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# Seasonal Weight Changes in Barred Owls by Sex

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## Abstract

*In a study of Barred Owls (Strix varia) on Bainbridge Island, WA, a seasonal change in weight was noted between the sexes. Both sexes were heaviest at the onset of the breeding season, but females lost weight at a greater rate than males, resulting in an overlap in weights between the sexes from February through October. Several weight measurements of both female and male Barred Owls were greater than the published maxima, and the study documented circumstantial evidence of nesting female Second Year (SY) Barred Owls.*

## Introduction

Barred Owls (*Strix varia*), whose range has been expanding, are a permanent resident of many areas of North America. They were first observed in Washington State in 1965 and have since increased their range (Taylor and Forsman 1976). Due to this species' negative impact on its congener, the Spotted Owl (*S. occidentalis*) (Mangan et al. 2019), a large body of data is being collected to document population dynamics and juvenile dispersal on Bainbridge Island. Measurements and observations included weight, wing chord, foot pad, tail length, breeding success, pair fidelity, juvenile dispersion, and molt characteristics were collected from the same population of Barred Owls since 1996. While weight is often used to aid in the sexing of many owl species (Karalus and Eckert 1974), there is an overlap in weight ranges between sexes of After Hatching Year (AHY) Barred Owls (Mazur and James 2020) at least from February through October that makes sexing based solely on weight suspect.

Located 11 km west of Seattle, WA, Bainbridge Island is 72 square km<sup>2</sup> and has a human population of 24,000 (bainbridge Wa. gov).

The island averages 94 cm of rain and 28 cm of snow, with cloud coverage 225 days per year. The average winter temperature is 5 °C, and the average summer temperature is 18 °C. Barred Owls were first detected on the island in 1993 and have since increased to over 35 pairs.

## Methods

AHY Barred Owls were captured in mist nets, noosed, or captured in a Swedish goshawk trap under federal permit number 23995 and were banded with both a federal band on one leg and a single band with a bicolored patterned band for individual recognition in the field on the other leg. The Barred Owls were sexed by one or a combination of the following methods: pair association, seasonal brood patch, weight (Mazur and James 2020, Earhart and Johnson 1970), call pitch (Bent 1938, Kroodsman 2005, Mazur and James 2020) and foot pad measurements (Pyle 1997). During the breeding season, especially during the incubation phase, breeding females develop brood patches that are observable when they are off the nest. Males have a lower pitch call than females, and this method of sexing was used primarily with calling pairs and not with individual Barred Owls. Males have measurably smaller footpads and weight (Mazur and James 2020) than females, but these measurements alone must be used with caution because of an overlap in these measurements in an area's population. Weights were taken using an Ohaus spring scale, 0-1,000 g in 10 g increments from 2001-2005, an Ohaus spring scale, 0-2,000 g, in 20 g increments from 2005-2011, and a Dune 0-2,000 g +/- 1 g digital scale from 2011 to 2020.

