Don't Put All Your Eggs in Real Nests: a Sequel to Faaborg

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John Faaborg (2004) nicely summarizes the limitations and potentially misleading inferences made from artificial nest experiments. However, we believe that a broader perspective is needed on some of the points raised in his commentary. Specifically, conservation biologists should know that (1) even the monitoring of natural nests is fraught with difficulties of its own; (2) artificial nest experiments may, under certain controlled conditions, represent a useful approach to address conservation questions; and (3) the development of reliable indirect approaches in general should be encouraged rather than condemned.

Faaborg's take-home message is based on an assumption that is shakier than it may seem, that "the only way to be sure of the *true* predation rates of a location is to study natural nests" (emphasis added). The monitoring of natural nests to determine predation rates is not as free of biases as it may seem. These biases can be summarized in two main points: (1) nests detected by observers may be slightly more exposed than the average nest in the breeding population (Martin & Geupel 1993) and (2) in spite of standard precautions followed by researchers, regular visits to monitor nest fate may increase the probability of failure by showing the way to both visual (Tryjanowski 1999; Gutzwiller et al. 2002) and olfactory-searching nest predators (Whelan et al. 1994). Clearly, care should also be taken to reduce biases when using natural nests to assess predation rates.

Most researchers using artificial nests aim to obtain relative rather than actual estimates of reproductive success. Nonetheless, it is true that even relative measures may be biased when artificial nests have not been properly calibrated against natural nests of the focal species (Major & Kendal 1996). The few studies comparing the fate of natural and artificial nests display a depressing absence of correspondence among these two types of nests (Willebrand & Marcström 1988; Cresswell 1997; Wilson et al. 1998; Buler & Hamilton 2000; Zanette 2002). Thus, although we agree that a healthy dose of skepticism is required when evaluating studies in which artificial nests have been used to estimate relative reproductive success, we should not throw the baby out with the bathwater. Studies comparing natural and artificial nests that are cited to reject the latter are not without biases. Indeed, when using artificial nests, it is easier to design a poor mimic than a good one. In most of these studies, the realism of the mimics could be questioned. In others, artificial and natural nests were spatially separated (Buler & Hamilton 2000) or experiments were conducted with natural nests but after the main breeding season (Cresswell 1997), when predator search images may have changed (Sieving & Willson 1999). Still others have used relatively exposed artificial open-cup nests without attempting to camouflage the eggs (Zanette 2002), and this may attract different predators than natural nests. The results are more encouraging when better mimics are used and when artificial nests attract the same species of predators in similar proportions as natural nests (Davidson & Bollinger 2000; Pärt & Wretenberg 2002). Calibration is thus needed to justify artificial nest experiments, but this has rarely been done and might be impossible for some focal species.

Artificial nests are more problematic when the natural nests being mimicked are relatively exposed (e.g., in open shrubs and trees and in open-cup nests on the ground) and depredated both by visual- and nonvisual-searching predators because any experiment with artificial nests is likely to attract a different set of predator species than do natural nests with incubating or brooding birds or adults feeding young (e.g., Zanette 2002).

An unfortunate potential side effect of Faaborg's commentary could be to discourage the development or refinement of indirect approaches to the assessment of reproductive success. Artificial nests should be only one element of a good avian conservation biologist's toolbox. To compare productivity among sites, several other

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indirect approaches have been developed and shown to hold potential. For example, relative estimates of productivity have been collected with constant-effort mist netting (DeSante et al. 1995), indices of reproductive activity (Vickery et al. 1992; Gunn et al. 2000), territory monitoring (Porneluzi et al. 1993), and distance sampling of fledgling brood density (Buford et al. 1996). Each method has its own limitations, the main one being failure to provide data on the predators of real nests. However, these methods should be calibrated in intensive study plots, where natural nests are monitored directly or with devices recording predation events. That is, we should determine whether indirect methods provide good relative measures of reproductive success in each study, irrespective of the fact that the method has been calibrated in another system.

