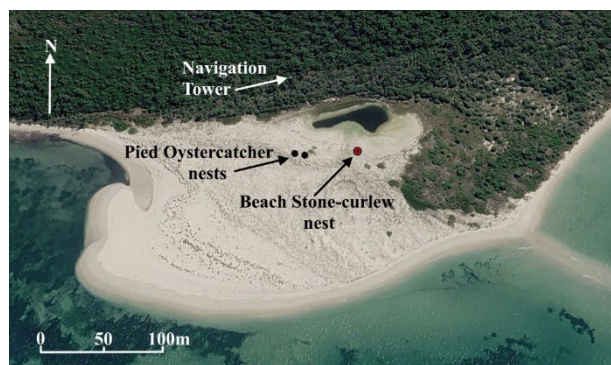


Figure 2. Location of Beach Stone-curlew nest, Pied Oystercatcher nests, lagoon, and navigation tower with Osprey nest, on the southeast corner of Corrie Island. Image Google Earth.

There are only a limited number of studies of Beach Stone-curlew in Australia, and all are restricted to readily observable aspects of the bird's ecology on the east coast. In northern NSW, studies by Clancy (1986), Hole *et al.* (2001), Rohweder (2003), Mo (2016), Murray (2019) and Mellish *et al.* (2012) described the bird's population and distribution, incubation period, breeding success, juvenile plumage development, diet and the impact of disturbance. Noske *et al.* (2024) described the incubation period, breeding success and juvenile development of birds nesting in southern Queensland. There are no studies that attempt to examine the species' behaviour as a function of environmental factors, resource distribution and predation risks.

The objective of the present study is to use data from trail camera images to quantify aspects of the birds' behaviour during incubation and chick rearing with respect to the prevailing environmental conditions and other influences. Aspects of the birds' nest site selection, foraging behaviour and predator deterrence behaviour will also be addressed.

METHODS

Description of the site

The nest was located on the northern side of a small remnant frontal sand dune in an area of active coastal accretion on the southeast corner of Corrie Island (**Figure 2**). The island is a Nature Reserve within the Myall Lakes Ramsar site and is located within Port Stephens at the mouth of the Myall River (32° 40.8'S, 152° 8.0'E). The nest was a shallow scrape in the sand with a single egg, in an area of sparsely growing spinifex grass *Spinifex sericeus* and pigface *Carpobrotus glaucescens*, and littered with beach wrack consisting of woody vegetation fragments and pumice (**Figure 5**). The site was around 120 m from the shoreline. A shallow barrier lagoon 75 m in length was present around 35 m north of the nest. A well-established forest of Grey Mangrove *Avicennia marina* was present along an earlier shoreline 70-80 m to the north. An active Osprey *Pandion haliaetus* nest was present on a marine navigation tower 115 m to the northwest of the nest.

The camera provided a view towards the northwest for a distance of around 90 m during the day. This view included the western section of the lagoon. The field of view was around 55 m wide at its maximum extent. Night-time viewing distance was limited to around 5 m.

Data collection and analysis

Images were obtained by a motion activated Reconyx Hyperfire 2 Covert trail camera with a detection range of 30 m. When triggered, the camera took five consecutive still images, each around one second apart. Shutter speed and ISO varied automatically according to the ambient light conditions. Dual images of different file size were recorded as jpg files and stored on an SD card. Daytime images were high-definition colour and night-time images were monochrome. A No-Glow GEN3 High Output Covert IR flash provided illumination at night. The camera recorded time, date, temperature and phase of the moon for each image. It was attached to a star picket around 2 m from the nest at a height of 60 cm.

A total of 6,118 images were captured from 29/10/2025 to 11/11/2025, while the birds were incubating. The chick hatched on 11/11/2025. A further 3,374 images were taken from 20/11/2025 to 26/01/2026. No images were taken during the intervening period due to camera battery failure. The second tranche of images captured the adults and the chick around the nest site up until 24/12/2025.

The camera continued to monitor the site until 26/01/2026.

All images were examined and analysed for the following activity; presence of adults and/or chick at the nest, incubation session time (time of an individual incubation episode), frequency of incubation session change over, frequency of egg rotation, adult-chick interactions, interactions with other avian species, and other adult and chick behaviours. Although the camera was equipped with a temperature sensor, the readings proved inaccurate. Instead, daily maximum and minimum temperatures, and relative humidity and wind speed at 0900 h and 1500 h, plus daily rainfall records were obtained from the Williamtown Bureau of Meteorology (BOM) Weather Station (https://www.bom.gov.au/climate/dwo/202511/html/ID_CJDW2145.202511.shtml). Observations from surveyors conducting regular monitoring of shorebird nesting on Corrie Island were also obtained.

