COPULATORY BEHAVIOUR IN GREAT HORNED OWL

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Introduction and Background

This paper is based on daily observations of a single pair of Great Horned Owls (*Bubo virginianus)* conducted at Fish Creek Provincial Park, Calgary, Alberta from 3 February 1992 until 27 February 1992. Roughly thirty hours of observations were made during this period. Twelve copulations were observed between 8 February and 23 February.

Most of the observations occurred in a roughly circular area 300 metres in diameter, bounded on the northwest by a housing subdivision, and on the southeast by the Bow River. Due to mild winter conditions this section of the river remained open and supported a population of waterfowl. Observations were at least one hour in duration with one observer assigned to each owl. The study concentrated on an observation period beginning before sunset and continuing until well after dark.

Methodology

We conducted our observations in the following manner. We each carried a spotting scope and tripod, binoculars, small tape recorder, synchronized watch, and hand-held CB radio. We also carried an incident light meter. The owl's territory was fairly open ground with stands of trees along the river. We began our observations during the last part of daylight when the owls were easy to spot. We became experts at spotting the owls huddled next to tree trunks in one of a dozen favourite perches at distances of up to 500 metres. We would then slowly work our way in as close as we dared and position ourselves to get the best view of the action. We quickly learned what distance to stay at so that we were not disturbing the birds. Not knowing in which direction the owls would necessarily fly, we would position ourselves as far apart as possible while keeping both owls under constant observation. Coordinating our observations by radio, we could keep track of who was observing which owl, and as the owls moved we would sometimes switch which one we were watching to avoid unnecessary movement.

As night fell, we could continue to see the owls in full detail right down until we could not read the incident light meter any more but by then the "action" was over, and "Fred" had departed on his nightly hunting rounds. Even at that late hour we could usually silhouette the owls against the night's sky, or on cloudy days, against the clouds illuminated by the glow of the city lights.

Once we had placed ourselves in good positions from which to observe, we would set up our spotting scopes and go to work. We set our quartz watches to the time signal from WWV/WWVH so that our time hacks would be identical, and also we would be within 1/10 second of UTC so that we could compare our data to meteorological or astronomical events recorded by Environment Canada. We would start our tape

recorders, state the date and time, which owl we were observing, etc., and then we would begin to observe the owl and record every movement that the owl made. Every five minutes or so we would do another time hack. We just let the tapes run in real time while we recorded every motion made by the owls. Along with my time hacks we would add the incident light level as recorded on the light meter. I have not had the light meter calibrated (I'm not sure who could do this) so I don't know what the measurements correspond to, other than to say they would be some fraction of foot-candles.

Once the observation was complete (usually after the male flew away to hunt and was lost from sight in the darkness) we would play back the tape and transcribe the observation. We used a stopwatch and the recorded time hacks to assign a time to each observed event. This ethological method was used for every observation. We have 37 approximately one-hour tapes of which 20 have been transcribed. Those not transcribed are either duplicate records for the same owl, or for the latter part of the study (22-27 February) when copulatory behaviour had ceased. (The transcripts (and tapes) can be made available to anyone who might be interested.)

At one point we borrowed a microphone from Ross Lein at the University of Calgary in order to try to capture one of these mating events. Since his microphone was very cumbersome I bought my own, a Sennheiser ME-80 directional mike, which was more compact, and had even better acoustics. We noticed that about 50% of the matings occurred in the same tree, so we lay on the snow under the tree under a piece of camouflage netting with the microphone and a video camera. I managed to catch one copulation on video, but the conditions were too hard on the camera (the battery would cease operating and I could not move to change packs) so we gave up on the video. However, I recorded a couple of excellent calls during the copulation from a distance of about 20 metres.

For control purposes we also made an observation in the early morning, before sunrise, and an observation during the middle of the day.

Copulatory Behaviour

Copulatory behaviour was observed to follow this general pattern:

As the evening approaches, the male begins a period of increased hooting activity characterized by contact calls. Contact calling in both sexes occurs from an upright, forward-leaning posture. The head faces forward in line with the body, the back is straight, and the tail is down, or bobs up slightly with each call note. The owl appears to be incapable of calling with the head turned. The throat visibly inflates just prior to hooting, and the white patch at the base of the throat of the male becomes much more visible. Between calls the throat patch decreases in size back to normal size.

These contact calls are usually initiated by the male, with the female responding within two to four seconds after the male's call has ended. On average the female responds to every second call. During this contact calling phase, the male calls at an average rate of 0.8 ± 0.6 calls per minute. The female calls at a rate of 0.4 ± 0.5 calls per minute. These rates can be contrasted with those observed during the day, when the call rate was observed to be one call per hour (0.02 calls per minute) for both sexes.

In all observations, the male engages in preening during this contact call period. Characteristic behaviours are "toe picking," where the beak is used to pry at the talons; "cheek scratching," where the feathers on either side of the face are scratched with a foot (this is always same side scratching); and "nuzzling and pulling up," where the face is rubbed into the wing or tail feathers, a single feather is picked up in the beak, and the whole length of the feather run through the beak. Wing stretching and beak snapping are also common. The male usually exhibits all of these preening behaviours. The female does little or no preening at this time.

After the male completes preening, a period of courtship calling begins. This is characterized by both owls adopting the "booming" posture. The head is held straight in line with the body, the body leans forward to the horizontal and the back is arched. The middle of the back is lower than the head and rump, and the tail is raised vertically during the entire call. The throat patch is inflated throughout the call, and remains fully, or partially, inflated between calls. The transition from contact calling to courtship calling (booming posture) is usually a gradual process with the owl assuming a more and more horizontal posture for successive calls. During courtship calling, the owls may edge out along the branch that each is roosting on, away from the trunk. This action seems to be meant to give the owl an unobstructed exit from the perch.