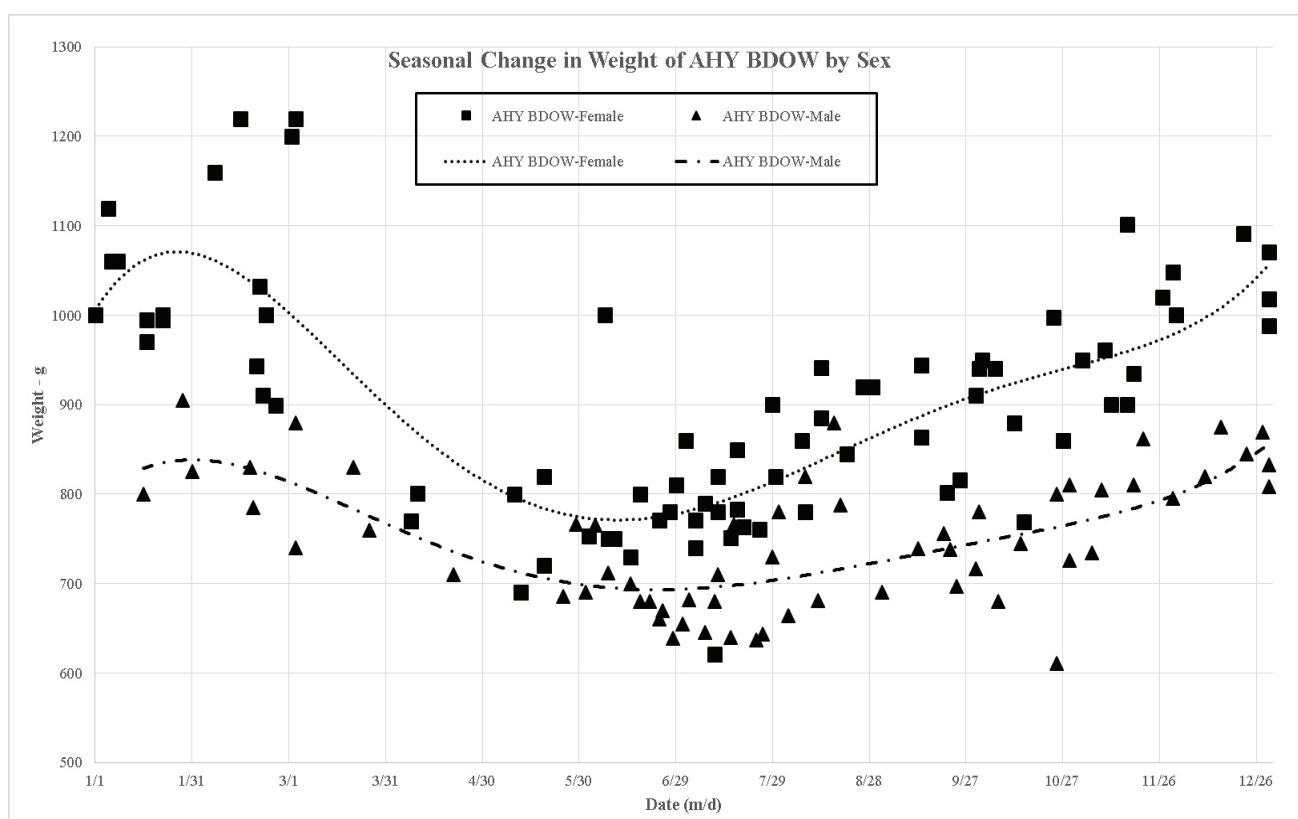
Hatching Year (HY) Barred Owls become AHY Barred Owls by definition on January 1st, but can be aged as Second Year (SY) Barred Owls, as they retain HY plumage until the partial remige molt starting in June and the complete rectrice molt starting in July and are included in this study as circumstantial evidence suggests that SY females may breed. Females were not targeted from March through April as Barred Owls are on eggs or with small young during these months, and the author did not wish to disturb them and potentially increase the risk of breeding failure.

## Results

Fig. 1 illustrates 80 data points that come from 30 female and 60 data points that come from 26 male breeding and non-breeding AHY Barred Owls. Female weights ranged from 621-1,220 g,

g, with a mean of 854 g. Male weights ranged from 637-905 g, with a mean of 750 g. Note that weight peaks for both sexes in late winter just before females commence incubation, usually the first week in March. The duties of incubation and tending to small young preclude the female from hunting, and result in a rapid weight loss as well as dependency upon the male to supply food. Females undergo a more extreme seasonal weight change than males, with one female documented at weighing 1,160 g in February and 740 g in July of the same year, a 36% decrease in weight. The mean weight in February of seven female's weights was 1,000 g and the mean weight of 14 females in July was 787 g, demonstrating a clear weight loss in females. From Fig. 1, the polyline shows an average 28% loss in weight for females.

**Fig. 1.** Seasonal Change of AHY Barred Owl Weight by Sex. A number of the data points were from the same individual Barred Owl over many years. Seven female Barred Owls provided 51 data points over a one to 12 year period. Two male Barred Owls provided 21 data points over nine and 10 years. Three female Barred Owl weights obtained early in the study were in excess of 1,000 g and were plotted as "1,000 g". The lines in Figure 1 are fifth order polynomials calculated in Excel to create a best fit line to correlate the data, the slope of which is a reflection of the rate of change in weight.



