TEMPORAL PATTERNS, DEFENSIVE BEHAVIOURS AND BENEFITS OF MALE PARENTAL CARE IN THE GLASSFROG *Centrolene savagei*

Ana María Ospina-L
Paula Navarro-Salcedo
Julián Alberto Rios-Soto
Sebastián Duarte-Marín
Fernando Vargas-Salinas
INTRODUCTION
PARENTAL CARE

Any parental trait that enhance the fitness of a parent’s offspring, and that likely originated and or is maintained for this function.

- Enhance offspring survival chances
- Lower feeding rate
- Exposure to predators
- Future chances of mating
To understand the evolutionary process behind the trade-off between cost and benefits of parental care, it is important to have detailed information about behaviors of parents.
To understand the evolutionary process behind the trade-off between cost and benefits of parental care, it is important to have detailed information about behaviors of parents.
HIGH DIVERSITY OF FORMS OF PARENTAL CARE

6 – 15 % Species
Centrolenidae (Glassfrogs)
Patterns of parental care in Neotropical glassfrogs: fieldwork alters hypotheses of sex-role evolution

J. DELIA*, L. BRAVO-VALENCA† & K. M. WARKENTIN*†
Centrolene savagei

Advertisement and courtship call

Tadpole description

Mating pattern

Courtship and post-amplexus displays

Homing behavior in males

Parental care behavior and offspring mortality

Body size: 19.0 – 24.2 mm
OBJECTIVES

1. To quantify variation in parental care at two temporal scales (day – night), and weeks along embryo development in the glassfrog *Centrolene savagei*

2. To experimentally test the commitment of males attending clutches, and recording male behaviors associated to parental care

3. To compare rates of embryo mortality in naturally abandoned clutches and clutches attended by males as a proxy to infer adaptive benefits of parental care in *C. savagei*
METHODOLOGY
La Aldea, municipality of Filandia, Quindío, Colombia
Montane wet forest (1600 masl)
February 2016  65 field visits  November 2018
(2 Nocturnal / 1 Diurnal surveys)
- Presence of males indicate paternity
- Number of dead/alive embryos
- Developmental stages
Early development of the glass frogs *Hyalinobatrachium fleischmanni* and *Espadarana callistomma* (Anura: Centrolenidae) from cleavage to tadpole hatching

Maria-José Salazar-Nicholls and Eugenia M. del Pino*
Oviposition

HATCHING OR STAGES 24 - 25

≤11
1. To quantify variation in parental care at two temporal scales (day – night), and weeks along embryo development in the glassfrog *Centrolene savagei*

2. To experimentally test the commitment of males attending clutches, and recording male behaviors associated to parental care

3. To compare rates of embryo mortality in naturally abandoned clutches and clutches cared by males as a proxy to infer adaptive benefits of parental care in *C. savagei*
Size, Endurance, or Parental Care Performance? Male–Male Competition, Female Choice, and Non-Random Mating Pattern in the Glassfrog *Centrolene savagei*

Ana M. Ospina-L.¹, Julián A. Rios-Soto¹, and Fernando Vargas-Salinas¹

\[ \text{PCI} = \frac{(\sum P) \times D}{M} \]

- Points according to egg attendance categories
- Days between the first and the last monitoring to the clutch
- Number of monitorings

Days:
- 0
- 1
- 2
- 3
- 4
EMBRYO DEVELOPMENT
1. To quantify variation in parental care at two temporal scales (day – night), and weeks along embryo development in the glassfrog *Centrolene savagei*.

2. To experimentally test the commitment of males attending clutches, and recording male behaviors associated to parental care.

3. To compare rates of embryo mortality in naturally abandoned clutches and clutches cared by males as a proxy to infer adaptive benefits of parental care in *C. savagei*.
Presence – absence of defensive behaviors

Time until males flee
1. To quantify variation in parental care at two temporal scales (day – night), and weeks along embryo development in the glassfrog *Centrolene savagei*

2. To experimentally test the commitment of males attending clutches, and recording male behaviors associated to parental care

3. To compare rates of embryo mortality in naturally abandoned clutches and clutches cared by males as a proxy to infer adaptive benefits of parental care in *C. savagei*
RESULTS AND DISCUSSION
1. To quantify variation in parental care at two temporal scales (day – night), and weeks along embryo development in the glassfrog *Centrolene savagei*

2. To experimentally test the commitment of males attending clutches, and recording male behaviors associated to parental care

3. To compare rates of embryo mortality in naturally abandoned clutches and clutches cared by males as a proxy to infer adaptive benefits of parental care in *C. savagei*
Paired t-test = 4.221, P = 0.001

Hyalinobatrachium orientale
Costs and benefits of temporary egg desertion in a rocky shore frog with male-only care

Rafael C. Consolmagno¹ · Gustavo S. Requena² · Glaucio Machado² · Cinthia A. Brasileiro³

Thoropa taophora  
Photo: M Texeira Jr
Predators are nocturnal

Water loss is too high for parents
Size, Endurance, or Parental Care Performance? Male–Male Competition, Female Choice, and Non-Random Mating Pattern in the Glassfrog Centrolene savagei

Ana M. Ospina-L.¹, Julián A. Rios-Soto¹, and Fernando Vargas-Salinas¹
1. To quantify variation in parental care at two temporal scales (day – night), and weeks along embryo development in the glassfrog *Centrolene savagei*

2. To experimentally test the commitment of males attending clutches, and recording male behaviors associated to parental care

3. To compare rates of embryo mortality in naturally abandoned clutches and clutches cared by males as a proxy to infer adaptive benefits of parental care in *C. savagei*
Fisher exact test, $P = 0.045$

Mann-Whitney, $U = 3.0$, $P = 0.052$
Maternal care in a glassfrog: care function and commitment to offspring in *Ikakogi tayrona*

Laura Bravo Valencia¹ · Jesse Delia²
1. To quantify variation in parental care at two temporal scales (day – night), and weeks along embryo development in the glassfrog *Centrolene savagei*.

2. To experimentally test the commitment of males attending clutches, and recording male behaviors associated to parental care.

3. To compare rates of embryo mortality in naturally abandoned clutches and clutches cared by males as a proxy to infer adaptive benefits of parental care in *C. savagei*. 
Mann Whitney U = 36, P = 0.003

Mean = 29.61 ± 43.41 SD
Mean = 78.64 ± 32.4 SD
OVIPOSITION OUT OF WATER

- *Hyalinobatrachium fleischmanni*
- *Centrolene peristictum*
- *Eleutherodactylus coqui*
- *Nannophrys ceylonensis*
- *Chiromantis hansenae*
- Males attending clutches perform brooding behavior mainly during the night.

- Males reduce brooding behavior from oviposition towards egg hatching; as the embryo develops males begin to call and search for new mates.

- Males attending clutches exhibit more defensive (and probably risky) behaviors than solitary males.

- Naturally abandoned clutches exhibit higher mortality rates than clutches attended by males.
Brooding behavior in *Centrolene savagei* may be adaptive, and it varies at different temporal scales.
ACKNOWLEDGEMENTS
• Familia Ospina-Vanegas
• Familia Duarte-Marín
• Familia Salcedo
• Kevin López-Molina
• Angélica Zapata
• Javier Muñoz
• Juan David Carvajal
• Maria Alejandra Bedoya
• Cristian González

• Luisa Arcila-Pérez
• Nicolás Echeverry
• Camila Basto
• Sebastián Guerrero
• Sergio Saavedra
• Santiago Casas-Cardona
• María del Mar Bedoya
• Tania García-Pérez