Do Birds Sleep?

by Val E. Pochay

I was recently watching a film about the European kingfisher which showed a perching kingfisher and the narrator stated the bird was sleeping. I then realized how frequently, both in film and literature, people speak of birds sleeping. However, sleep is a powerful and definable physiological state. In fact, the need for sleep in some animals and humans is so strong that prolonged deprivation has caused irreversible behavioral changes and, in some cases, death. So is it true that birds sleep? To answer the question "Do birds sleep?" requires specific terminology. Words such as torpor, hibernation, resting and sleep are not interchangeable. Some birds may do all these things, but each is done separately.

Sleep can be defined both behaviorally and physiologically. Behaviorally a bird would be expected to return to a specific site, exhibit a specific posturing, and have an increased arousal threshold. Behavioral observations re very difficult to interpret as an animal may exhibit a certain behavior, but not necessarily the associated physiology. For example, the *Echidna* or spiny anteater, a primitive mammal from Australia, exhibits all the behavior of an outstanding sleeper and adapts well to the laboratory; but unlike other mammals studied, the *Echidna* does not dream.

The physiological studies of sleep require extensive instrumentation including an electroencephlographic (EEG) machine to measure electrical activity of the brain, an electromyograph (EMG) to measure muscular activity and electrooculographic equipment (EOG) to measure eye movements. Physiological studies have shown that some animals do not sleep, but possess instead a basic rest and activity cycle. Physiological studies, in conjunction with behavioral studies, confirm an animal's sleep state.

For a moment let's review our own sleep pattern. We usually go to bed in the evening and after some time gently progress from waking behavior through several stages becoming more distant from our surroundings until we reach stage four — a point where it is difficult to wake us. During stage four the brain generates slow waves of high amplitude commonly called Slow Wave Sleep (SWS). It is during this time that talking and sleepwalking occur. After approximately 40 minutes we re-ascend through the stages; however, we do not awake. We enter our first Rapid Eye Movement (REM) period, also called Paradoxical Sleep period (PS), that lasts approximately ten minutes. REM is the dream period for humans. Throughout the night this ascending/descending continues approximately every ninety minutes and the REM periods grow in duration until, in the early morning hours, we may have an hour long dream. Each sleep stage is defined by the EEG machine and by behavioral changes.

Bird sleep is not as well documented as human sleep so only two stages will be discussed. They are: Slow Wave Sleep (SWS), (replacing stages 1 through 4 in humans) and Paradoxical Sleep (PS), which is equivalent to Rapid Eye Movement (REM) or dream sleep in humans. Table 1 highlights some of the similarities and differences between humans and animals. The box turtle and bull frog possess only a basic rest and activity cycle.

In order to "produce" sleep, an animal must have certain brain chemicals and anatomical parts. It is generally agreed that birds possess all the neuroanatomy and neurochemistry necessary for the generation of sleep.

The first successful EEG from a bird (pigeon) was obtained in 1939. The correlation between EEG activity and the sleep-waking cycle was first described in the tero bird *(Belonopterus chilensis lampronotus)* more than 28 years ago, but it wasn't until 1964 that the presence of paradoxical sleep in birds was described. Less than 20 of some 8,800 bird species have had EEG sleep studies; these 20 species represent less than 0.23% of the bird population. Several of these studies relied on one or two birds to represent the whole family. For instance, of the 328 species in the parrot family, only the parakeet has been studied. From these few studies a pattern has emerged showing that we do not have to condemn birds to a vigilant life without a chance to dream.

Using the information provided in Table 2 we can create the "typical" sleeping patterns of birds. Birds spend approximately 60% of their day or 14 hours awake. The remaining 40% is spent sleeping. When birds sleep is variable. The starling *(Sturnus vulgaris)* is permanently active during the daylight hours and is a nocturnal sleeper, whereas the burrowing owl *(Speotyto cunicularia)* sleeps more during the day than evening. Each bird studied did have its favorite sleeping position: the goose rested its head on its back while the pigeon rested its head in its breast. The bird retires to its chosen sleeping place and its typical posture and enters into slow wave sleep. The EEG shows slow waves (typically 2 to 4 Hz) of high amplitude.