Data was consolidated into total daily incubation time, number of egg rotations per day, and number of incubation changeovers per day. The frequency of daily egg rotation and total daily incubation time was compared to the BOM daily maximum and minimum temperatures, and the 0900 h and 1500 h wind speed and relative humidity readings using the correlation function (CORREL) in MS Excel to provide correlation coefficients (r). Values of 0.01-0.39 were interpreted as weak correlations and values of 0.40-0.69 as moderate correlations. The interpreted strength of the correlation was the same whether the values were positive or negative. Regression analysis (R^2) using MS Excel was also conducted on some variables.

RESULTS

Incubation

There was considerable variation in total daily incubation time, the number of changeovers for incubation sessions and individual incubation episodes. The maximum, minimum and average values for these three measures are shown in **Table 1**.

Table 1. Minimum, maximum and average total daily incubation time, incubation session changeovers and incubation session times

	Maximum	Minimum	Average
Total daily incubation %	97.3	48.2	81.1
Incubation session changes/day	23	0	16
Incubation session time	6:50	0:02	1:06

Incubation session changeover occurred in two different manners. In some cases, the non-incubating bird would approach the incubating bird while on the nest, and the birds would swap duties. In other cases, the incubating bird would stand, call, and then depart the nest, leaving the egg unattended. Subsequently, the second bird would approach the nest and commence incubating. The period in which the egg was unattended varied from a minute to over an hour.

The percentage of incubation time was also calculated for four six-hour daily time intervals, and the results are shown in **Table 2**.

Table 2. Average percentage of incubation time for four six-hour daily time intervals

Time interval (h)	Incubation%
0001-0600	82.2
0601-1200	79.2
1201-1800	86.7
1801-2400	76.9
Average	81.3

The percentage of daily incubation time and the daily egg rotation were compared with the daily maximum and minimum temperatures, and relative humidity and wind speed at 0900 h and 1500 h. The correlation coefficients are shown in **Tables 3a** and **3b**.

Table 3a. Correlation coefficients (r) for incubation time with maximum and minimum temperatures, relative humidity and wind speed at 0900 h and 1500 h

Environmental factors	Correlation coefficient	Association with incubation
Maximum temperature	-0.031	No association
Minimum temperature	0.029	No association
Relative humidity 0900 h	-0.512	Moderate negative association
Relative humidity 1500 h	-0.425	Moderate negative association
Wind speed 0900 h	0.400	Moderate positive association
Wind speed 1500 h	0.408	Moderate positive association

Table 3b. Correlation coefficients (r) for daily egg rotation with maximum and minimum temperatures, relative humidity and wind speed at 0900 h and 1500 h

Environmental factors	Correlation coefficient	Association with egg rotation
Maximum temperature	-0.303	Weak negative association
Minimum temperature	-0.379	Weak negative association
Relative humidity 0900 h	0.145	No association
Relative humidity 1500 h	0.094	No association
Wind speed 0900 h	-0.025	No association
Wind speed 1500 h	0.183	No association

The relationship between daily incubation time and maximum and minimum temperatures is shown in **Figure 3**. A regression analysis of daily incubation time vs. maximum and minimum daily temperatures was prepared. Linear trend lines were applied and a coefficient of determination (R^2) calculated. The results are presented in **Figure 3**. The relationship between daily incubation time and relative humidity is shown in **Figure 4**.

