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How to capture breeding Southern Lapwing *Vanellus chilensis*

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ABSTRACT: The Southern Lapwing (*Vanellus chilesnis*) is a common bird in Southern America and commonly found in any large open areas, including agriculture and urban. The lapwing is a facultative cooperative breeder and aggressively defends its breeding territory. Thus, the breeding system and their consequences for reproductive success are interesting for evolutionary biology. Capture of the lapwing, however, is difficult. Most studies to date have not captured or individually marked birds even though identifying individuals to examine their roles in the breeding units is essential for understanding group evolution and interactions. Here we describe ways to efficiently capture the Southern Lapwing during the breeding season using mist-nets at night and by taking advantage of their defensive behaviors. Before hatching, nets were placed inside the breeding territories and by strategically walking towards the birds they were guided towards the nets, in which they fell when taking flight. After hatching, we captured the young birds and held them near the nets in which the adults fell when defending them. By using these methods, we captured 78 birds during the 2012 and 2013 breeding seasons. We observed no nest nor territory abandonment after captures. We suggest that our methods are useful in most situations with lapwings and better capture and marking will contribute to developing long-term population monitoring.

KEYWORDS: Charadriidae, methods, mist-net, parental defense, shorebird.

INTRODUCTION

Understanding population dynamics, breeding behaviors and many other aspects of biology in many animals and especially birds requires their capture to uniquely mark each individual. Capturing, marking and recapturing some species of birds are relatively easy, and extremely difficult for others (Martin 1969, Braga *et al*. 2014). Some birds also remember conditions of their captures and avoid them in the future (Marzluff *et al*. 2010). The Southern Lapwing *Vanellus chilensis* (Molina, 1782) (Charadriiformes: Charadriidae) is very widespread in South America and much less common elsewhere (Martin 1997, Sánchez *et al*. 1998, Abrego 2012). Capturing this shorebird is extremely difficult. As birds of open areas, they apparently see and avoid nets. They are very defensive and, if they recognize a person as a threat, often attack the person (Costa 2002, *pers. obs.*). Finally, when one bird vocalizes it gathers the attention of other birds nearby and can alert them to potential captures and they seem to remember, often for extended periods of time, their capturer (*pers. obs.*).

The Southern Lapwing lives and nests on the ground in open areas and has become accustomed to urban areas (Sick 1997). Breeders can often use the same breeding territory in consecutive breeding seasons (Saracura 2003, *pers. obs.*). Lapwings are cooperative breeders with a flexible reproductive system, the details of which are still poorly known but may include pairs or cooperative breeding groups with three or four individuals (Walters & Walters 1980, Walters 1982, Saracura *et al*. 2008, Santos & Macedo 2011). Thus, understanding dynamics of lapwing breeding groups can provide information for understanding breeding system evolution (Costa 2002, Macedo 2008, Maruyama *et al*. 2010). Additionally, their study can inform wildlife management strategies (lapwings often use airports and may interfere with flights; Nascimento *et al*. 2005, Guedes *et al*. 2010).

Previous studies of behavioral and reproductive ecology of this common species relied on simple observations, without capturing and marking (Walters & Walters 1980, Walters 1982, Gallegos Luque 1984, Costa 2002, Maruyama *et al*. 2010). Only one study described

capturing birds by using fall traps and nylon nooses near the nest (Saracura *et al*. 2008). However, they were unable to capture all birds in any family group and only captured a fraction of the total number of birds under study. Here, we describe how we captured all members of breeding units of the Southern Lapwing during the breeding season by using mist-nets at night.

METHODS

Study site

As part of a reproductive behavioral study underway, we captured the Southern Lapwing in the city of Curitiba (49°14' W, 25°27' S), state of Paraná, southern Brazil. During the 2012 breeding season (August – December) we captured on a campus of the Federal University of Paraná, and during 2013 breeding season (November 2013 – January 2014) on a campus of the Federation of Industries of Paraná (FIEP). The study site includes buildings, grassy lawns (including sports fields that are used for nesting), streets lined with trees and small patches of native forest.

