

# **Behavioural Inventory of Bald Eagle (*Haliaeetus leucocephalus*) Chicks of Northeast Florida**

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## **Abstract:**

Bald Eagles have previously been considered an endangered species in the United States, after populations declined due to DDT pesticide exposure. The species population has since recovered and is no longer endangered, however if populations decline again in the future establishing a behavioural baseline of wild bald eagle chicks may serve as a useful tool for future conservation efforts. In this study, Bald Eagle chick behaviour was surveyed via an online live webcam stream of a nest in Northeastern Florida to document commonly observed behaviours, and their relative frequencies. I found that 6 behaviours of sitting, standing, laying, preening, stretching and feeding were most commonly observed, and one additional alternate breathing pattern of panting was observed. The relative frequencies of the observed behaviours was laying 62%, sitting 20%, feeding 9%, standing 5%, preening 2%, and stretching 2%.

## **Methods:**

Bald Eagle chick behaviour was surveyed online using the NEFL Cam streams available on Youtube: <https://www.youtube.com/watch?v=SrKkGqkQG6M>. Streams from Cam 4 and Cam 1 were principally used, as these showed the best angle and view of the nest. Behaviour was initially monitored for an hour to establish the variation of behaviours exhibited in the nest. The variation in behaviours included stretching, sitting, standing, preening feathers, feeding and laying. It was observed that the parent eagles were not always present, and thus behaviour was focused on the nestlings.

Next, behaviour was instantaneously observed at intermittent times between 7h and 23h, for eleven days from March 11<sup>th</sup>- March 20<sup>th</sup>, 2022. Individual observation windows were randomly chosen. Between 6 and 24 instantaneous observations were made each day, with an average of 12 observations per day. During the monitoring time windows, an Excel spreadsheet was used to record the time, day, number of chicks in the nest, their behaviour, and whether a

parent was in the nest, perching nearby, or absent. If observed, changes between behaviours were also noted. Visual screenshots were taken of the webcam footage to visually document the exhibited behaviours.

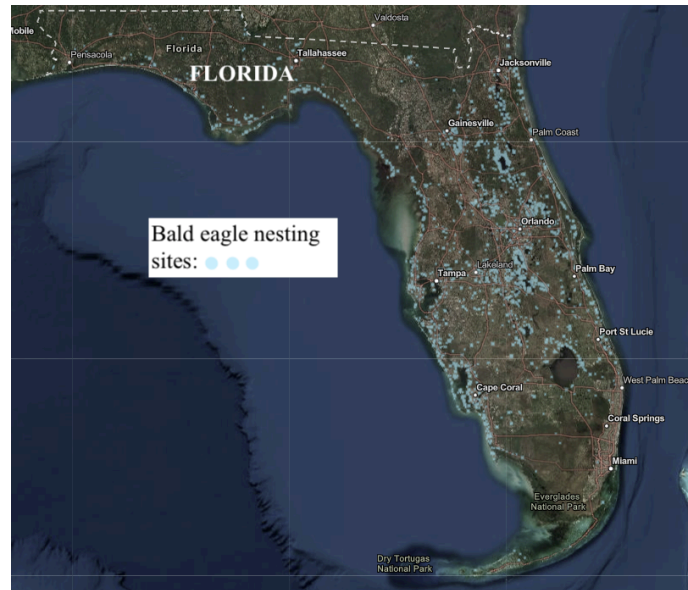
Additionally, respiratory rates were estimated on a single day, by counting number of chest expansions observed per minute. The estimations were recorded twice in total: once during earlier hours (12:35h), and once during later hours of the same day (14h) . During later observation periods of the study, a brief description and potential rationale were also composed for each behaviour that was recorded, in the context of the overall behaviour observed.

After the collection of raw data, data was analyzed to determine the relative frequencies of exhibited behaviours, to see which behaviours were most and least common in the nest. To determine the frequencies, the data was filtered in Excel to count the number of times each behaviour occurred. Subsequently, the number of times a particular behaviour was recorded was calculated a percentage of total observations recorded, and the resulting relative frequencies were visualized in a pie chart using Excel.