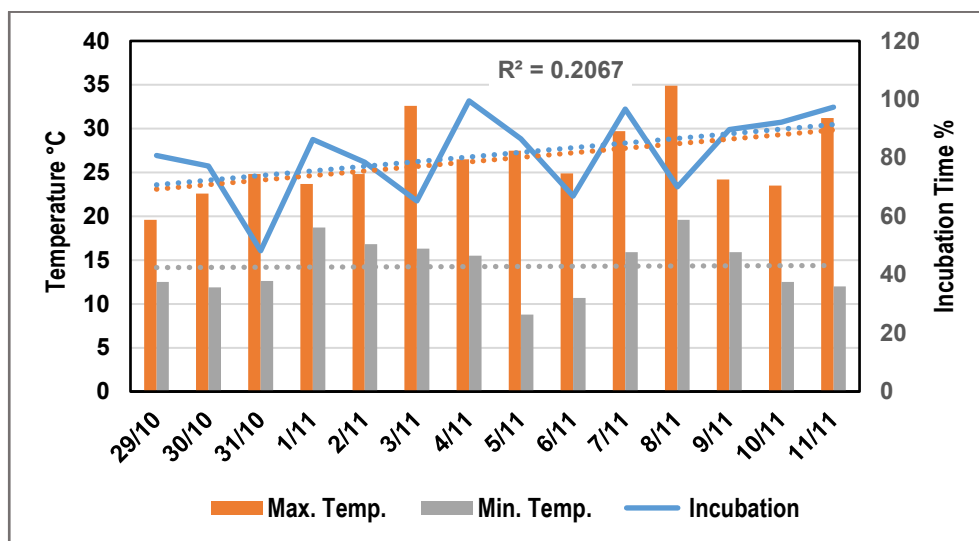
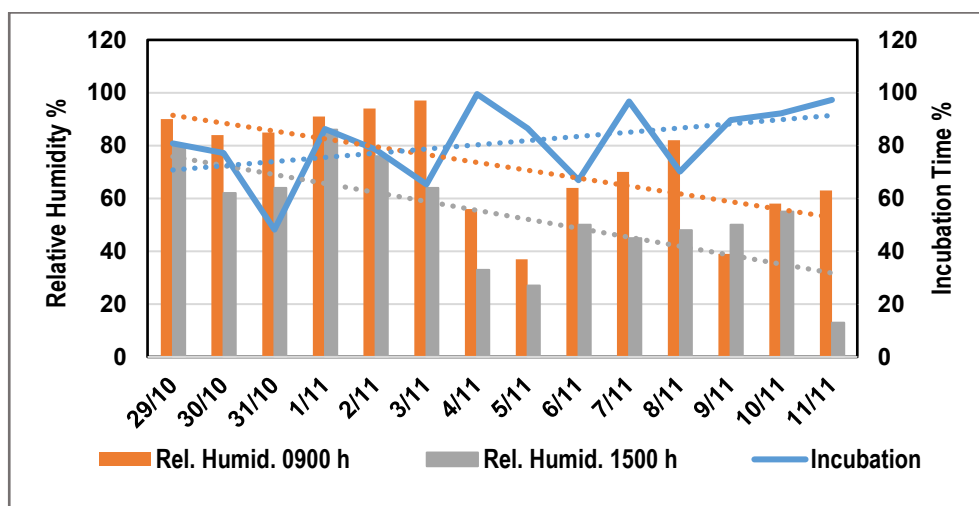
**Figure 3.** Chart showing variation of daily incubation time with maximum and minimum temperatures, and linear trend lines up until date of hatching.**Figure 4.** Chart showing variation of daily incubation time with relative humidity at 0900 h and 1500 h, and linear trend lines up until date of hatching.



Figure 5. Upper left: Beach Stone-curlew nest with single egg. Upper right: Incubating Beach Stone-curlew with flock of Little Corellas. Second bird in background. Lower left: Beach Stone-curlew rotating egg. Lower right: Beach Stone-curlew standing over newly hatched chick (11/11/2025). Photos NPWS trail camera.

On several occasions the incubating adults were recorded exhibiting behaviour designed to lower their body temperature. Gular fluttering was observed when the heat sensor in the trail camera recorded temperatures of 28°C or higher. The birds vibrated the skin and muscles of their throat while keeping their bill open. This behaviour did not trigger the camera on its own and examples seen were captured incidental to other activities. Consequently, the frequency of this cooling behaviour could not be determined.

Incubating birds exhibited a notable difference in behaviour during the night. When not incubating, they would often approach the nest and stop briefly to inspect, before walking away. This behaviour

was not seen during the day. Another notable behaviour involved approaching the nest and probing momentarily with the bill. This occurred during day and night and could be followed by the bird either rotating the egg, maintaining the nest, commencing incubation or walking away from the nest.

When wind velocity was compared with daily incubation time, a moderately positive correlation was determined for both 0900 h and 1500 h wind speeds (**Table 3a**). However, the bird's behaviour in relation to varying wind speed could not be determined from the images.

Egg rotation

Incubating birds rotated the egg throughout the day, and on one occasion at night. The number of daily rotations varied from nil to 13 per day. Rotation usually occurred when birds changed over incubation sessions, and sometimes during a period of incubation. The bill was used to rotate the egg by drawing it towards the bird, while the feet were sometimes used to hold the egg in place (**Figure 5**). The rotation process varied from a quick sweeping motion with the bill to an extended period of adjustments over 1-2 minutes using both bill and feet.

