**Discussion Questions**

to accompany

***Animal Behavior,* Eleventh Edition**

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**Chapter 11**

**Parental Care**

11.1 If songbirds can evaluate the risk of nest predation and make adaptive adjustments in the length of incubation periods, what predictions follow for New Zealand bellbirds (*Anthornis melanura*) in (1) mainland populations where introduced non-native predators (rats, cats, possums, and the like) are common versus (2) island populations that have never been affected by exotic predators? If incubating females do differ behaviorally in the two locations, and they do, what does this say about the costs of engaging in relatively long bouts of incubation? What are the conservation implications of finding that bellbirds have adjusted their parental behavior in relation to the presence of exotic predators, which were introduced after 1300 (Massaro et al. 2008)?

11.2 Here’s another way of looking at the effect of differences between males and females on the probability that their putative offspring are truly their genetic offspring. If a female lays a fertilized egg or gives birth to a baby, this offspring will definitely have 50 percent of her genes. In contrast, a male that mated with this female may or may not be the father of that offspring. Thus, the argument goes, males have less to gain by parental behavior. But imagine a hypothetical species in which males have, say, a 40 percent chance of siring the offspring of any given mate. Further, imagine that there are two hereditarily different male phenotypes in the population—a paternal type and a nonpaternal type. The average paternal male mates with two females (each with an average of 10 eggs), whereas the average nonpaternal male mates with five females (which enables him to fertilize 40 percent of 50 eggs in all). In addition, let’s say that the paternal male boosts the survival chances of the eggs under his care to 50 percent, whereas the unprotected offspring of nonpaternal males have a 10 percent survival rate. Which behavior is adaptive here? Show your math. What point does this example make about the evolution of male parental care?

11.3 Males of the golden egg bug (*Phyllomorpha laciniata*) are sometimes chosen by females to receive their eggs, which are glued to the males’ backs. Why do males accept this burden? Either males carry eggs to attract gravid females, which may then copulate with them, or males carry eggs (of their mates) to decrease the risk that their offspring will be afflicted by parasites. Given these alternatives, what significance do you attach to the following three results: (1) males from an area where egg parasites are numerous are much more likely to carry eggs than those from a region where egg parasites are essentially absent; (2) eggs laid on plants, an alternative for egg-laden females, are up to ten times more likely to be destroyed by parasites than eggs laid on male bugs; and (3) when females were given a choice between mating with an egg-bearing male versus one unencumbered by eggs, they did not choose the egg bearers significantly more often than those without eggs (Gomendio et al. 2008).

11.4 McCracken found that although female Mexican free-tailed bats (*Tadarida brasiliensis*) usually feed their own pups, they do make occasional “mistakes,” which they could avoid if each pup were left in a spot by itself instead of in a crèche with hundreds of other babies (McCracken 1984). Does this mean that the parental behavior of this species is not adaptive? Use a cost–benefit approach to develop alternative hypotheses to account for these “mistakes.”

11.5 In some cases, males or females do care for young of their own species that are not their own, as when certain male fish take over and protect egg masses being brooded by other males or when female ducks acquire ducklings that have just left someone else’s nest. Propose alternative hypotheses to explain this phenomenon. Under what circumstances might adoptions actually raise the caregiver’s reproductive success? Under what other circumstances might adopters help nongenetic offspring as a cost of achieving some other goal?

11.6 Interspecific brood parasitism is very rare in birds, an ability of only about 1 percent of all species (Lack 1968). Make a prediction about which group of birds, those with precocial young or those with altricial young, would be more likely to evolve into specialist brood parasites. In altricial species, the eggs are small in relation to parental body weight, but the hatchlings are initially completely dependent on food supplied to them by parents. In precocial species, the eggs are relatively large, but the youngsters can move about and feed themselves shortly after hatching (Lyon and Eadie 1991).

11.7 The mangrove gerygone (*Gerygone levigaster*), a small warbler-like songbird of Australia, sometimes incubates the egg of a little bronze-cuckoo, a specialized parasitic species. When the parasitic cuckoo hatches, the gerygone may pick the nestling up and physically remove it from its nest, a very unusual response of bird hosts to brood parasites., What Darwinian puzzles are associated with this case?

11.8 The superb fairy-wren (*Malurus cyaneus*) is one of the very few bird species that abandon the chicks of brood parasites. Why don’t more victimized species do the same? After all, many other birds exploited by cuckoos can identify and take action against the parasite’s eggs, which they do by learning the distinctive visual features of their own eggs and then rejecting those that do not match. The same species that are extremely good at learning to recognize egg features usually completely fail to recognize a cuckoo chick. However, consider the costs of learned chick recognition for birds that are successfully parasitized in their first year of breeding by a single cuckoo chick that takes over the nest and eliminates all the hosts’ offspring, as is the cuckoos’ habit (Langmore et al. 2009). How would such host adults respond to their own chicks in the next breeding attempt?

11.9 About 15 to 20 percent of all nestling cuckoo parasites are abandoned and left to die by their reed warbler (*Acrocephalus scirpaceus*) hosts after about 2 weeks of foster parent care. Tomas Grim suspected that reed warblers had evolved a means to avoid helping a parasite, namely a time limit on parental care for a brood (Grim 2007). To test this idea, Grim performed experiments in which he manipulated broods of reed warbler chicks so as to extend the period of parental care needed for the young to fledge. He created experimental broods by transferring younger (and older) chicks between nests. How did he expect the parent warblers to respond, if the time limit hypothesis was correct? Why might it be advantageous for reed warblers to use the time limit system rather than learning what kind of nestlings to care for and which ones to reject?