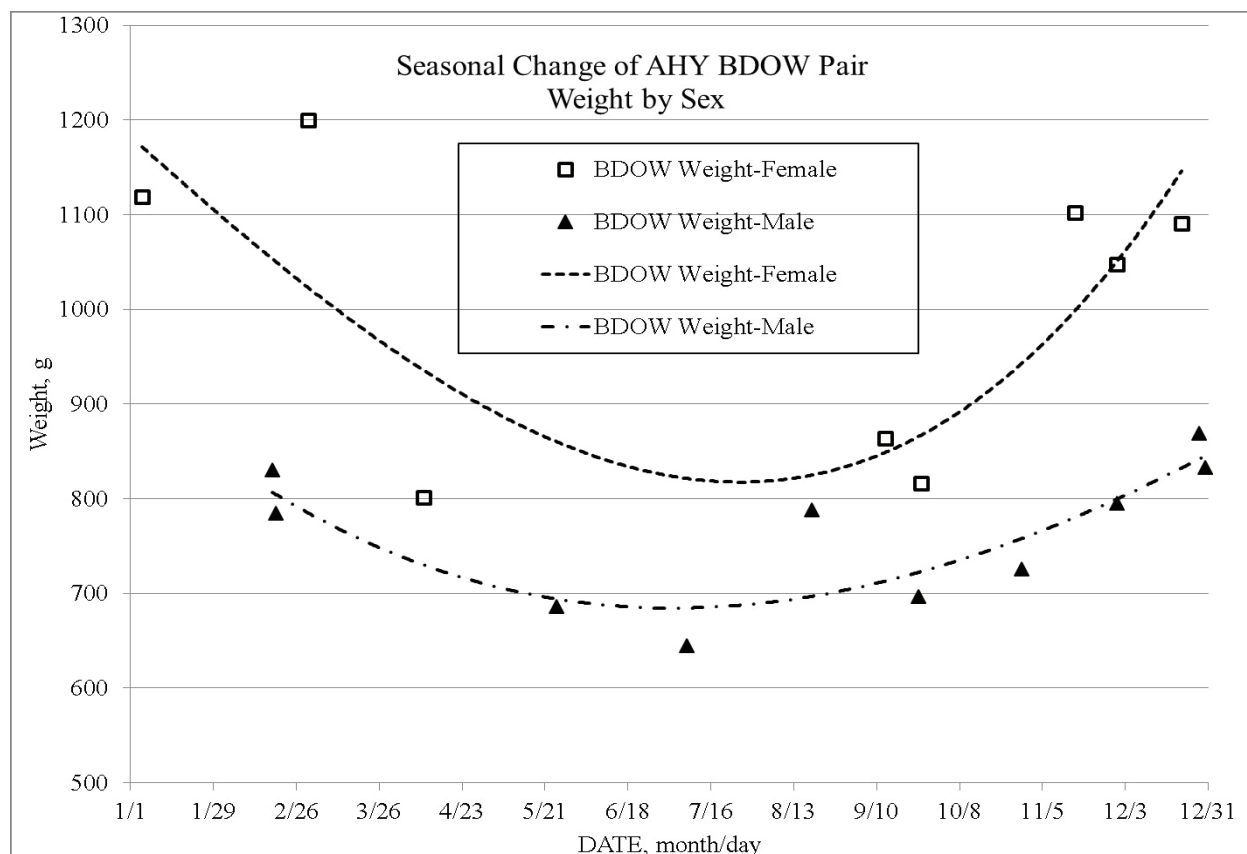
Males can undergo an approximate 20 per cent seasonal weight change, with one male going from 645 g in July to 785 g the following February. The mean weight of two males in February was 807 g, and the mean weight of eleven males in July was 688 g. From Figure 1, males underwent an average 18% loss in weight. Note in Figure 1 that from February through October there is an overlap of weights in which a male may weigh more than a female.

Fig. 2 illustrates the weight changes of a mated pair of Barred Owls that I have been following for nine years. The lowest weight of the female (801 g) occurred as an SY in April 2012 when she did not breed. She was heaviest (1200 g) in February 2020 as a nine year old, prior to incubation. Her mate is two years older, and with the exception

of 2018, the pair fledged young every year since 2012. The data confirm that both male and female Barred Owls undergo weight changes during their breeding cycle. On average, both sexes lose weight from February through June.