The frequency of egg rotation was compared with the daily maximum and minimum temperatures, and the 0900 h and 1500 h relative humidity and wind speed. The correlation coefficients are shown in **Table 3b**. A weak negative correlation was demonstrated for maximum and minimum temperatures.

Chick raising

As a result of camera failure, no images from the first eight days of the chick's life were obtained. The first images of the chick were obtained on day nine. These showed the chick standing in, and immediately adjacent to the nest (**Figure 6**). On all occasions when photographed, the chick was seen in close proximity to one of the adults. Images of the chick in and around the nest were captured on 15 occasions, including five at night. The last image of the chick was captured on day 41. Images illustrating the chick's physical and plumage development over this period are shown in **Figure 6**.

On day 9, the chick was covered in grey down with four longitudinal stripes on the upperparts and irregular black marks on the head and neck. A pronounced black stripe was present from behind the eye to the nape. The bill was black. On day 24, the runner was covered in light grey down with four longitudinal stripes on the upperparts. The black stripe from behind the eye to the nape was still present. A white ear patch was also present behind the eye. The bill was black and the legs greenish-grey. On day 32, the down on the chick had been partly replaced by feathers on the wings and back. Black markings were on the head only. The white ear patch had extended down the neck. A short white eyebrow had formed. The iris was yellow, the bill was black and the legs greenish-grey. By day 41, the breast and mantle had a coverage of buff-grey feathers. Feathers were beginning to develop

on the head and neck. A white eyebrow had started to develop along with a pale chin. The iris was yellow, the bill was black and the legs greenish-grey.

An image of an adult bringing food to the chick was captured on day 9. At various times, adults sat on the nest for extended periods, although the chick could not be seen. While camera images showed the chick at or in the vicinity of the nest on many occasions, observers conducting weekly surveys of summer shorebird breeding activity on the island, only managed to find the chick once. On day 9, it was photographed with its parents sheltering behind a dead tree at the northern end of the lagoon. It was around 65 m from the nest and in close proximity to two Masked Lapwings.

The Beach Stone-curlews were recorded in the vicinity of the nest site until 24/12/2025, 44 days after hatching. After that date there are no further images, and the birds are considered to have abandoned the site and moved the chick elsewhere.

Interactions with other avian species

Following the chick's hatching, the Beach Stone-curlews were observed giving mantling displays on several occasions. In these displays, the birds would hunch down, splay their wings out wide and puff out their chests (**Figure 7**). Only on one occasion was a potential predator observed. On the chick's day 31, an adult displayed towards a Black-shouldered Kite *Elanus axillaris* that flew over the nest. On another occasion, an adult was observed looking skywards immediately after a mantling display. Following this display the bird ran rapidly towards an unseen intruder with head down and wings outstretched while calling (**Figure 7**).

Several other avian species were recorded near the nest, on the adjacent sand flats and around the lagoon while the birds were incubating. The most prominent was a large flock of foraging Little Corella *Cacatua sanguinea* which surrounded the nest on several occasions. The incubating bird remained alert while the corellas were present but did not take any agonistic action (**Figure 5**).

Other species recorded near the nest during incubation were Masked Lapwing *Vanellus miles*, Pied Oystercatcher *Haematopus longirostris* and Red-capped Plover *Anarhynchus ruficapillus*. Birds on or around the nearby lagoon were Silver Gull *Chroicocephalus novaehollandiae* and Australian Pelican *Pelecanus conspicillatus*. No defensive action was taken towards these species.

