



AN EXPERIMENTAL APPROACH TO EGG PREDATION IN A LITTLE TERN *STERNA ALBIFRONS* COLONY

PRIMEIRAS EXPERIÊNCIAS NO ÂMBITO DO CONTROLO DA PREDACÃO NUMA
COLÓNIA DE CHILRETA *STERNA ALBIFRONS*

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In 1998 and 1999 the Little Tern (*Sterna albifrons*) colony at Lagoa de Santo André, Portugal, suffered severe egg predation by an avian predator (Allen Revez *et al.* 1999, Catry *et al.* 2000). Indeed, 33% (1998) and 39% (1999) of all clutches were destroyed before hatching but the predator species could not be directly identified. Here we report (1) an experimental study that allowed to identify the main egg predator and (2) a preliminary study that investigated experimentally a non-lethal method of predator control that has been used to reduce egg predation - conditioned taste aversion (CTA; Nicolaus *et al.* 1983, Avery *et al.* 1995). CTA consists of inducing an aversion towards a particular prey by presenting the predator a pre-treatment consisting of the prey items treated with illness-inducing compounds. Predators recover from the illness but will avoid the prey item in the future, depending on factors such as chemical concentration, compound, administration (Avery & Decker 1994) and pre-treatment duration (Avery *et al.* 1995).

In Experiment 1 - identification of the main egg predator - five artificial nests with two Quail (*Coturnix coturnix*) eggs each were placed at six experimental sites located in areas where Little Tern has previously attempted to nest:

the ocean beach (two replicates), the lagoon shore (two replicates), and the two lagoon islands (one replicate per island). At the beach and at the lagoon shore the two distinct experimental replicates were separated by over 200 m. Within each experimental site the nests were separated by over 10 m. The experiment was conducted at the end of the 1999 breeding season, when only one Little Tern couple was breeding. The nests were followed until they disappeared and the cause of destruction recorded. Experiment 2 - implementation of CTA - took place in March and April 2000 and involved three consecutive treatments in two distant areas (A and B) at the lagoon shore. In treatment 1, fifteen artificial nests with one or two non-treated Quail eggs were randomly placed in both areas (0% treated eggs, Table 1). This treatment lasted for 6 days, and all predated eggs were replaced daily. Treatment 2 was again presented in both areas and consisted in fifteen artificial nests with Quail eggs treated with illness-inducing compounds in area A (100% treated eggs) and with non-treated Quail eggs in area B (0% treated eggs). The chemical used was Mesurol Antilema, with 4% methiocarb (BAYER), and the eggs were treated as described by Avery *et al.* (1995). This second experiment lasted for 6 days, and again all predated eggs were replaced daily.

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Finally a third treatment was conducted in area A but not in Area B for 8 days. This was in all similar to the second treatment in area A.

Experiment 1: of the 30 artificial nests in six experimental areas, 14 (46%) were predated, 4 (13%) were destroyed by humans, 4 (13%) disappeared for unknown reasons and 6 (20%) remained intact during the experiment (7 days). Of the 14 nests predated, 13 were so by Carrion Crow (*Corvus corone*), as identified by tracks left at the nests. Of these 13, 8 were at the lagoon shore and were predated within the first 24 hours of the experiment. The remaining 4 were at the northern island and were destroyed at the end of the experiment. The 4 nests destroyed by humans and the 6 nests that remained intact were all from the beach experimental areas.

Experiment 2: during treatment one (0% treated eggs in both Area A and B), all nests in both areas were predated. Carrion Crows were observed to take and eat eggs from the nests. In treatment 2 (100% treated eggs in Area A, 0% treated eggs in Area B), all nests were again lost to Carrion Crows, though in area A some eggs were taken from the nests, broken though not eaten. Since this second treatment was not successful in reducing nest predation, a third treatment with similar treatment was performed in Area A. However, Carrion Crows continued to severely predate the nests in this third treatment. An effort to find the eggs taken by the predators in Area A revealed that only 17% were eaten and that 83% were removed from the nests, broken but not eaten (n=36).