The male then often flies from his roosting perch to the tree in which the female is roosting (six of nine observations). He always selects a perch higher than the female's. Calling in the booming posture will then become very intense, with the female usually calling in response to every call made by the male. She will also enter a period of responding on the first note of the male's call. Eventually the lead role in calling becomes unclear. The female may begin to initiate calls to which the male may or may not respond. The lead may sway back and forth during this phase. The male's call rate increases to an average of 2.7 $\pm$ 1.1 calls per minute, and the female's increases to 2.3 $\pm$ 1.2 calls per minute.

In eight out of nine observations, the female flies from her roosting perch and lands in a nearby tree just prior to copulation. She always selects a "hunting" perch, characterized by being far from the trunk, high in the tree, and surrounded by an unobstructed field of view and no obstacles to flight. Within a minute or so the male leaves his perch and flies directly to the back of the female.

Call rate does not appear to be a trigger for copulation. In the four cases where the male flew to the female's roosting tree and then the female subsequently left to fly to a hunting perch for copulation, the male's call rate decreased to 1.2 $\pm$ 1.2 calls per minute, while the female's decreased to 1.5 $\pm$ 0.7 calls per minute between the time that the female left and the copulation occurred. In addition, copulation was observed when call rates did not increase, and high call rates were not always followed by copulation. The total number of calls preceding copulation varies from 13 to 196, and so also does not appear to be a factor in triggering copulation. Overall, the male hoots 1.5 times more frequently than the female prior to copulation.

During copulation the female's posture is horizontal, and her wings are folded and seem to be held

slightly away from her body. Her tail is raised, and her back is arched downwards. Her head is raised with the beak open. Copulation is brief, lasting four to seven seconds.

The male's wings are outstretched and flapping (roughly four beats per second) presumably to keep balance. His back is arched downwards, his tail is up and his head is down. He nuzzles at the feathers of the female's nape with his beak, and will also pull at these feathers (similar to the "nuzzle and pull up" preening behaviour). Treading is apparent. Both owls engage in a unique series of copulatory vocalizations comprised mainly of short, rapid notes and a high-pitched squeal. (These vocalizations are described later.)

Once copulation is complete the male flies directly from the back of the female to a hunting perch in a different tree, whereupon calling drops to only one or two widely spaced contact hoots. This reduction in call rate occurs when the male leaves the area, regardless of whether copulation has occurred. The only time a second copulation was observed, it took place over an hour later.

After copulation, the female remains motionless on the perch where copulation occurred. She remains nearly horizontal, and the base of her tail shows spasmodic muscular movements for up to ten minutes afterwards. The reason for these movements is unclear; perhaps they assist fertilization. At the end of this post-copulatory phase, the female assumes a more upright posture, and generally fluffs up her feathers which were flattened during flight or copulation. She usually engages in a period of preening involving all the behaviours noted earlier. She leaves this perch only to return to the tree where she was roosting. Unlike the male, she was never observed to leave the immediate area.

Although some authors have described ritual bowing, mutual preening, and mate feeding prior to copulation, none of these behaviours was observed. Although food caching was observed on two occasions, the male was never seen to bring food to the female. These rituals may apply only during initial pair bonding, which we did not observe.

Vocalizations

The male's call notes are lower in pitch than the female's. The male's normal call consists of a four note sequence "Hoo hoo — hoo hoo." "I'm here — are you?" The female's normal call is higher in pitch than the male's, and contains an extra note at the beginning "hoo hoo hoo — hoo hoo." "I'm still here — you too?" During the entire observational period, no variance in this normal call structure was observed.

As the male flies to the back of the female for copulation, both owls begin a series of short, rapid hoots (four or five per second). These hoots are continued throughout the entire copulation. Shortly after the male lands, a warbling, high-pitched squealing call (reportedly similar to the fright call made by owlets) is made by one of the owls. In one recording this squealing call began 1.9 seconds after the beginning of the short hoots and lasted for 1.6 seconds. The short hoots ended 0.8 seconds later. The total duration of these calls (and this copulation) was 4.3 seconds. This call structure was typical of all copulations. In some copulations, immediately following the squeal there was a variable length chatter reminiscent of a

kingfisher or squirrel. A normal call from both owls signals the end of copulation.

Correlation to Incident Light Level

On five days during which copulations were observed, measurements of incident light were also taken using a hand-held light meter. All first copulations occurred when light levels were between seven units and three units. It took from six to nine minutes for light levels to fall through this range (sample size n=5), yet these "windows" were separated by as much as ten minutes by absolute time of day.

The table below lists copulation times in absolute time (MST), incident light measurement at the time of copulation, time of copulation relative to sunset, and weather conditions.

At the time at which the observations were conducted, light levels changed by 1.7 units within 00:01:24 ± 00:00:57.

Summary

Copulation in Great Horned Owls *(Bubo virginianus)* is brief, lasting four to seven seconds. Copulation was observed to occur exclusively in trees on high, unobstructed perches. Pre-copulatory rituals such as bowing, mutual preening, and mate feeding were not observed. These rituals might only occur during initial pair bonding.

Copulation is accompanied by three unique vocalizations: a series of short, rapid hoots, a high-pitched squeal, and occasionally a trailing variable-length chatter. Call frequency does not appear to correlate with copulation. We suspect that the purpose of the observed increases in calling may be to improve pair bonding, establish territory, or to encourage the female to move to a more accessible perch for copulation. The total number of calls preceding copulation also does not appear to be a controlling factor.

Incident light correlates with copulation better than time does. In the field we found that we could predict the level of activity more reliably using a light meter than by using a watch. Additional study in this area is warranted.

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Incident Light & Copulation Time

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