Published weights for male Barred Owls (Mazur and James 2020, Earhart and Johnson 1970) give ranges of 483-812 g, and 468-774 g, and for females, 650-1,020 g, and 610-1,051 g, respectively. I made nine measurements from five different females whose weights exceeded the published maximum. Six of the nine female weights greater than 1,051 g were late fall and winter captures. Of the other three, one weighed in mid-February was 1,220 g and the other two weighed 1,220 g and 1,200 g in early March, prior to incubation. There were 13 weight measurements of male Barred Owls

Figure 2. Seasonal Change in weight of a mated pair of Barred Owls. The lines in Figure 2 are third order polynomials calculated in Excel to create a best fit line to correlate the data, the slope of which is a reflection of the rate of change in weight. The male contributed 10 years of data and the female eight years.



that exceeded 812 g, with the highest being 905 g from a five year old. Two of the weights that were greater than 812 g were obtained in August of the same year from the same male, with the other 11 weight measurements were made from November through March.

Evidence of three SY female Barred Owls successfully breeding was documented. In June of 2007, a SY female was banded with signs of a brood patch and presumably her two fledged young who were nearby begging for food. The SY female plumage was wet, making age evaluation difficult. The previous female on this territory had been re-trapped the previous October, but in February, the male was seen with an unbanded new mate. Six days later, with dry plumage, the newly banded female was recaptured and found to have SY plumage, photographed, and age verified under ultraviolet (UV) light. UV light has proven

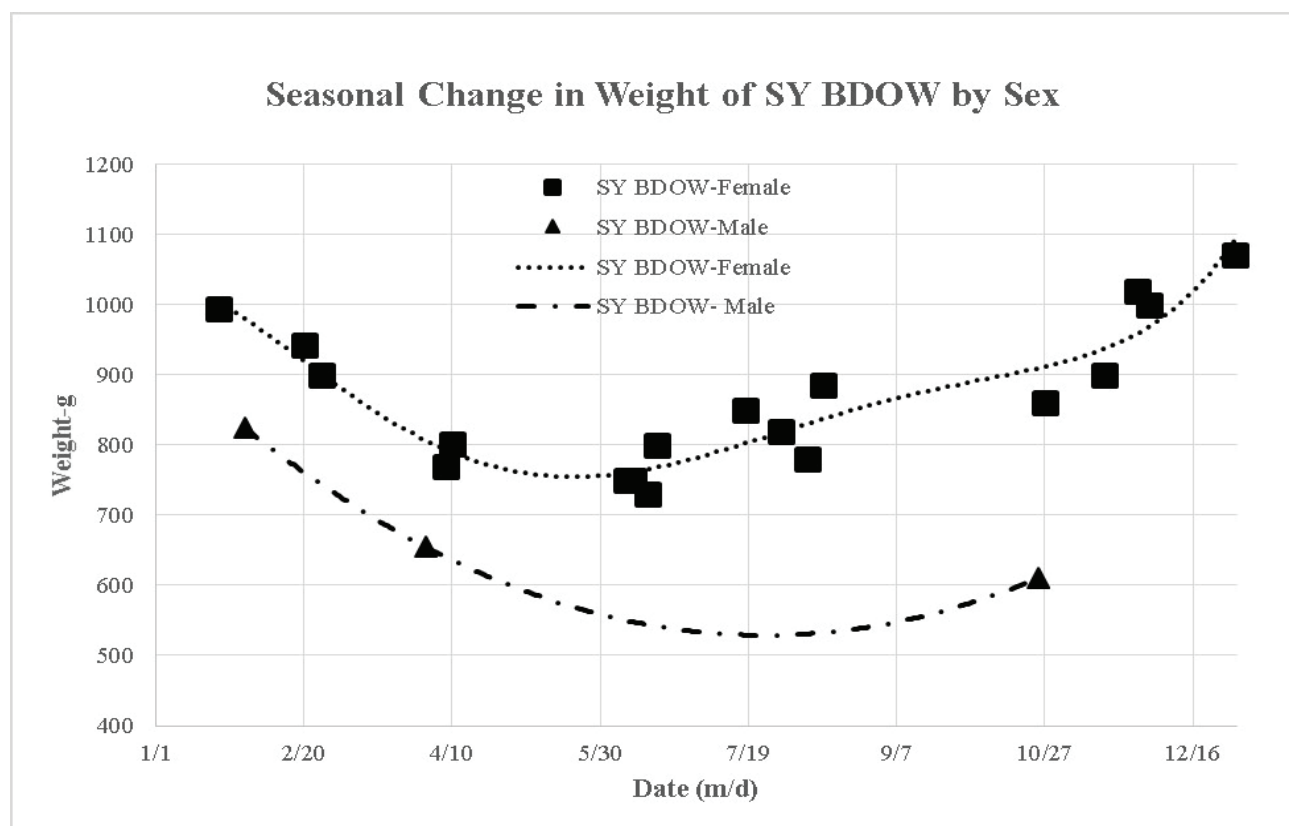
to be a useful tool to age several species of owls (Weidensaul et al. 2011). In 2010, two SY females had moved into previously unoccupied territories for Barred Owls on the island. When they were caught and banded in June, each had evidence of a brood patch and young Barred Owls, presumably theirs, were heard calling nearby. Figure 3 depicts the seasonal weight change of 11 female and three male SY Barred Owls. Note the similarity of the lines of Figure 3 with those of Fig. 1.