We conclude that: (1) Carrion Crows were the main egg predators of artificial nests with Quail eggs placed in the nesting grounds of Little Tern; (2) In the absence of Little Terns, the lagoon shore is subjected to a high predation rate. On the contrary, at the ocean

beach predation by Carrion Crows is almost absent; (3) CTA with Mesurol Antilema was not successfully implemented. Though a significant fraction of eggs were not eaten, they were still taken from the nests and destroyed; (4) Nevertheless, CTA might indeed be implemented but different chemicals and/or different concentrations need to be tested (see Catry 2000).

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RESUMO

A utilização de ninhos artificiais com ovos de Codorniz (Coturnix coturnix) numa colónia de Chilreia (Sterna albifrons) na Lagoa de Santo André permitiu (1) identificar como principal predador de ovos a Galinha-preta (Corvus corone) e (2) investigar experimentalmente a implementação de uma técnica não letal de controlo de predação – CTA (Conditioned Taste Aversion). Não se conseguiu implementar na população de Galinha-preta uma aversão suficiente face aos ovos de Codorniz para evitar que estes sejam retirados dos ninhos artificiais e consequentemente destruídos. A predação dos ninhos artificiais não diminuiu quando ovos normais de Codorniz foram substituídos por ovos tratados com um composto químico repelente. No entanto, uma vez que apenas uma pequena fracção dos ovos retirados foi de facto consumida (17%), diferentes compostos químicos, concentrações ou desenhos experimentais deverão ser testados no futuro para melhorar a aversão implementada.

REFERENCES

Allen Revez, M., T. Catry. & I. Catry 1999. *A Andorinha-do-mar-anã (Sterna albifrons) na*

Table 1. Design and results of Experiment 2. Behaviour: E=eggs taken from the nests and eaten; D=eggs taken from the nests, destroyed but most not eaten.

Tabela 1. Desenho e resultados da Experiência 2. Comportamento E=ovos retirados do ninho e ingeridos; D=ovos retirados dos ninhos, destruídos mas maioritariamente não ingeridos.

	Area A					Area B				
	Description	Days of treatment	Eggs (n)	Predation	Behaviour	Description	Days of treatment	Eggs (n)	Predation	Behaviour
1	0% treated eggs	6	115	100%	E	0% treated treated eggs	6	115	100%	E
2	100% treated eggs	6	123	100%	D	0% treated treated eggs	6	115	100%	E
3	100% treated eggs	8	162	100%	D	-	-	-	-	-

Lagoa de Santo André em 1998. Relatório para o Instituto da Conservação da Natureza, não publicado. 31pp.

Avery, M.L. & D.G. Decker 1994. Responses of captive Fish Crows to eggs treated with chemical repellents. *Journal of Wildlife Management* 58: 261-266.

Avery, M.L., M.A. Pavelka, D.L. Bergman, D.G. Decker, C.E. Knittle, & G.M. Linz 1995. Aversive Conditioning to Reduce Raven Predation on California Least Tern Eggs. *Colonial Waterbirds* 18: 131-138.

Catry, T., M. Allen Revez & I. Catry 2000. Nidificação da *Andorinha-do-mar-anã* (Sterna

albifrons) na *Lagoa de Santo André em 1999.* Relatório para o Instituto da Conservação da Natureza, não publicado. 24pp.

Catry, T. 2000. *Ecologia e Conservação da Andorinha-do-mar-anã* Sterna albifrons nas salinas de Castro Marim e Cerro do Bufo e na Lagoa de Santo André. Relatório de Estágio para obtenção da Licenciatura em Biologia Aplicada aos Recursos Animais, não publicado. FCUL, Lisboa.

Nicolaus, L.K., J.F. Cassel, R.B. Carlson, & C.R. Gustavson 1983. Taste-Aversion Conditioning of Crows to Control Predation on Eggs. *Science* 220: 212-214.