Behavioural patterns for the White-breasted thrasher *Ramphocinclus brachyurus brachyurus*: the socio-ecological conservation approach

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Research theme

• Collaborative approach to conservation biology: behavioural ecology of an endemic species, the White-breasted thrasher (*Ramphocinclus brachyurus*).

• Main objectives
  • Confront scientific knowledge with social representations.
  • Understand the interaction rules between social and ecological organizations.

• Co-supervisors: Dr. Daniel IMBERT and Dr. Jean-Raphaël GROS-DÉSORMEAUX

• Scientific co-supervisor: Pr. Frank CÉZILLY
Presentation of the species

• The White-Breasted Thrasher *Ramphocinclus brachyurus*

• (Temple *et al.*, 2006, Mortensen *et al.*, 2014, 2016)
  • Mimids family (*Mimidae*)
  • Two islands and two subspecies

White-breasted thrasher
(*Ramphocinclus brachyurus sanctaelucia*)

White-breasted thrasher
(*Ramphocinclus brachyurus brachyurus*)

Photos by Jennifer Mortensen
History of the species

- **1905**: At the edge of extinction
- **1950**: Considered extinct
- **1976**: Creation of the reserve
- **UICN 2015**: Rare threatened species
- **Currently**: Population estimated between 200 and 400 individuals

Distribution of the White-Breasted Thrasher in Martinique - Map 2018 @Google
Production of scientific knowledge

- Relative observation of habitat
  - Phytocenosis analyzes
  - Forest litter analyzes

- Observation on species
  - Capture-Mark Recapture sessions
  - Counting and marking nests
  - Behavioural analyzes
  - Listening points
Social representations of conservation

• Naturalistic representations
  • How do ornithologists represent conservation issues?

• Legal representations
  • How did evolve formal and informal rules regulating interactions between the species and its environment?

• Political representations
  • How did evolve conservation policies for the White-breasted thrasher?

• What discrepancies and concordances stand between scientific knowledges and social representations for the conservation of this species?
Applied development research

• Collaboration agreement between le Parc Naturel Régional de la Martinique (PNRM), l’Université des Antilles (UA) and le Centre National de la Recherche Scientifique (CNRS).

• A long-term follow-up of the impacts of the changes on socio-ecological issues in the nature reserve of Caravelle peninsula in Martinique.
Mobilized disciplines (concepts and methods)

• Behavioural Ecology

• Population biology (genetics, self-ecology, chorology, etc.)

• Sociology

• Geography/Geomatics

• Botanics
Vigilance and disturbances

- Objective: Production of knowledges on the disturbances
- Theoretical framework:
  - Relationship between vigilance behaviour and capture effort (Beauchamp & Ruxton, 2016)
  - Many parameters may affect vigilance behaviour making predictions difficult (Deportes et al., 1989; Ferriere et al., 1996; Ferriere et al., 2001).
- Problematic:
  - Birds alternating between time spent in vigilance and time allocated for foraging (Beauchamp and Ruxton, 2016).
  - For some species, the size of the group can impact vigilance (Beauchamps, 2008; Cézilly & Keddar, 2012).
  - Burger & Gochfeld 2002, vigilance increases near to trails.
- Research question: Can the vigilance behaviour of the White-breasted thrasher be predicted?
- Hypotheses:
  - Case A: There is no difference of vigilance according to the catching effort $H_0$, there are differences of vigilance according to the catching effort $H_1$.
  - Case B: There is no difference of vigilance according to the number of individuals present $H_0$, there are differences of vigilance according to the number of individuals present $H_1$.
  - Case C: There is no difference in vigilance according to the proximity of individuals to the trail $H_0$, there are differences in vigilance according to the proximity of individuals to the trail $H_1$. 
Methods

• Video recordings (total time spent prospecting: 260 hours)
  • Behavioural sequences alternating between:
    • Vigilance (V)
    • Scratching (S)
    • Eating (E)

• Quantification:
  • Vigilance rate (number of scans/time unit)
  • Capture effort (number of scratches/prey captured)
Methods

• Correlation tests:
  • Pearson’s test, to test the relationship between vigilance rate and capture effort.

