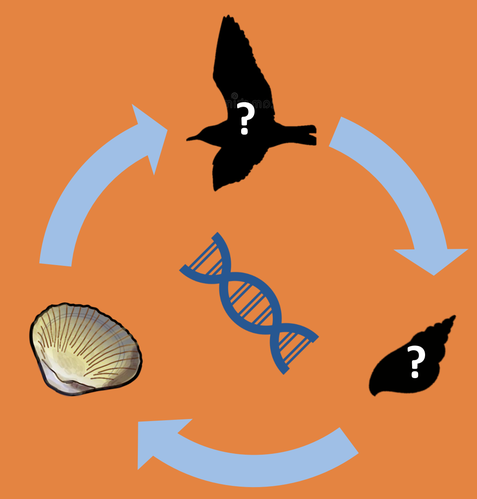
Elucidation of the life cycle of the trematode *Curtuteria arguinae* using molecular techniques



Leslie **STOUT***[,1], Aurélie **CHAMBOUVET**[2], Guillemine **DAFFE**[3], Adrien **DE MONTAUDOUIN**[4], Flore **DARAMY**[1] and Xavier **DE MONTAUDOUIN**[1]

[1] Univ. Bordeaux, CNRS, Bordeaux INP, EPOC, UMR 5805, Station Marine d'Arcachon, Arcachon
[2] CNRS, UMR 7144 AD2M, Station Biologique de Roscoff, Sorbonne Université, Roscoff, France
[3] Univ. Bordeaux, CNRS, OASU, UAR 2567 POREA, Pessac, France
[4] SEPANSO Aquitaine, Bordeaux, France

BACKGROUND

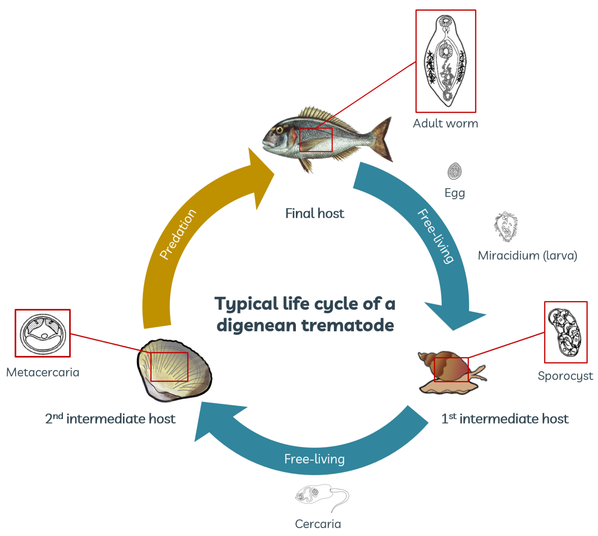


Figure 1: Typical life cycle of a marine trematode

- The marine trematode *Curtuteria arguinae* (Echinostomatidae) infests the common cockle (*Cerastoderma edule*) as its second intermediate host in form of metacercariae (Fig. 2), along the Atlantic Coast of Southern Europe.
- First described in 2006 in the national natural reserve of Banc d'Arguin (SW France), with continuous high prevalence and abundances over the last 20 years ➔ Potential pathogenic effects on cockles (of major ecological and socio-economical importance). However…

QUESTION : 1st intermediate host and final host unknown…
But we know…

- Potential life cycle similarity with the sister species *Curtuteria australis* found in New-Zealand:
  Cominella glandiformis → *Austrovenus stutchburyi / Macomona liliana* → *Haematopus ostralegus finchi*
- For echinostomatids: 1st intermediate host: abundant gastropod, final host: bird (predominantly).

What is the complete life cycle of *Curtuteria arguinae* ?

Search for 1st and final hosts using the DNA of *C. arguinae*

Figure 2: Sampling site; *C. arguinae* metacercaria; common cockles

1ST INTERMEDIATE HOST

Material and Methods

- Collection of 1180 individuals belonging to the 5 most abundant gastropod species on Banc d'Arguin in September 2023 :
  Tritia reticulata, Bittium reticulatum, Peringia ulvae, Tritia neritea, Steromphala umbilicalis.

250(1) ind per species divided into 5 aquaria with 1L seawater

1,5-2,5 days — 23,5°C

Filtration
(filter pore size: 8 µm)

DNA extraction

C. arguinae specific qPCR assay
(cox1 and 18S genes)

- Collection of cercariae by cercarial emission from 280 individuals of the putative host species
- Genetic analyses: DNA amplification and sequencing of a partial fragment of the cox1 gene (primers TremCOIS2/TremCOIAS2, Magalhães *et al.* 2020)

(1) except for *Peringia ulvae* : 180 individuals collected

Results

- **All aquaria containing *Bittium reticulatum* individuals: positive for *C. arguinae* DNA**
- All aquaria containing the other four gastropod species: negative.
- **DNA match :** partial cox1 sequences from cercariae and metacercariae are identical
- Cercarial emission: 1.6 % prevalence in *B. reticulatum*