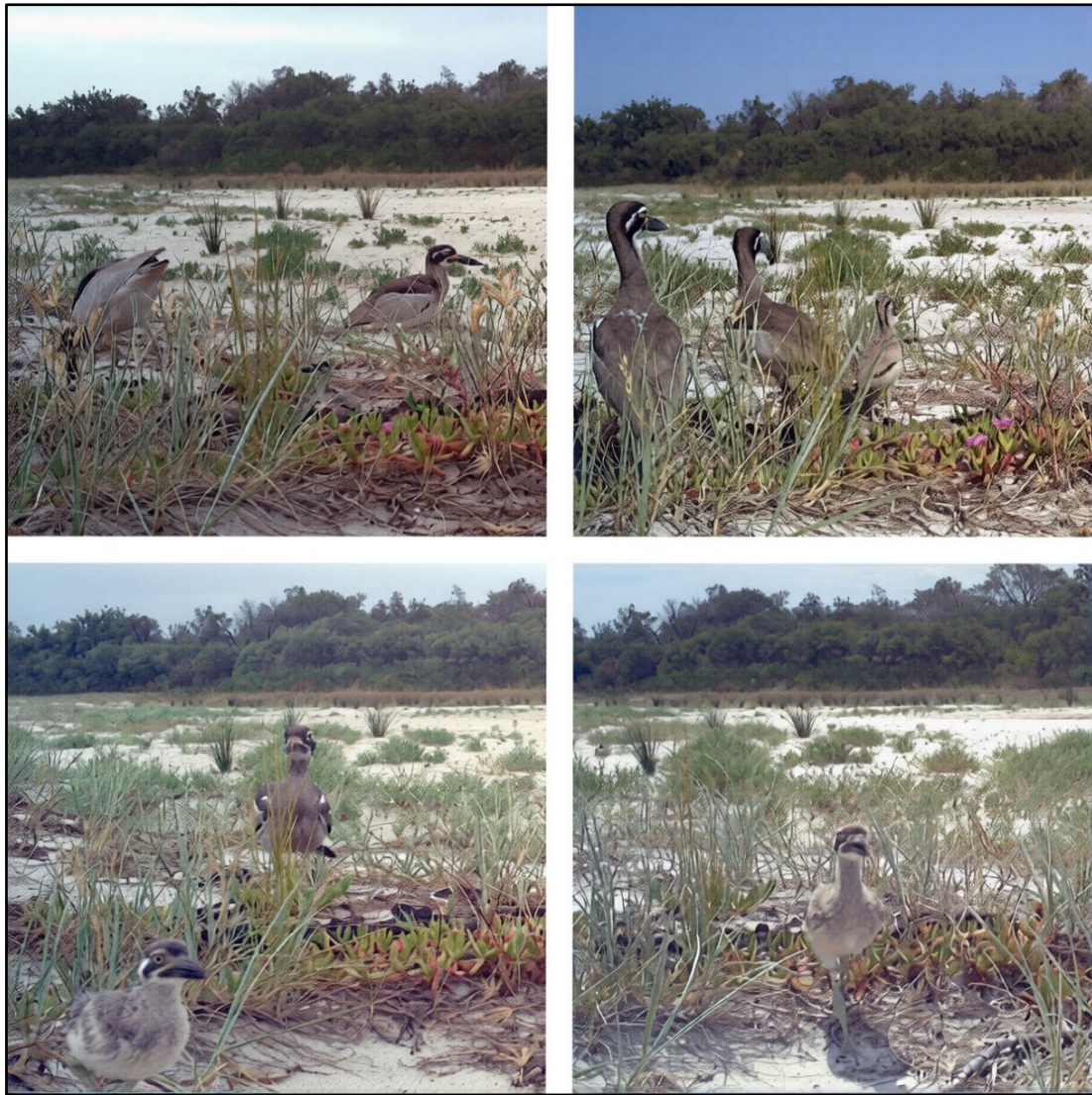


Figure 6. Beach Stone-curlew adults and chick at the nest showing plumage development and growth over six weeks. **Upper left:** Day 9. **Upper right:** Day 24. **Lower left:** Day 32. **Lower right:** Day 41. Photos NPWS trail camera.



Figure 7. Beach Stone-curlew defensive behaviour towards threats. **Left:** Mantling. **Right:** Running attack. Photos NPWS trail camera.

A pair of Pied Oystercatchers made two nearby nesting attempts, 50-60 m west of the Beach Stone-curlew nest during the latter's nesting period. Their first nest was abandoned, but the birds successfully fledged a chick on a second attempt. An adult oystercatcher was photographed displaying aggressively towards a Beach Stone-curlew in defence of its newly hatched chick (**Figure 8**).

Avian species present while the chick was known to be present were White-faced Heron *Egretta novaehollandiae*, Australian Raven *Corvus coronoides* and Australasian Pipit *Anthus novaeseelandiae*. These three species closely inspected the vacated nest with the ravens doing so on several occasions. Other species present were Bar-shouldered Dove *Geopelia humeralis*, Pied Oystercatcher, Silver Gull, Greater Crested Tern *Thalasseus bergii* and Eastern Rosella *Platycercus eximius*. No agonistic actions towards these species were recorded.



Figure 8. Pied Oystercatcher, with newly hatched chick, showing agonistic behaviour towards approaching Beach Stone-curlew (9/12/2025). Photo Sharon Taylor.

After the Beach Stone-curlew abandoned the site, there was a considerable increase in the number of other species and number of birds present in the general vicinity of the nest and the lagoon. These included Black Swan *Cygnus atratus*, a large flock of roosting Australian Pelican, Masked Lapwing, a flock of Far Eastern Curlew *Numenius*

madagascariensis, White-faced Heron, Australian Raven and Osprey.

