



Haemoproteus syrnii in *Strix aluco* from France: morphology, molecular characterisation, and sporogony in a Hippoboscid fly (*Ornithomyia* sp.).

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Introduction : In France, the Apicomplexa *Haemoproteus syrnii* (Mayer, 1910) is frequently found in the Tawny owl, *Strix aluco* (Linnaeus, 1758). The invertebrate host was still unknown and the parasite was classified in the subgenus *Parahaemoproteus*. We complete here the life cycle of *H. syrnii* in vertebrate and invertebrate (*Ornithomyia avicularia*) hosts and insist on the importance of the volutine grains as a constant morphological criterium. A molecular phylogeny reconstruction is proposed based on a portion of the cytochrome b.

Fig 1 : Life cycle of *Haemoproteus syrnii*

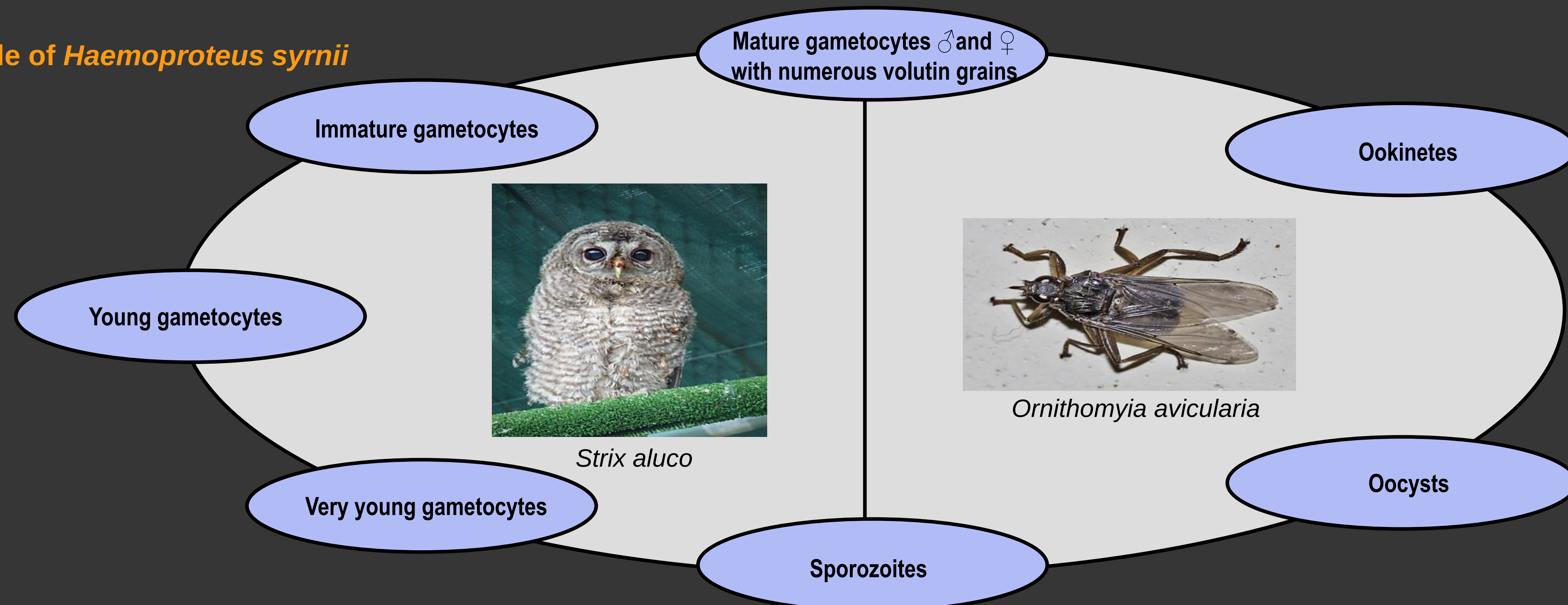
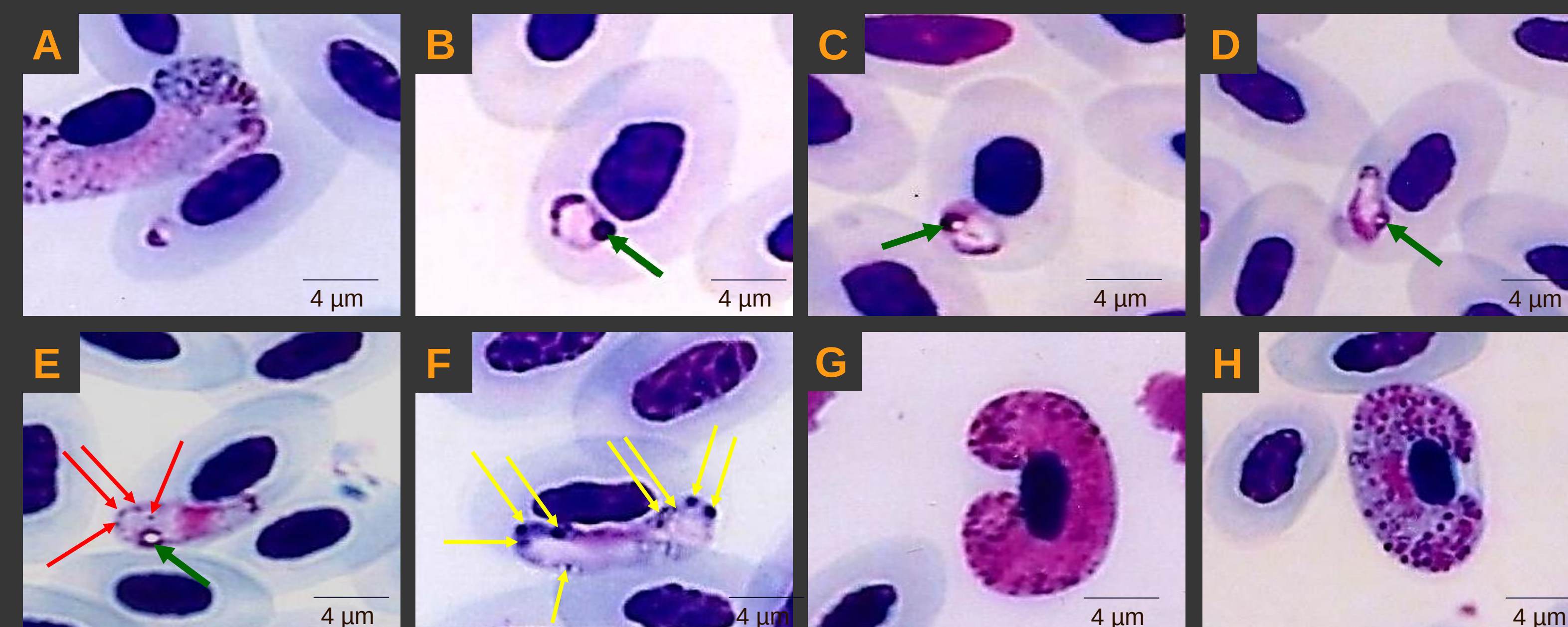


