Frequencies of the motion patterns in the maintenance and agonistic activities of the Phalacrocorax brasilianus in the marine and river environments in the state of Paraná, Brazil

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Introduction

The Neotropic Cormorant *Phalacrocorax brasilianus* (GMELIN, 1789), is distributed from the southwest end of the United States to the south tip of South America. The bird is present throughout Brazil (Veitenheimer-Mendes et al, 1993), preferring the clear and little deep waters in low elevations as, for instance, rivers, dams, swamps and coastal waters (Stiles & Skutch, 1995). The behavioural characteristics are usually seen as inferior to characteristics of the system (De Queiroz & Winberger, 1993). However the behaviour is an important tool to understand habitat use and it is necessary in the comparative biology that has been revolutionized by the breakthroughs in the phylogenetic methods (Kennedy et al, 1996).
The objective of this study was to analyse the behaviour of the Neotropic Cormorant drawing a comparative line of the motion frequency patterns in the marine and river water environments.

Material and Methods

The study was accomplished in the period June 2000 - October 2001, on the "Ilha dos Ratos" 25° 51' 755"S / 48° 34' 364" W, in the Guaratuba Bay (coastal area of Paraná) with a population of approximately 1800 birds and in the São Lourenço and Barigüi Parks in the urban environment of the city of Curitiba, where the population oscillated between five and 25 and 1 and 100 respectively. The methods "ad libitum" and "focal animal" were used (Altmann, 1974). The first one for the description of the postures and the second one to obtain the frequency of the postures for the different water systems. The birds were not marked, therefore the individuals were chosen randomly for the application of the methods.
The field notebook records consisted of the times of field observations, number of birds and climatic conditions according to Lehner, 1996.

Results and discussion

The number of birds were recorded together with their behaviour. Notations were made about the observing time and weather conditions. The activities were divided into maintenance and agonistic. 32 motion patterns were observed among these activities (Oliveira & Costa, 2001a; Oliveira & Costa, 2001b; Oliveira, 2001; Oliveira & Costa 2002). In the maintenance activities 27 motion patterns were registered and among them four varieties (table 1).

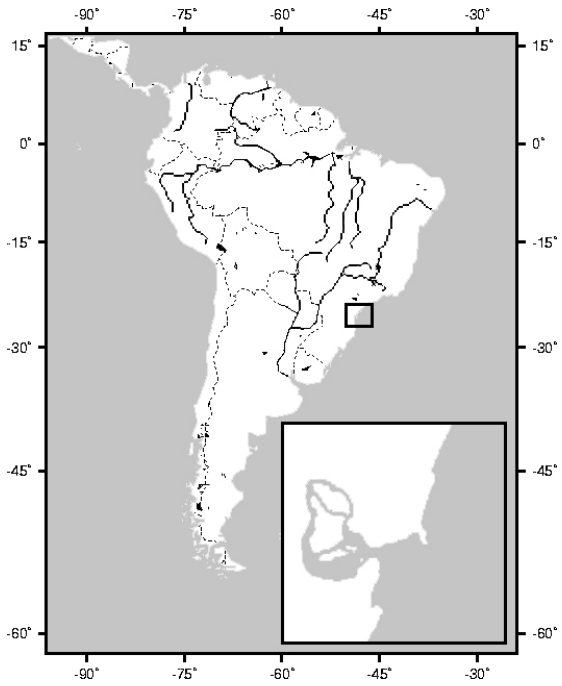

Figure 1. Situation of the study areas

In river water, the motion pattern of cleaning with the beak (36,64%, N=3973) was the most frequent and the resting one (29,65%, N=3973), the second most frequent. While the most frequent pattern in sea environment is the rest pattern (44,4%, N=205) and the pattern of cleaning with the beak (40,97%, N=205) as second. Gwiazda (2000) obtained almost the same data for *P. carbo sinensis* concerning the rest pattern, although he has used the time as unit.

The frequency obtained for the pattern of drying of feathers was of 4,2% (N=3973). Different angles of wings spanning were observed. The total of observed behaviours, Henneman (1982) mentioned by Schmidt (1994) registered for the P. auritus a frequency of 2,7% of the total behaviour observed for this pattern. Lekuona (1999) described for *P. carbo sinensis* that the wing spanning happens only after the period in water, for the drying of the wings. This corresponds with the registrations of this work.