## **Introduction:**

Florida has a high density of nesting bald eagles (*Haliaeetus leucocephalus*) compared to other states within the USA, with an estimated 1500 nesting pairs present (FWC, 2022). The majority of nesting sites are localized near bodies of waters such as lakes and rivers, or near the coastlines of Florida (Fig. 1). Bald eagles are no longer considered as endangered or imperiled species, as populations successfully recovered after DDT pesticide exposure, which historically affected the species' ability to produce durable eggshells (Henny et al., 1992). Nonetheless, some

American federal acts and treaties remain in place to protect the species to promote beneficial conservation practices.



**Figure 1:** Map of historical bald eagle nesting areas, conducted by the Florida Fish and Wildlife Conservation Commission (FWC). Blue dots represent eagle nesting sites, spotted from aerial surveys between 1998 and 2017. (Modified from FWC, 2022).

Although the species is currently not in danger of extinction, if population numbers decline in the future, it may be beneficial to understand the behavioural baseline of bald eagle chicks in the wild, should behaviour be monitored in captivity for abnormalities. Thus, understanding wild bald eagle chick behaviour may serve as a beneficial future conservation tool to the species, should they become endangered once again.

This study examines behaviour of two bald eagle chicks, roughly 2 months in age and of undetermined sex. A nest of an undisclosed location within Northeast Florida was surveyed using a live webcam stream through the American Eagle Foundation to document the most commonly observed behaviours.

## Results:

A total of 6 distinct behaviours were observed throughout the observation periods (Table 1). These behaviours were divided into two categories: resting and active behaviours. Within resting behaviours, sitting, standing and laying were observed (Table 1). Within active behaviours, stretching, preening and feeding were observed. Additionally, one alternate breathing pattern of increased respiratory rate was observed throughout these behaviours. Breath rate estimates were 92 breaths/minute at the observed heightened rate, and 27 breaths/minute at an observed baseline rate.

**Table 1:** Commonly Observed Chick Behaviours

**Laying:** Chicks were often observed to rest in a laying down position. Eye movements were usually slow blinking, and breathing was slow and rhythmic. Head positioning was observed to be in a rested position. This posture was usually observed for longer period of times (30 minutes to 2 hours at a time). Few vigilant states were also observed where blinking was rapid and the chicks' heads were raised while laying down.



**Sitting:** Resting position commonly observed where chicks appeared to be sitting upwards. Body posture consisted of shifting bodyweight backwards with tarsals extended in front of body. This was commonly observed after feeding.



***Sitting: cont.***



***Standing:*** Behaviour similar to standing, or perching as if on a branch, was often observed. This body posture consisted of chicks standing in an upright position on their tarsals, with no noticeable body weight resting on the ground.



***Feeding:*** Feeding was commonly observed after a parent brought prey to the nest. Most often the prey was fish, for one observed exception of a weasel. Chicks almost always fed independently, using their tarsals to hold prey down while they tore it apart using their beaks. In particular, chicks fed independently on fish, however they waited for a parent to dismember the weasel before eating it. Most often, one chick began eating first while pushing the other away from the food. The non-feeding second chick often retreated away from the prey to sit and watch.

*Feeding: cont.*



**Stretching:** Stretching was often observed during resting periods such as sleep, or from a laying position. A single wing would be laterally extended for a brief period of 2-3 seconds, then to be tucked back into a resting position. The laying position was maintained throughout the movement. Extension of both wings simultaneously from a laying position was never observed.



***Preening:*** Chicks preened their feathers and wings, to self-groom periodically. This behaviour was often observed during the day, and was never observed at night.



***Alternate Breathing Pattern - Panting:*** Breathing through an open beak or panting was observed, accompanied by increased breathing rate from observed baseline levels. This was most notable through arduous breathing and rapid chest expansion and contraction. The estimated observed respiratory rate was 93 breaths/minute, in comparison to 27 breaths/minute observed at later hours of the same day. This behaviour was commonly observed in the local hours of 12h-14h, and the nest appeared to be exposed to direct sunlight with no shade falling over the nest at these times. See discussion for further insight on this behaviour and temperature.