## Discussion

The data plotted in Figure 1 are from 20 years of banding data (2001-2020) following the Barred Owl population on Bainbridge Island, WA. Much of the data were collected during routine banding operations without specifically attempting to track the weight of an individual throughout the year.

These seasonal weight changes are not uncommon and have been documented in other raptors

Fig. 3. Seasonal weight change of SY Barred Owl by Sex. The lines in Figure 3 are fifth order polynomials calculated in Excel to create a best fit line to correlate the data, the slope of which is a reflection of the rate of change in weight. Data is from 11 female and three male SY Barred Owl.





including the Tawny Owl (*Strix aluco*) (Hirons et al. 1984), in the Tengmalm's Owl (*Aegolius funereus*) (Korpimäki 1990), and Snail Kites (*Rostrhamus sociabilis*) (Valentine-Darby 1997). The phenomenon has also been documented in other avian species, such as the Eurasian Blackbird (*Turdus merula*) (Macleod et al. 2005) and six Chilean passerines (the White-crested Elaenia (*Elaenia albiceps chilensis*), the House Wren (*Troglodytes aedon chilensis*), the Rufous-collared Sparrow (*Zonotrichia capensis australis*), the Thorn-tailed Rayadito (*Aphrastura spinicauda spinicauda*), the Patagonian Sierra-Finch (*Phrygilus patagonicus*), and the Black-chinned Siskin (*Carduelis barbata*) (McGehee et al. 2012).

On Bainbridge Island, the mild fall and winter do not appear to be difficult times for adult Barred Owls, based on their rapid weight gain. This is the period when females, in particular, add weight in preparation for the upcoming breeding season, as shown by the increased slopes of the polynomial lines in Figures 1-3. Rapid loss of weight in the females occurs during the period of incubation and until the young are able to self-regulate their body temperature and the female is able to resume hunting, usually in mid-April. The weight loss in males is due to the increased demand to supply food for himself and to the female while she is incubating, and then to supply food to himself, the female, and the young until the young can self-regulate their body temperature and allow the female to resume hunting for herself and supplement the growing food demands of the young. These food demands continue into the summer, by which time the young start learning how to hunt on their own and become less dependent upon the adults for food. Adults start molting remiges in June and rectrices in July while still feeding the young and molt continues into late summer. The young disperse from their natal site, usually in August.

Fig. 2 reflects the change in weight of a pair of Barred Owls collected over a nine year period. Note that the shape of the polynomial line roughly corresponds to that of Fig. 1.

SY Barred Owls are not believed to breed (Mazur and James 2020); however, my evidence suggests that female SY Barred Owls do breed. The polynomial lines of Figure 3 are similar to those of Figure 1, evidence that SY female Barred Owls do breed. In one instance, the SY female had replaced the previous female on the territory, sometime after October and before February and the nesting season. In two other cases, SY females had dispersed into previously unoccupied Barred Owl territories and found mates. In these early years of Barred Owl range expansion on the island, while most of the preferred territories had established pairs of Barred Owls, there were still areas that were suitable habitat and available for dispersing young Barred Owls to claim.

## Conclusion

Weights in excess of published reference values were recorded for both male and female Barred Owls, with a male documented at 905 g and two females at 1220 g. Future research examining weight fluctuations in owls as well as other species should consider obtaining data of females just prior to egg laying, as this is the period when weight peaks for many species. Weight is often used as an aid for sexing owls, and outside the breeding and molting periods, can be relatively straight-forward. During the breeding season, with females losing weight at a greater rate than males, there is an overlap in which weight may not be a useful aid in determination of sex. Several female SY Barred Owls were found and believed to have bred, as they were caught in proximity to young with aged brood patches.

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Barred Owl Photo By Joe Fuhrman