Table 1. Frequency of the motion patterns registered in sea and river environments

Behavioural Patterns	**Sea Environment (N=205)**	**River Environment (N=3973)**
Resting Period	44,39%	29,65%
Plumage straightening	1,46%	2,47%
Drying of Feathers	X	4,17%
Forage	0,97%	3,25%
Paw Scratching	0,97%	1,74%
Yawning	2,43%	0,90%
Defecating	X	1,41%
Throat shaking	0,48%	3,32%
sleeping	0,48%	0,30%
Drinking water	X	0,23%
Regurgitating	X	0,05%
Wing extension	X	0,33%
Eating	0,48%	0,12%
Beak Cleaning	40,97%	36,64%
Shrinking	1,9%	1,36%
Flying		0,45%
Take off from water	1,46%	X
Ducking with light wings movement	X	0,18%
Ducking	X	0,38%
Moving wings to clean	1,46%	2,06%
Shaking water out of the body	0,48%	4,15%
Bath	1,95%	0,38%
Landing in water	X	X
Moving on tree branch	0,48%	1,48%
Moving in water	1,46%	1,33%
Moving on the ground	X	0,35%
To choke	X	0,18%
Pronounced stretching of neck	1,95%	0,10%

X - observed patterns, though not computed.

Four patterns were registered for the agonistic activities and the frequencies were computed only for the river system. The most frequent motion pattern was the warning posture (62,5%, N=51), followed by the attack posture (21,1%, N=51). The alert posture was the least frequent (10,3%, N=51) followed by the escape posture with food (5,9%, N=51) (figure 2).

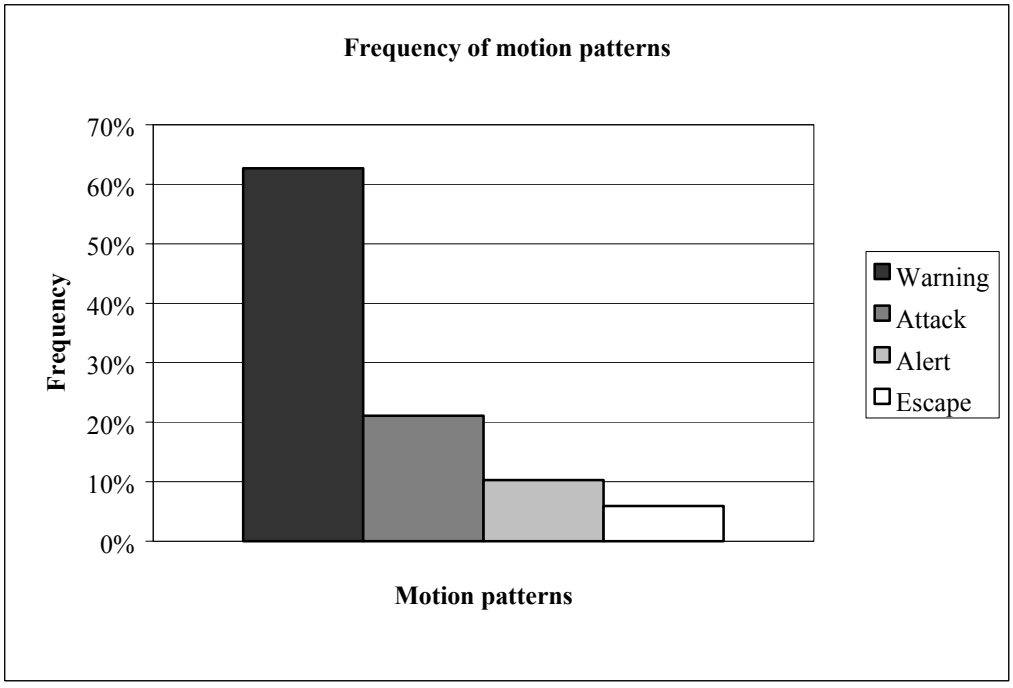

Figure 2. Frequencies of motion patterns concerning the agonistic activity

Ecological Aspect

The greatest importance in the *Phalacrocorax brasilianus* study is its behavioral context.

Although the frequency has been changed, they were not significant due to the sample N (205 – marine environment and 3973 – river environment). This has made it possible to reach a conclusion which was supported by the first hypothesis that was raised which says that the motion patterns would be just the same ones triggered in both environments.

The predominant motion pattern were the "rest posture" and the "beak cleaning" in the maintenance activity.

The a-biotic ecological factors did not influence the behavior patterns execution even considering that in marine environment the bird would move away from the observation place (island) in search for food inside the bay. This fact is explained by direct antropic action next to the feeding place; the sea. Those actions are suggested by ferry-boats, motorboats, ships, yachts, fishing boats and the continental disturbance.

In river environment the observations were accomplished in urban area (municipal park) where the lake was considered the feeding place, not suffering direct antropic influence.

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