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BAIT FISHING BLACK-CROWNED NIGHT HERON (*NYCTICORAX NYCTICORAX*) IN CHILE

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Martinete común (*Nycticorax nycticorax*) pescando con cebo en Chile.

Key words: Black-crowned Night Heron, *Nycticorax nycticorax*, Ardeidae, bait fishing, tool use, Chile.

INTRODUCTION

A bird that manipulates and places within its striking range an edible (bait) or inedible (lure) item in order to attract or distract fish as potential prey, exhibits a specific behavior called active bait fishing (Ruxton & Hansell 2011) or baiting (Kushlan & Hancock 2005), which is classified as a form of tool use (Crain *et al.* 2013). This "learned or culturally transmitted behavior" (Higuchi 1988) has now been reported for nine species of herons (Hustler 1995, Ruxton & Hansell 2011, Réglade, Bonhomme & Chapuis 2013, Réglade & Barkin 2014, Réglade & Mitchell 2014). Adult Black-crowned Night Herons (*Nycticorax nycticorax*) baiting fish with bread were previously observed in a Californian park (McCullough & Beasley 1996) and a Louisianan zoo (Riehl 2001). More recently, adult and immature Black-crowned Night Herons have also been noticed baiting fish with bread on two golf courses on the Hawaiian islands of Oʻahu since 2007 and of Kauaʻi since 2008 (Gavin & Solomon 2009, Walther 2009, Reeseftube 2010, Pratt *et al.* 2011, Freakepedia 2011; Nikosnature 2012, 2013). A video also shows an adult Black-crowned Night Heron using bread as bait at the Botanical Garden of Taipei, Taiwan (Do 2009, pers. comm.). In brief, all these observations occurred in man-made environments with some human-dependent bait (bread). Here we report and analyze the first sighting of a subadult Black-crowned Night Heron actively and successfully baiting fish with natural items (dragonflies), independently of human intervention in a South-American rainforest, where DS also filmed the heron.

OBSERVATION

In mid-February 2006, two of us (DS, MU) were aboard an inflatable boat on lake Tin-

quilco (39°10'09"S, 71°43'47W, 770 m a.s.l.) in the rainforest of the Huerquehue National Park, in the region of La Araucanía (southern Chile). They began to film a sub-adult Black-crowned Night Heron holding two mating dragonflies on the bank of the lake. The resulting video (web link: http://youtu.be/3R0X_M-dHSw) is 31:05 min long and consists of several successive clips of an hour-long observation.

The capture of a new dragonfly or the seizure of a previously used dragonfly from the water surface after at least one successful strike was considered as the time limit between two successive baiting sequences. With this definition, five successful sequences were individually analyzed, in which the heron often repositioned the dragonfly. A successful strike at 0:46 min seems to be the last action of a first partially filmed sequence with the mating dragonflies. During the following 19 min, three sequences begin at 0:51 min with a new dragonfly, 4:30 min with the seizure of the dragonfly and 6:42 min with another seizure of this same dragonfly as it drifted on the water surface. The heron then moved to a new location for a fifth sequence beginning at 20:15 min. But since the successive clips of this video were separated by random interruptions of unknown duration, the first definition of limit cannot be used to evaluate the duration of each baiting sequence. Nevertheless, except for the first incomplete sequence, the duration between the end of the bait positioning and the time of the first fish capture had a mean of 52 s $\pm$ 43 (SD) for the four following sequences.

The bait positioning also varied qualitatively in three principal methods: the bird either held the insect on the water with bill vibrations (n = 8) or left the insect on the water after some bill vibrations (n = 2) or dropped it from a small height (n = 2). When the heron held the dragonfly on the water, it replaced the bait between two to four times with short time intervals [median = 5 s, range (3–27), n = 10] before finally leaving it alone. The two larger values of this series (27 s then 12 s, at 1:14 min and 4:42 min, respectively) corresponded to moments when the heron appeared to look towards the videographers and not at the water.

A total of 12 strikes resulted in 11 fish captures (successful striking rate = 91.7%), at least 10 of which occur during the 20 min of the five identified baiting sequences (one, two, two, four, and one respectively). The mean duration between strikes within a sequence was 35 $\pm$ 28.6 s (n = 4). The only unsuccessful strike occurred within the second sequence. After the tenth fish capture, the bird apparently lost its bait and then caught only one fish during the following 10 min of foraging without bait. At 14:45 min the heron also made five strikes towards flying dragonflies without managing to catch any during 2:30 min.

DISCUSSION

This heron exhibited an active baiting behaviour based on its successful use of captured dragonflies as bait to attract fish instead of simply eating the insects. Additional evidence for active baiting behavior was the observed repositioning of the bait within the heron's strike zone after the bait drifted away. The bait-positioning methods were variable and the mean duration of 52 $\pm$ 43 s (n = 4) between the placed bait and the first successful strike was far greater than that of 4.4 $\pm$ 1.3 s (n = 20) for Japanese Striated Herons (*Butorides striata*) with animal baits (Higuchi 1986) and also that of 5.53 $\pm$ 3.23 s (n = 7) for a single Green Heron (*Butorides virescens*) fishing with bread and pop-corn (Higuchi 1988). This discrepancy may be due to different ecological conditions, such as the density of potential prey or water turbidity. The long mean duration between successive strikes

within baiting sequences may be due to similar factors. It is interesting to note that the movements of the heron's head often preceded the beginning of the bait positioning. This suggests that the heron looked carefully at prey movements before "deciding" when and how to place the bait in order to optimize the probability of a successful capture.

This heron seemed to be more successful with bait than without (i.e., 10 prey captures in 20 min of bait fishing vs. one prey capture in 10 min of foraging without bait). However, other factors could potentially contribute to the apparent superiority of bait fishing relative to other fishing techniques. One factor is the uncertainty of the fishing period's limits without bait (Higuchi 1986). Another factor could also be due to a diminished hunger of the successful baiting heron. Indeed, a less hungry heron might fish less efficiently.

With regards to the origin of this behavior, it is regularly assumed that fish feeding by humans may have contributed to its emergence (Pratt *et al.* 2011). The videographers surely distracted this heron, especially when the bird looked at them instead of the water. Nevertheless the observers didn't provide any baits unlike observations elsewhere in man-made environments (McCullough & Beasley 1996). Thus this sub-adult heron probably learned this behavior without any human help, as already reported for three other species: Striated Heron (Higuchi 1986), Green Heron (Norris 1975, Goodman 2007), and Little Bittern (*Ixobrichus minutus*) (Ryan 2013). An issue remains as to whether the young herons can learn this behavior alone or if they learn from their parents.

The rarity of reports of active baiting behavior both within and across bird species might be due to cognitive constraints (Ruxton & Hansell 2011). However, active baiting behavior may be under-reported given difficulties of actually observing the behavior under many conditions. Furthermore, Ruxton & Hansell (2011) suggest that the behavior's rarity may also be due to ecological constraints. Indeed, this technique might not be as frequently efficient as other usual fishing methods. The bait availability or the ability to find and capture it, can also partially explain its rarity (e.g., the heron failed five times to catch flying dragonflies). And therefore, even if the active baiting technique might need higher cognitive skills than other fishing behavior, this assumption remains to be addressed.

In conclusion, as for the two sibling *Butorides* species, the bait-fishing behavior is now well established both for immature and adult Black-crowned Night Herons with human dependent and independent baits. So far the observations have been sporadically made in North America, South America (the reported observation) and Asia. This behavior shared by an increasing number of heron species raises some intriguing issues that could be addressed by experimental approach (Ruxton & Hansell 2011).

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