Fig 2 : Development of *H. syrnii* in the red blood cells of *Strix aluco*:

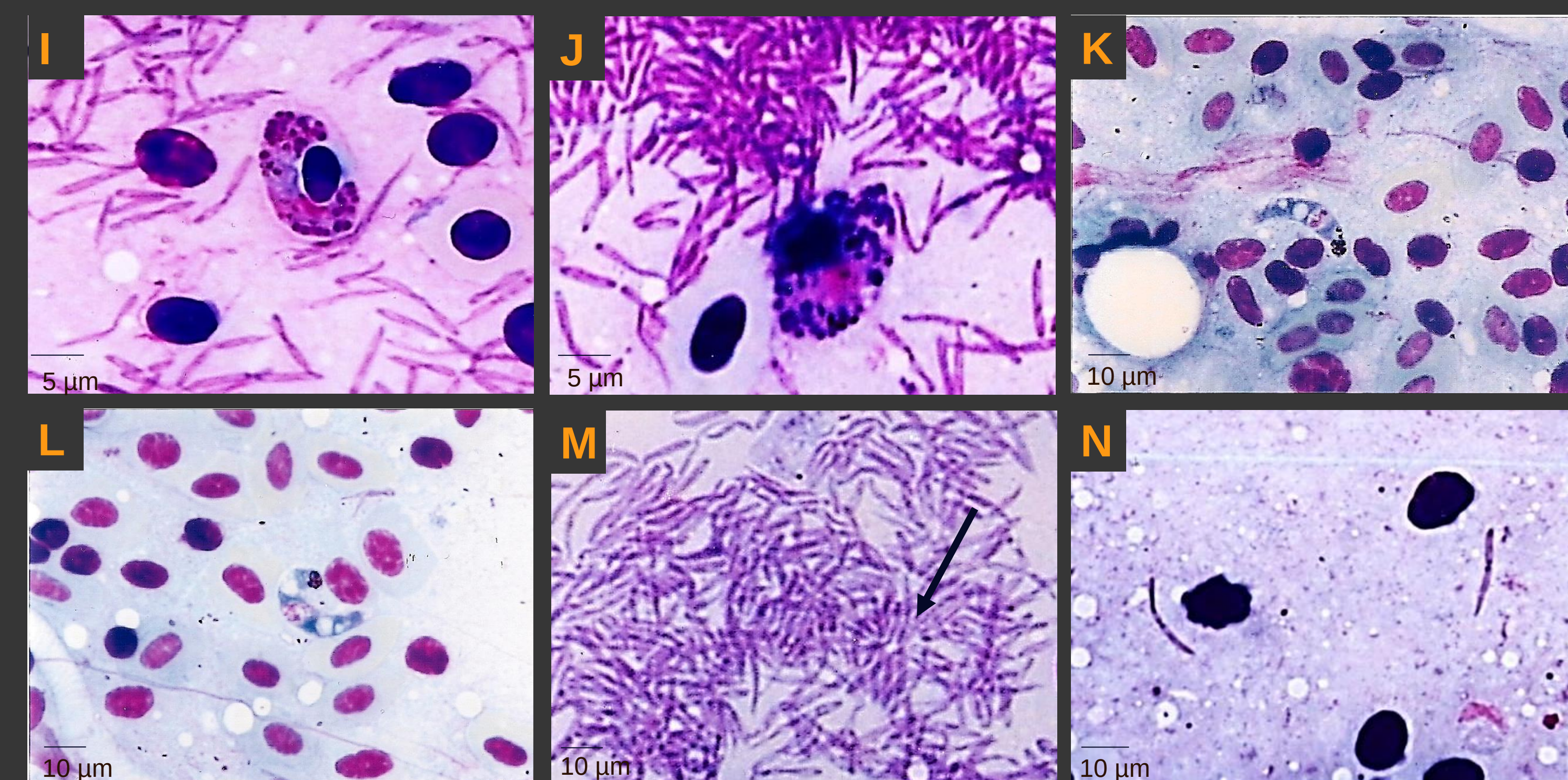
A: Very young gametocyte; **B-D:** young gametocytes with an initial volutin grain (green arrows); **E:** Immature gametocyte with a few new small volutin grains in the same area than the initial one (red arrows); **F:** immature gametocyte with numerous volutin grains (yellow arrows); **G:** Male gametocyte with many volutine granules; **H:** Female gametocyte with many of volutine granules.