Foraging

No images were captured of the adult birds foraging or carrying food prior to the chick hatching. The first such image was on the chick's day nine. An adult bird approached the nest with what appeared to be a shore crab in its bill. The feeding interaction between the adult and the chick occurred just out of the camera view. The crab was not disarticulated. Another instance of an adult carrying prey was recorded on the chick's day 41. In this instance, the adult did not look for the chick near the nest and continued walking away from the camera towards the west. The type of prey could not be identified.

It is not known where the birds foraged. During the period captured by the trail camera, when departing from or returning to the nest, the birds were most frequently observed heading towards or returning from the direction of the lagoon (see **Figure 2**). The birds that were seen carrying food appeared from that direction. They were not observed foraging around the section of the lagoon covered by the trail camera. Observers conducting regular surveys of shorebird breeding on Corrie Island, noted the adult pair on the beach but saw no indications of foraging (T. Blair pers. comm.). Prior to and after nesting, the birds were observed foraging for shore crabs amongst nearby tidal mangroves (S. Taylor pers. comm.).

DISCUSSION

There are many factors that influence the behaviour of Beach Stone-curlew when selecting a nest site, incubating their egg and raising their chick. The following section discusses some behaviours in relation to measurable environmental factors and direct observations. The egg was laid shortly before 10/10/2025 (S. Taylor pers. comm.), which indicates a minimum incubation time of 33 days. The camera images cover only 42% of that time leading up to hatching on 11/11/2025. Incubation period for the species elsewhere has been observed as minimum 33 days on Bribie Island, Queensland (Noske *et al.* 2024) and minimum 30 days at Red Rock NSW (Clancy 1986).

Temperature records from the trail camera were not used. When compared to the 0900 h and 1500 h BOM observations, individual records were found to be 2.6 - 15.6°C higher. The camera's temperature

sensor is housed inside its rugged weather-resistant casing, and consequently records the internal compartment's temperature. Williamtown is located 30 km southwest of Corrie Island and is 6 km from the coast, and consequently weather conditions will not be identical to those at the beachside nest site. Temperatures from the BOM ranged from a minimum of 8.8°C to a maximum of 34.9°C, over the incubation period.

As the camera was motion activated, observations were limited to those occasions when the birds were moving while in range. The camera images were unable to discriminate when windy conditions and rain influenced behaviour.

Incubation

The most significant outcome of this study was the demonstration of a moderately strong negative correlation between the extent of daily incubation and relative humidity (**Table 3a**). This diverging trend is illustrated in **Figure 4** where incubation is shown to increase as relative humidity decreases. However, this correlation doesn't indicate causation and does not prove that the changes in the variables are related. It does however, indicate that relative humidity could be one component of the drivers that cause the birds to increase incubation time. The increase in incubation time could also be driven by the bird's awareness of the approach of the chick's hatching.

Another measure of the bird's response to relative humidity is indicated by the higher amount of incubation time in the afternoons (1201-1800 h) compared to other periods of the day (**Table 2**). Over the period in which the birds were incubating, the daily relative humidity recorded at 1500 h, on all but one occasion, was 5-79% less than in the morning (**Figure 4**).

During incubation, all avian eggs lose water by diffusion through the pores in the eggshell. The higher the humidity level of the air surrounding the eggs, the lower the water loss rate and the lower the embryonic mortality rate. Birds regulate relative humidity and water loss from the egg through incubation. Humidity regulation also influences the egg's heat loss through evaporation (van der Pol *et al.* 2013). Consequently, increased incubation time would be expected when relative humidity is low.

It is unclear as to whether temperature is a driver of the bird's incubation behaviour. It would be anticipated that incubation time would increase during periods of lower temperature. While there

was no correlation between temperature and incubation time (**Table 3a**) the regression analysis of incubation time vs. maximum temperature (**Figure 3**) provided an R^2 value 0.207. This indicates 20% of the variation in incubation time can be explained by change in temperature. It is possible that a correlation between increasing incubation time with lower temperature to keep eggs warm may have been masked by increased incubation time at higher temperature to keep eggs cool.

The daily minimum and maximum temperatures ranged from 8.8 to 34.9°C during incubation. The optimal temperature for embryonic development across a wide variety of species ranges from 36 - 38°C (Smith *et al.* 2012). However, nesting on sand does not offer thermal stability advantages as it heats up rapidly under direct sun and cools rapidly at night. There were also no potentially insulating materials in the nest. It appears that the incubating birds were able to maintain optimum embryonic temperature and humidity levels mainly through a high level of daily incubation (average 81.1%). This included gular fluttering when ambient temperature became too hot. However, it cannot be ruled out that the increase in incubation time also reflected the parents' awareness of approaching hatching. The cooler temperatures at night did not appear to greatly impact the amount of incubation time (**Table 2**).