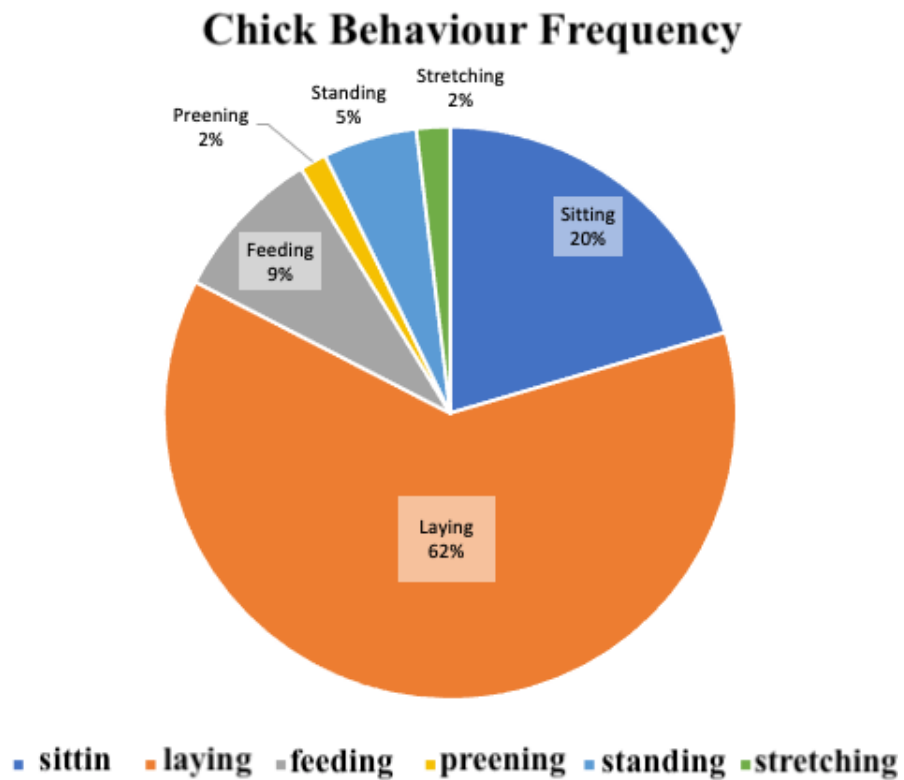




*Alternate Breathing Pattern – Panting: cont.*



The observed frequencies of these behaviours were: laying 62%, sitting 20%, feeding 9%, standing 5%, preening 2%, and stretching 2% (Fig. 2).



**Figure 2:** Frequency of Observed Chick Behaviours. The frequency of recorded observed behaviours was: laying 62%, sitting 20%, feeding 9%, standing 5%, preening 2%, and stretching 2%.

## **Discussion:**

The chick behaviours of highest frequencies were resting behaviours: laying and sitting (Fig 2). Whereas behaviours with lowest frequencies were active behaviours such as preening and stretching (Fig 2). This finding of passive resting behaviours, such as sitting, being observed more frequently than active behaviours, such as preening or movement, are consistent with results from a behavioural study conducted on Washington bald eagles (Bradshaw, 2011). The increased frequency of resting behaviour may be partially explained by energetic cost, as sedentary behaviours such as sitting or laying require lower energy expenditure in comparison to active behaviours (Masman et al., 1998).

A limitation of this study is that most observations were made during daytime, which could result in collected data that is biased towards daytime behaviours. Additionally, recorded behaviours may be representative of chicks in the surveyed nest but not representative of all Northeast Florida's chicks. Despite this, as findings were similar to previous studies investigating bald eagle behaviour, this is likely not a significant factor (Bradshaw, 2011). To mitigate the bias of daytime recordings, future studies may choose to investigate behaviour equally throughout the day and night.