Conclusion: *Bittium reticulatum* is the 1st intermediate host of *C. arguinae*

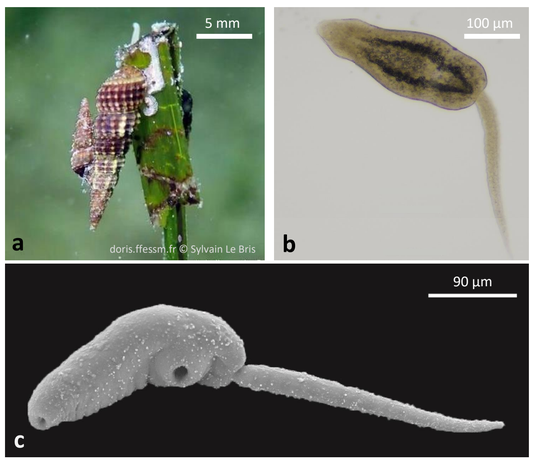


Figure 3: a. Photograph of *Bittium reticulatum*; Microphotographs of cercariae of *C. arguinae* b. observed under a light microscope; c. by SEM

FINAL HOST

Material and Methods

- Collection of 167 individual bird feces of oystercatchers (*Haematopus ostralegus*, n=110) and seagulls (*Laridae* sp., n=57) on Banc d'Arguin from January to June 2023.

Bird feces sample

DNA extraction
with ½ sample

C. arguinae specific qPCR assay
(cox1 and 18S genes)

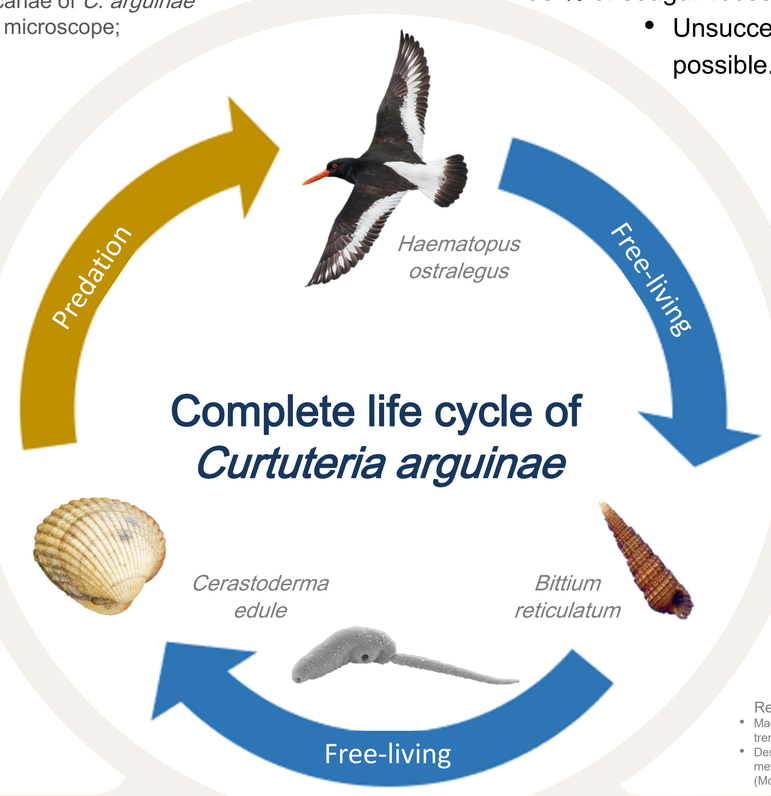
IF — POSITIVE

Search for trematode eggs for genetic analysis
in other ½ sample by observation under a stereomicroscope

Results

- 42 % of oystercatcher feces samples were positive for *C. arguinae* DNA
- 98 % of seagull feces samples were negative (1/57 positive sample).
- Unsuccessful DNA extraction on eggs: no DNA matching possible.

Conclusion:
the oystercatcher (*Haematopus ostralegus*) is the final host of *C. arguinae*



PERSPECTIVES

- It is now possible to study the dynamics of this host-parasite system:
  - Infestation phenology of 1st and 2nd intermediate hosts
  - Effects of the final host's phenology (migratory bird)
  - Effects of the 1st intermediate host's distribution on cockle infestation: additional data shows that cockle infestation intensity is highest in seagrass where *Bittium reticulatum* is most abundant.

AKNOWLEDGEMENTS

Many thanks to the **BSP** for honoring me with a **student travel award** enabling me to participate in this conference. Sampling was performed thanks to Planula 4 vessels (CNRS-INSU, FOF) and its staff. We thank the SEPANSO staff managing the Natural Reserve. We also thank Nicolas Lavesque for helping with SEM imaging.

References :
- Magalhães L, Daffe G, Freitas R, de Montaudouin X (2020). *Monorchis parvus* and *Gymnophallus choledochus*: two trematode species infecting cockles as first and second intermediate host. Parasitology 147, 643–658.
- Desclaux C., Russell-Pinto F., de Montaudouin X. and Bachelet G. (2006) First record and description of metacercariae of *Curcuteria arguinae* n. sp. (Digenea: Echinostomatidae), parasite of cockles *Cerastoderma edule* (Mollusca: Bivalvia) in Arcachon Bay, France. Journal of Parasitology 92, 578–587.

with the BSP Student Travel Award

BSP Spring Meeting 2024

Leslie STOUT
PhD candidate
*leslie.stout@u-bordeaux.fr