Wind speed had a moderate positive correlation with incubation time (**Table 3**). Windy conditions increase heat loss from the egg and can force birds to spend more time sitting on the nest (Smith *et al.* 2012). However, the use of a trail camera does not provide a mechanism for monitoring the behaviour of the birds in varying wind speed conditions.

Egg rotation

Daily egg rotation rate showed no correlation with relative humidity or wind speed (**Table 3b**). There is however a weak negative correlation with temperature indicating that increasing temperature may be one factor driving reduced egg rotation rates. However, egg rotation was not recorded every day.

Neither the physical nor the physiological basis for egg turning during incubation in birds is well understood (Peskova *et al.* 2026). Reasons suggested include: maintaining even heat distribution in the egg; preventing the embryo sticking to the shell membrane; and to properly mix the nutrient-rich albumen. Regular movement also

aids gas exchange through the shell pores. Frequency of rotation may also be related to egg size and albumen content. However, egg-laying reptiles and mammals do not rotate their eggs, so the reasons remain obscure (Peskova *et al.* 2026).

Interactions with other species

There is no evidence of agonistic behaviour towards other avian species that were present while the birds were incubating. The Little Corella, Masked Lapwing, Pied Oystercatcher and Red-capped Plover that were recorded near the nest site were not seen as threats by the Beach Stone-curlews.

However, once the chick had hatched, frequent mantling displays and aggression to mostly unseen threats were observed. The most probable threats to the chick would have been from Silver Gulls, Australian Ravens and raptors. The former two species were regularly recorded near the nest site and the lagoon, and a Black-shouldered Kite was observed as the subject of a mantling display. The nearby nesting Osprey would not have been a threat to the chick, but White-bellied Sea Eagles and Brahminy Kites, which are common in Port Stephens (Stuart 2024), would have been threats.

While the Beach Stone-curlew behaved aggressively towards avian threats, the birds were similarly perceived as a threat by Pied Oystercatchers after their chick had hatched (Figure 8).

The increase in the number of avian species around the nest site after it had been abandoned, suggests that the Beach Stone-curlews' territorial and agonistic behaviour resulted in a reduced presence of other species around the site while the birds were incubating and chick raising.

Corrie Island is an occasional destination for recreational boat users and fishermen. The extent to which the nest site was subject to human disturbance is unknown, apart from regular surveyors. The incubating birds moved away from the nest at times when observers were present.

Nest site selection

The Beach Stone-curlew is a strictly coastal species. Many factors influence their nest site selection (BirdLife Australia 2023). These include nest placement above high tide level to avoid inundation; access to the shoreline for foraging; textured substrate to provide camouflage for eggs; low, sparse vegetation to provide open views of potential

predators and shelter for chicks. Other factors are avoidance of predators and human disturbance and ready access to nearby intertidal zones with rich food supplies, primarily crabs and marine invertebrates. The nest site on the southeast corner of Corrie Island (Figure 2), ticks all these boxes. There is also a possibility that nest site selection may have been influenced to a degree by commensalism derived from the presence of the nearby nest of non-threatening Ospreys.

Canine predators that had previously preyed on nesting shorebird eggs and chicks on Corrie Island were removed by NPWS in 2025 (K. Howard pers. comm.).

However, the selection of the nest location on Corrie Island raises some interesting questions. Beach Stone-curlews exhibit a high degree of faithfulness to nest sites (Hole *et al.* 2001; Rohweder 2003; NSW Scientific Committee 2008; Murray 2019; BirdLife Australia 2023; Noske *et al.* 2024). The site of the previous 2017 nesting attempt on Corrie Island was 750 m west of the current nest (Fraser & Stuart 2018). The 2017 site is thought to have been used only once, although birds have been regularly recorded on the island since then. The 2017 site is located immediately adjacent to a food source – an extensive mudflat that hosts hundreds of soldier crabs at low tide (N. Fraser pers. obs.).