Interestingly, the observed ability of chicks to independently feed on fish, which makes up the majority of their diet, and not weasel, may demonstrate an increased difficulty of feeding that develops at later stages of maturation. The thick skin of the weasel may require more force and coordination to remove, which may be difficult task at this stage of the chicks' development. Alternatively, this hesitation to eat the non-fish prey may simply be a due to a lack of preference, as strong preferences toward fish prey have been previously documented (Retfalvi, 1965). Future observations later in chick development could provide insight whether this is preference or

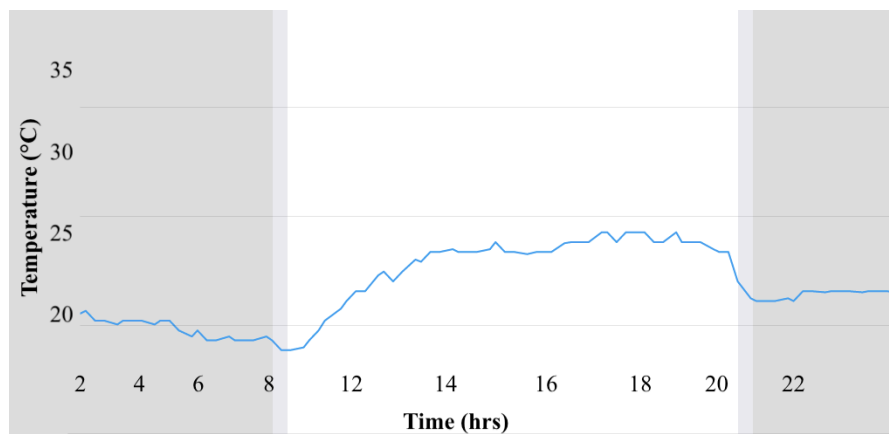
development-based, by examining whether older chicks are able to independently feed on weasel or large rodent prey.

Furthermore, during feeding, the behavioural dynamic of one chick eating first while pushing the other away may be dominance related. This dominance exhibited by the single chick who fed first, may be in accordance with the sex of the birds. Female chicks are usually larger, due to the sexual dimorphism of the species, and usually outcompete male chicks for feeding. (Bortolotti, 1986, Drummond et al., 1991). However, as the sex of the chicks was undetermined, it is difficult to conclude whether this is the case. Alternatively, chicks may be of the same sex, yet the more dominant and aggressive chick may have a competitive advantage against the less aggressive chick due to an increase in size (Bortolotti, 1986). This increase in body size endowing an advantage in sibling competition has been commonly observed across avian species (Meyburg, 1974, Procter 1975, Werschkul 1979). Most often, larger first-hatched chicks will assert dominance through aggressive behaviour early on during the nestling period (Bortolotti, 1986). Ultimately, sibling aggression has been previously documented in bald eagles and thus this interpretation of dominance-like behaviour may be warranted (Bortolotti, 1986). Future studies may determine sex, or measure differences in chick mass to further examine the effects of these factors on dominance-related behaviour and feeding patterns.

Finally, the observed panting-like behaviour, or breathing with an open beak, could be an attempt to cool down body temperature and promote heat loss. As birds lack sweat glands, and thus rely on their respiratory system to thermoregulate (Brackenbury, 1991). This breathing behaviour was commonly observed in the local hours of 12-14h, seeming to coincide with some of the hottest hours of the day (Fig 3), however a direct correlation was not investigated. Additionally, exposure to direct sunlight in the nest may potentially influence this behaviour.

Future studies may examine and record panting breathing patterns across multiple days to determine whether there is a correlation between increased temperatures and increased respiratory rates or levels of direct sunlight exposure.

In brief, future studies are suggested to examine potential correlations between observed behaviours and developmental, as well as environmental, factors. Examining these relationships in further detail would elucidate the behavioural tendencies of bald eagle chicks with finer resolution.



**Figure 3:** Northeast Florida Temperature: Sample daily trend (Recorded 03/18/2022). Data from NOAA 2022.

### **Conclusion:**

This study describes six of the most commonly observed behaviours, their relative frequencies, and one alternate breathing pattern exhibited by 2-month-old bald eagles, in a Northeast Florida nest. These observed behaviours may serve as a foundational baseline for future studies which characterize bald eagle chick behaviour throughout stages of development. Additionally, this baseline may provide a useful comparison for inferring abnormal bald eagle chick behaviour in captive environments such as zoos or rescue sanctuaries. Thus, this

documented baseline for potential behavioral comparisons can serve as a useful tool to aid future conservation efforts, if bald eagle populations decline again in the future.

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