Directed capture before hatching

During the breeding season and upon recognizing a breeding territory, prior to approaching birds, we setup 2 - 4 mist nets (mesh size 5 x 5 cm, 15 m length, 3 m height) at night. Nets were placed inside breeding territories but not too close from nests (> 10 m). Once nets were open and ready, we then walked away from the nets and to the opposite side of the nest and then slowly walked towards the nest until birds recognized us as intruders. Upon recognition, birds began their defensive display, in which they squatted and emitted alarm calls and walked away from the nests. We continued slowly walking towards the birds such that their walking away from us took them closer to the nets (3 to 5 m), at which time we suddenly ran in their direction forcing them to fly away, thereby flying into the net (Figure 1A). We immediately and quickly removed the bird or birds, banded them, released them and closed and removed the nets and left the area.

Baited capture with young birds

Young birds soon after hatching and when adults sound an alarm call (or when startled) immediately lie down and hide motionless. Thus, to avoid stepping on young birds, after they hatched we changed the capture technique. At this time, adults are more alert and more quickly call and fly away rather than defensively displaying at a nesting site. We then used the young as bait (Picman 1979, Picman *et al*. 2002). Young were at least two weeks old as a precaution against possible problems due to temperature regulation; adults brood young for several days after hatching (Walters 1982).

First, from a distance that did not cause an alarm response from the adult birds we were interested in capturing, we located the young shortly before sunset using binoculars or a spotting scope. Once all young were located, we quickly entered the area and captured them by hand. Then we quickly set up two mist-nets in a "V" formation (Martin 1969). At this time it was twilight or dark and we released the young inside the two arms of the "V" (Figure 1B). We retreated from the area, waited 10 min and then checked the nets. Sometimes, under campus lighting, we continuously observed birds and nets. If the birds were captured, we quickly processed them as described above and left the breeding area. If not, when an adult bird was near the "V" we ran (as described above) or walked briskly towards the birds to drive them into the nets.

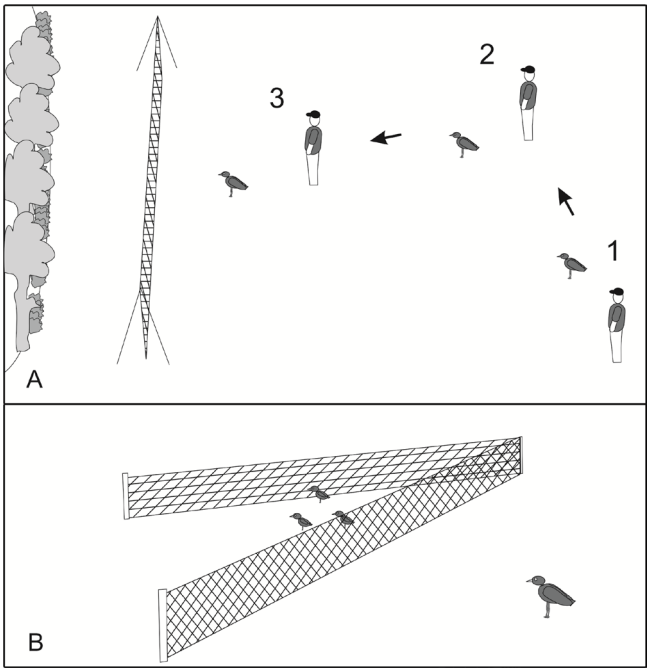

FIGURE 1. Schematic diagrams of the (A) directed capture and (B) young as bait methods to capture the Southern Lapwing (*Vanellus chilensis*) at night and in the breeding season. Scenarios are shown in (A), where a researcher directs a target individual to a mist-net during the night (arrows and numbers indicate the sequence), and in (B), where the mist-nets are set up in a "V" shape with the young within the "V" that draws the birds to the young, and thereby fall into the net.

RESULTS

We captured 52 lapwings during 26 nights in 2012 breeding season, and 26 during five nights in 2013 breeding season. Captured birds included all individuals that hatched eggs in the study site (n = 61), comprising

nine breeding pairs and seven breeding groups (three or four individuals) in 2012, and all individuals in four pairs and four groups in 2013. Also, we captured additional birds that did not reproduce in the study site (12 in 2012, and five in 2013). Most birds were captured before hatching (81%, n = 42 in 2012 and n = 16 in 2013, Table 1). No abandonment of nests, young birds or breeding territories occurred after adults were captured.