11.10 In the eclectus parrot (*Eclectus roratus*), mothers sometimes take parental favoritism to extreme lengths by killing their sons, but never their daughters (Heinsohn et al. 2011). Sex-specific infanticide occurs more often at nests that can be flooded during the rainy season. Sons spend longer in the nest than daughters. Link this factor to why it might be adaptive for a parent parrot to kill a son in a vulnerable nest occupied by offspring of both sexes.

11.11 Female cattle egrets (*Bubulcus ibis*) adjust the amount of androgen they supply to their eggs in relation to each egg’s position in the laying sequence. Female canaries (*Serinus canaria)* add male sex hormones to the eggs fertilized by male partners with attractive songs (Gil et al. 2004). Female blue tits (*Cyanistes* *caeruleus*) provide less food for the offspring of partners whose crown feathers have been manipulated so that they reflect less ultraviolet light (Hunt et al. 1999). Why can these different decisions all be considered examples of parental favoritism, and what do the three examples have in common with respect to how maternal decisions advance the fitness of the mother?

11.12 Birds are not the only animals in which intense, and sometimes fatal, sibling conflicts are known to occur. For example, spotted hyena (*Crocuta crocuta*) females often give birth to twin pups, which compete aggressively, even lethally, for their mother’s milk. Develop one or more adaptationist hypotheses about siblicide, and then make use of the following four findings: (1) the total amount of milk given to pairs of offspring in which siblicide eventually occurs is lower than from mothers with surviving twins; (2) females do not reduce the amount of milk they provide after siblicide has occurred; (3) siblicide is more common when females have to travel great distances in search of prey; and (4) females sometimes separate fighting twins and may preferentially nurse the subordinate cub (Hofer and East 2008, White 2008).

11.13 In fish with paternal care of egg clutches, it is not uncommon for the brooding male to consume a portion of the eggs he has received from his mate(s). For example, Hope Klug found that some brooding male flagfish (*Jordanella floridae*) sometimes consumed every egg they were brooding. In contrast, other males occasionally ate only a part of the clutch under their control (Klug 2009). When males devoured the entire clutch, the eggs they ate tended to be of higher energy content than the eggs eaten by males that consumed a part of the clutch they were brooding. What hypotheses can you develop to account for male decisions about egg consumption?

11.14 Use the concept of reproductive value to make predictions about the response of incubating mallard ducks (*Anas platyrhynchos*) to the approach of a predator. These birds can improve the odds of saving their own skin by quickly flushing from the concealed nest, but their noisy departure will often give the nest location away, with the likely loss of all the eggs within. Or they can sit tight, remaining as inconspicuous as possible, improving the odds that the predator will pass by the nest and its contents but also increasing their personal risk of being killed (Albrecht and Klvana 2004). Make predictions about how mallards will respond in relation to the number of eggs being incubated, the mean size of the eggs in the clutch, and their stage of development.

References

Albrecht, T., and Klvana, P. 2004. Nest crypsis, reproductive value of a clutch and escape decisions in incubating female mallards *Anas platyrhynchos*. *Ethology* 110: 603–614.

Gil, D., Leboucher, G., Lacroix, A., Cue, R., and Kreutzer, M. 2004. Female canaries produce eggs with greater amounts of testosterone when exposed to preferred male song. *Hormones and Behavior* 45: 64–70.

Gomendio, M., García-González, F., Reguera, P., and Rivero, A. 2008. Male egg carrying in *Phyllomorpha laciniata* is favoured by natural not sexual selection. *Animal Behaviour* 75: 763–770.

Grim, T. 2007. Experimental evidence for chick discrimination without recognition in a brood parasite host. *Proceedings of the Royal Society B* 274: 373–381.

Heinsohn, R., Langmore, N. E., Cockburn, A., and Kokko, H. 2011. Adaptive secondary sex ratio adjustments via sex-specific infanticide in a bird. *Current Biology* 21: 1744–1747.

Hofer, H., and East, M. L. 2008. Siblicide in Serengeti spotted hyenas: A long-term study of maternal input and cub survival. *Behavioral Ecology and Sociobiology* 62: 341–351.

Hunt, S., Cuthill, I. C., Bennett, A. T. D., and Griffiths, R. 1999. Preferences for ultraviolet partners in the blue tit. *Animal Behaviour* 58: 809–815.

Klug, H. 2009. Relationship between filial cannibalism, egg energetic content and parental condition in the flagfish. *Animal Behaviour* 77: 1313–1319.

Lack, D. 1968. *Ecological Adaptations for Breeding in Birds*. London: Methuen.

Langmore, N. E., Cockburn, A., Russell, A. F., and Kilner, R. M. 2009. Flexible cuckoo chick-rejection rules in the superb fairy-wren. *Behavioral Ecology* 20: 978–984.

Lyon, B. E., and Eadie, J. M. 1991. Mode of development and interspecific avian brood parasitism. *Behavioral Ecology* 2: 309–318.

Massaro, M., Starling-Windhof, A., Briskie, J. V., and Martin, T. E. 2008. Introduced mammalian predators induce behavioural changes in parental care in an endemic New Zealand bird. *PloS One* 3: e2331. doi:2310.1371/journal.pone.0002331.

McCracken, G. F. 1984. Communal nursing in Mexican free-tailed bat maternity colonies. *Science* 223: 1090–1091.

White, P. A. 2008. Maternal response to neonatal sibling conflict in the spotted hyena, *Crocuta crocuta*. *Behavioral Ecology and Sociobiology* 62: 353–361.