In general, we agree with Faaborg's commentary, but we think the key message should be that (1) we need to broaden our perspectives on the assessment of reproductive success rather than condemn one of the approaches used and (2) all conservation studies based on indirect productivity estimates should be carefully calibrated. Collecting data from natural nests generally is not a valid option when the area under investigation is composed of a large number of sites, a landscape mosaic, or even a large number of landscape units. Furthermore, characterizing the reproductive success of species assemblages, rather than focal species, quickly becomes unrealistic over large spatial scales or long temporal scales. Finally, some species will remain extremely hard to monitor with natural nests because of their life history—nesting substrates selected, nest structure, behavior around the nest—or because of their cryptic choice of nest site. Thus, using currently available technology and methods, indirect estimation of reproductive success will continue to be a reasonable way to improve upon traditional survey methods based on presence, abundance, or density estimates. We only need to find the best combination of field methods and calibrate them with intensive study plots. Although indirect methods should be time-efficient alternatives to natural nest monitoring, it pays to calibrate these methods so that they can be applied with confidence over large scales, over long periods, or to a large set of focal species. Thus, we strongly believe that more effort should be invested in the development or refinement of indirect methods to assess and compare site productivity.

Literature Cited

Buford, E. W., D. E. Capen, and B. K. Williams. 1996. Distance sampling to estimate fledgling brood density of forest birds. Canadian Field-Naturalist **110:**642–648.

Buler, J. J., and R. B. Hamilton. 2000. Predation of natural and artificial nests in a southern pine forest. Auk **117:**739–747.

Cresswell, W. 1997. Nest predation: the relative effects of nest characteristics, clutch size and parental behaviour. Animal Behaviour **53:**93–103.

Davidson, W. B., and E. Bollinger. 2000. Predation rates on real and artificial nests of grassland birds. Auk **117:**147–153.

DeSante, D. F., K. M. Burton, J. F. Saracco, and B. L. Walker. 1995. Productivity indices and survival rate estimates from MAPS, a continent-wide programme of constant-effort mist-netting in North America. Journal of Applied Statistics **22:**935–947.

Faaborg, J. 2004. Truly artificial nest studies. Conservation Biology **18:**369–370.

Gunn, J. S., A., Desrochers, M.-A. Villard, J. Bourque, and J. Ibarzabal. 2000. Playbacks of mobbing calls of Black-capped Chickadees as a method to estimate reproductive activity of forest birds. Journal of Field Ornithology **71:**472–483.

Gutzwiller, K. J., S. K. Riffell, and S. H. Anderson. 2002. Repeated human intrusion and the potential for nest predation by gray jays. Journal of Wildlife Management **66:**372–380.

Major, R. E., and C. E. Kendal, 1996. The contribution of artificial nest experiments to understand avian reproductive success: a review of methods and conclusions. Ibis **138:**298–307.

Martin, T. E., and G. R. Geupel, 1993. Nest-monitoring plots: methods for locating nests and monitoring success. Journal of Field Ornithology **64:**507–519.

Pärt, T., and J. Wretenberg. 2002. Do artificial nests reveal relative nest predation risk for real nests? Journal of Avian Biology **33:**39–46.

Porneluzi, P., J. C. Bednarz, L. J. Goodrich, N. Zawada, and J. Hoover. 1993. Reproductive performance of territorial Ovenbirds occupying forest fragments and a contiguous forest in Pennsylvania. Conservation Biology **7:**618–622.

Sieving, K. E., and M. F. Willson. 1999. A temporal shift in Steller's Jay predation on bird eggs. Canadian Journal of Zoology **77:**1829–1834.

Tryjanowski, P. 1999. Effects of research activity on the success of Red-backed Shrike *Lanius collurio* nests. Ornis Fennica **76:**41–43.

Vickery, P. D., M. L. Hunter, and J. V. Wells. 1992. Use of a new reproductive index to evaluate relationship between habitat quality and breeding success. Auk **109:**697–705.

Whelan, C. J., M. L. Dilger, D. Robson, N. Hallyn, and S. Dilger, 1994. Effects of olfactory cues on artificial-nest experiments. Auk **11:**945–952.

Willebrand, T., and V. Marcström. 1988. On the danger of using dummy nests to study predation. Auk **105:**378–379.

Wilson, G. R., M. C. Brittingham, and L. J. Goodrich. 1998. How well do artificial nests estimate success of real nests? Condor **100:**357–364.

Zanette, L. 2002. What do artificial nests tells us about nest predation? Biological Conservation **103:**323–329.