• Comparison of means:
  • Two groups tested
    • Group 1: <2 individuals
    • Group 2: >2 individuals
  • T.test to determine the mean difference between the number of vigilance acts per seconds for the two groups.
  • Cohen’s d computation for the mean difference between the number of vigilance acts per seconds for the two groups.

• Significance of the linear model:
  • Linear model built with the number of vigilance acts per seconds and distance to trail (meters).
### Results

- **Correlation tests:**
  - Pearson’s test: Not significant.

- **Comparison of two means:**
  - t-test not significant.
  - Cohen’s d.

- **Linear model:**
  - Significant: negative relationship between vigilance rate and distance to trail.

#### Pearson’s correlation

<table>
<thead>
<tr>
<th></th>
<th>t</th>
<th>df</th>
<th>p.value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vigilance with Capture effort</td>
<td>-0.0967</td>
<td>38</td>
<td>0.9235</td>
<td>[-0.3256; 0.2973]</td>
</tr>
</tbody>
</table>

#### Average vigilance rate between two groups, n= 40 individuals.

- $\bar{x}_1 = 0.117; \bar{x}_2 = 0.104; t= 0.787; df = 38; p.value=0.437; Cohen’s d = 0.26; 95\% CI = [-0.367;1.067]$

#### Vigilance function of distance to trail, n= 40 individuals.

- Estimate =0.0008; Std.Error=0.0004; t.value=-2.165; p.value=0.037
Discussion

• Can the behavior of the White-breasted thrasher be predicted by capture effort, group size or distance to trail?

• No relationship between vigilance rate and capture effort, or vigilance rate and group size, thus we cannot predict this with the studied sample.
  • Dependance of vigilance behavior to many parameters (Desportes et al., 1989; Ferrière et al., 1996; Ferrière et al., 2001).
  • Possible situations : High vigilance and high capture effort; Low vigilance and low capture effort; high vigilance and low capture effort; low vigilance and high capture effort.

• For the White-breasted thrasher, there is a negative relationship between vigilance rate and distance to trail : predictions can be made with the studied sample.
Prospects

• While foraging, is there a threshold of number of individuals from which would appear the relationship between vigilance rate and group size?

• From which number of individuals, there is a relationship between capture effort and group size?

• What is the distribution of the theoretical situations for vigilance and capture effort in the dataset?
Prospects

• Definition:
  • « High vigilance rate »: when vigilance rate is upper the mean of the population
  • « Low vigilance rate»: when vigilance rate is under the mean of the population
  • « High capture effort »: when the capture effort is upper the mean of the population
  • « Low capture effort »: when the capture effort is upper the mean of the population

<table>
<thead>
<tr>
<th>Vigilance rate</th>
<th>Capture effort</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High</td>
<td>27,5</td>
</tr>
<tr>
<td>Low</td>
<td>Low</td>
<td>37,5</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>20</td>
</tr>
<tr>
<td>Low</td>
<td>High</td>
<td>15</td>
</tr>
</tbody>
</table>

• 65% extreme situations
  • Are those behaviors exclusive?

• 20 % of the situations : individuals are very vigilant and performants for capturing preys.

• 15% of the situations : individuals are not vigilant and weak for capturing preys.
  • How do age, preys’ abundance or predation risk can explain this ability?
Methodological challenges

• Detection of small preys during recording analyzes
• Correlation tests between types of calls and vigilance.
• Correlation tests between types of calls and capture effort.
• Identification of individuals.
• Evaluation of the resource.

Thank you for your attention!
Acknowledgement


• Ferrière, Régis, Bernard Cazelles, Frank Cézilly, et Jean-Pierre Desportes. 2001. « Predictability, chaos and coordination in bird vigilant behavior ».


• Thanks to Pr. Frank Cézilly (President of Caribaea Initiative), Dr. Daniel Imbert (Lecturer, HDR), Thomas Alexandrine (Environmental guardian), Dr. Laurent Louis-Jean (Administrator of national natural reserves).