Beach Stone-curlew have a well-documented preference for foraging on crabs, particularly soldier crabs (Clancy 1986; Hole *et al.* 2001; Rohweder 2003; Mellish & Rohweder 2012; Murray 2019; Noske *et al.* 2024). Armies of soldier crabs on mudflats at low tide provide an attractive prey item that can be taken with minimal effort. Both the Light-blue Soldier Crab *Mictyris longicarpus* and the Dark Blue Soldier Crab *Mictyris platycheles* are present in Port Stephens (N. Fraser pers. obs.). However, soldier crabs have not been observed in the vicinity of the current nest (T. Blair pers. comm.). The nest is 35 m from a lagoon, 120 m from a sandy shoreline and around 200 m from a shoreline fringed with mangroves, all of which could be potential sources of food. Ghost Crabs *Ocypode cordimana*, also a food source, are present on the beaches and adjacent sand flats. A study of Beach Stone-curlew scat on the NSW north coast revealed the dominant prey were Light-blue and Dark Blue Soldier Crabs. Other prey included lesser amounts of shore and marsh crabs of the Grapsidae family and ghost crabs of the Ocypodidae family, as well as insects (Mellish & Rohweder 2012).

The nest record from 2017 (Fraser & Stuart 2018, Fraser 2020) was thought at the time to represent the presence of a second Beach Stone-curlew pair nesting in Port Stephens (Murray 2019). Up until then, a pair that had been nesting regularly on Dowadee Island since 2011, were the only known breeding birds in Port Stephens. Dowadee Island is 7 km west of Corrie Island.

In August 2025, three adult birds were present on the southern shoreline of Corrie Island (**Figure 9**). These may have been the birds from Dowadee Island with a mature offspring or additional birds that had been nesting at a previously unrecognised location in Port Stephens.



Figure 9. Three adult Beach Stone-curlew, southern Corrie Island, 21/08/2025. Photo Sharon Taylor

The Beach Stone-curlew nesting on Corrie Island in summer 2025/26 could represent an additional pair, new to the area, and breeding for the first time, or they could be the birds from Dowadee Island choosing to nest at a different location. Dowadee Island is reported to have become increasingly inundated by high tides recently, making the site potentially unsuitable (T. Murray pers. comm.).

Prior to nesting and subsequent to abandoning the nest site, adult birds were seen foraging amongst the tidal mangroves on the northern and western sides of the Winda Woppa sandspit. They were not observed on the tidal flats to the west of Corrie Island where Soldier Crabs are abundant (S. Taylor pers. comm.). Winda Woppa is located around 1.5 km northeast of the nest site. Numerous shore crabs are present in this area. Pre-nesting familiarity with

this food source may have influenced the birds' selection of the nest site, and post-nesting relocation to the adjacent Winda Woppa sandspit. It appears the birds preferred to forage for shore crabs rather than the potentially more abundant and readily obtainable soldier crabs.

CONCLUSIONS

This study has attempted to identify some of the environmental and other factors that drive the behaviour of Beach Stone-curlew while incubating and chick raising on Corrie Island. Potential drivers considered were temperature, relative humidity, wind speed and rainfall. Conclusions are limited to the 14-day period of incubation leading up to the chick hatching.

A moderately strong negative correlation between the extent of daily incubation and relative humidity was demonstrated and a moderately positive correlation between wind speed and daily incubation was present. This implies that incubation time increased during periods of lower relative humidity and higher wind speed. There was no correlation between temperature and incubation time, although a positive trend was demonstrated by regression analysis. Correlation between increasing incubation time and lower temperature to keep eggs warm may have been masked by increased incubation time at higher temperature to keep eggs cool. The frequency of egg rotation showed a weak correlation with temperature, but no correlation with relative humidity or wind speed.

These associations do not confirm that temperature, relative humidity and wind speed are direct drivers of the birds' behaviour, but they do indicate that these may be contributing factors. More detailed research is required to identify the extent to which these drivers are active.

Observations of foraging suggest that shore crabs may have been a major component of the birds' diet prior to, during and after chick raising. This differs from other studies and observations that identified Soldier Crabs as the dominant diet component.

This study was limited by the extent of trail camera images that covered only 42% of the incubation period. Extended coverage of incubation would allow a more detailed analysis and firmer conclusions. Recorded Beach Stone-curlew movements indicated that a considerable amount of activity occurred in the vicinity of the nest, but just outside the camera's field of view. It is

recommended that future camera placement around 4 m from the nest be considered. Calibration of the camera's temperature sensor is also required.

The outcomes of this study also highlight the limitations of behavioural studies based on trail camera images. Cameras can only capture what is occurring in their field of view, and only while the subjects are moving. The images cannot be used to identify periods of rain and high wind and the birds' response to these conditions. To be more effective, behavioural studies incorporating trail camera data require additional support from regular observer-based field studies.

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