TABLE 1. Number of adult individuals of the Southern Lapwing (*Vanellus chilensis*) captured by reproductive stage and method.

Reproductive Stage	Method	n
2012 breeding season		
Pre-laying	Directed	24
Laying/Incubation	Directed	18
Post-hatching	Young as bait	10
2013 breeding season		
Laying/Incubation	Directed	14
Post-hatching	Young as bait	12

DISCUSSION

We captured all nesting birds we wished to capture in both breeding seasons (n = 61), using the methods we described here. Other studies had no individuals captured or seldom more than one individual marked in any breeding unit (Walters & Walters 1980, Walters 1982, Gallegos Luque 1984, Saracura *et al*. 2008). Thus, by efficient use of these methods, we were able to capture at night and then observe behaviors during the day of uniquely marked individuals, which was essential for our study of mating systems, which otherwise would have been impossible.

In our preliminary attempts to capture the lapwing, aside from standard setting of mist-nets, we attempted to throw fish nets and mist-nets over birds at night, which worked reasonably well for Northern Lapwings *Vanellus vanellus* (Thompson *et al*. 1994). We also tried to launch nets using an air-pressure launcher. We built a drop-net system, but birds never entered the trap. We also attempted using nylon nooses and cages near nests (Berg *et al*. 2002, Saracura *et al*. 2008), all unsuccessfully. We captured one adult by hand while it was on the nest, reluctant to leave as we approached, but that nest was then abandoned. Once we began using the two methods we describe here, we soon discovered that these successful methods had no apparent negative effects on birds.

Lapwings are aggressive and may react differently to different intruders (Costa 2002) and there are behavioral differences between individuals (*pers. obs.*). Thus, observing target birds prior to capture aids in determining where to put nets, what path to walk to force birds towards the nets and so on. Even at night, lapwings sometimes see mist-nets, especially when cloudy and in areas with artificial lights. In some occasions, we used structures as trees, buildings, or simply elevations in the terrain as backgrounds for the nets to avoid detection by the lapwings. In darker areas without urban lights, captures should be even easier. Also, wind causes nets to move around and then they are easier to see (Martin 1969) so we recommend capturing when wind is not an issue. Additionally, if nets are placed too close to nests, birds can easily perceive the nets. Thus it is important to have nets ready to quickly deploy and at distances greater than around 10 m from the nests. Flashlights should be avoided because birds often immediately flee the area once illuminated (but see Thompson *et al*. 1994 for different results with the Northern Lapwing). Even when birds are difficult to see, they may continue to vocalize and can be followed by sound.

Because birds in the study site are more or less accustomed to people, in our first tries (prior to egg laying) at directed captures, we easily walked to within 10 m (or less) of the birds. However, once eggs were laid and incubation began, stronger defensive behaviors occurred. Most individuals walked away, stopped and squatted while giving alarm calls (Costa 2002). Birds that behaved that way were usually easily captured. However, some birds flew away more quickly and were somewhat harder to capture. In this case, we found out that it was better to simply come back later, after hatching, to use the young as bait.

As we practiced, our own capture success increased. Thus, captures were quicker and more efficient during the second year. Because most breeding pairs and groups reproduce in the same breeding territory in subsequent years, recapturing is unnecessary as identifying them by their bands is equivalent to capture for longevity studies. Thus, capture effort for long-term studies can be concentrated in the first year of study and as necessary in subsequent years. During the second breeding season monitoring the Southern Lapwing in the campus of the Federal University of Paraná we only needed to capture a few individuals (seven birds) to again have all individuals marked.

By capturing breeding units, a more efficient, more detailed population study became possible. By capturing birds at night, they are less likely to recognize the people involved and so subsequent observations do not cause attacks by the birds. We found that birds sometimes remember, and attack, the researcher when

walking through the breeding area without stopping to observed birds, and up to a year after original capture or after capturing their young. Finally, no negative effects were detected in captured birds and abandonment never occurred, in contrast to a previous study (Saracura *et al.* 2008). Thus, these methods are useful for the Southern Lapwing and may be adaptable to a variety of situations, such as studies in natural environments. Using these techniques we are beginning to unravel the complexity of the Lapwing breeding system.

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