It is now more difficult to wake the bird. The bird can remain in this SWS stage for up to 68 minutes, but more typically it lasts 6 to 8 minutes. The eyes may be closed or partially open. This is the time when the wise old owl talks (vocalizes) in his sleep.

Soon the brain waves change. The EEG looks as though the bird is awake, but as we look at the bird we see that the head has dropped or nodded and the eyes have closed. The bird has entered its first PS or dream period. PS periods in birds are usually less than 10 seconds; although the starling has PS episodes that can last 250 seconds, a record by avian standards.

NOTICE — as of January 1, 1989, all correspondence intended for the editor of the *Watchbird* should be mailed directly to the AFA business office. Send to the Editor, c/o AFA, P.O. Box 56218, Phoenix, Arizona 85079-6218.

Table 1
Some Representative Sleep Patterns

	Total Sleep Time	Dream Sleep		
	% of 24 hr. day	% sleep	No. of Dream Periods	Duration
Human	30%	24%	4	10 - 60 min.
Monkey	41%	15 - 18%	15 - 18	6 - 9 min.
Dog	35%	36%	36 - 42	4 - 7 min.
Cat	48%	28%	26 - 42	3 - 6 min.
Rabbit	26%	12%	24 - 75	48 - 116 sec.
Hamster	60%	23%	NR	3 - 4 min.
Spiny Anteater	36%	0	0	0
Bat	83%	11%	NR	NR
Bird	40%	3 - 16%	227 - 515	3 - 40 sec.
Box Turtle	0	0	0	0
Bull Frog	0	0	0	0

NR = Not Reported

Table 2
Slow Wave and Dream Sleep in Birds

	Slow Wave Sleep		Dream Sleep		
Species	(% 24 hr.)	Duration (min.)	(% SWS)	No. of Dream Periods	Duration (sec.)
Hawk	30%	3 - 40	7 - 10%	NR	3 - 15
Owl	62%	NR	3 - 7%	232	4 - 30
Penguin	38%	NR	12 - 14%	515	9 - 10
Quail	NR	NR	NR	NR	3 - 4
Parakeet	36%	NR	3%	NR	NR
Jackdaw	28%	7	3%	NR	30 - 40
Starling	38%	4 - 6	2%	NR	15 - 21
Pigeon	43%	1	4 - 12%	403	9 - 15
Chicken	NR	NR	3 - 16%	NR	5 - 30
Goose	27%	3.5	10%	445	5 - 6

NR = Not Reported

The drive for sleep is so strong that if a bird is held immobile and not allowed its typical posturing the bird will still sleep.

Was the kingfisher asleep? Although not studied in the laboratory, I believe he was. "Do birds sleep?" Not only do they sleep, they dream! We may never know what birds dream about or if they have the vivid imagery we enjoy, but as aviculturists we must include our birds' need for sleep in our aviary management plans.

References

Charles J. Amlaner, Jr. and Nigel J. Ball. A synthesis of sleep in wild birds. Behaviour 87:85-119, 1983.

Scott S. Campbell and Iren E. Tobler. Animal sleep: A review of sleep duration across phylogeny. Neuroscience & Biobehavioral Reviews, 8:269-300, 1984.

Irving J. Goodman. The study of sleep in birds. In: Birds: Brain and Behavior, edited by I. Goodman and M. Scheu. New York: Academic Press, pp. 133-152, 1974.

Ernest L. Hartmann, M.D. The Functions of Sleep. Yale University Press, 1973.

Arnd Stiefel. Ruhe and Schlaf bei Vogeln. In: Die Neue Brehm-Bucherei, 487. Wittenberg: A. Ziemsen, 1976 (in German). ●