→ Volutin appears early in the first stages of the gametocytes, firstly as an initial grain which multiplies through the parasite development

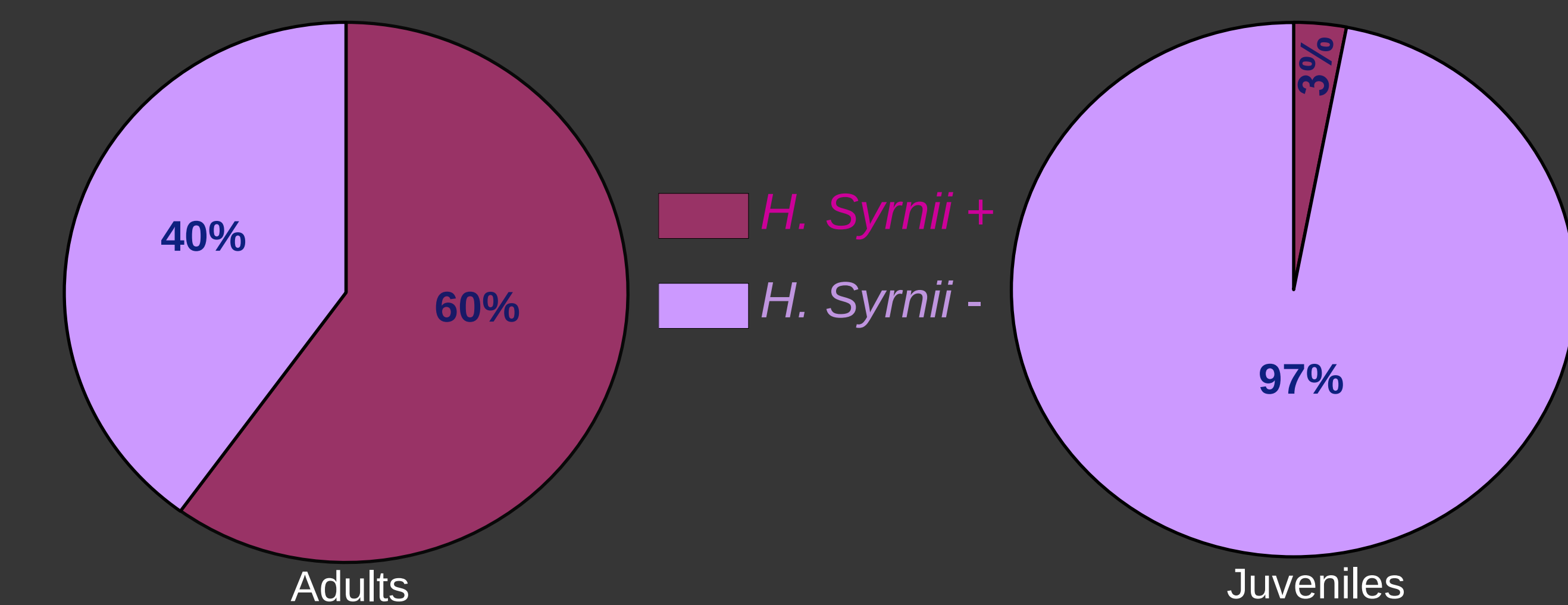
Fig 3 : Development of *H. syrnii* in the haemocoel of *O. avicularia* :

I-J&L: Ruptured immature oocysts & gametocytes freshly; **K-L:** Ookinete surrounded by digested red blood cells; **M:** Immature oocyst with sporozoites still grouped and attached by one end; **N:** Two mature sporozoites.



→ All the stages of *H. syrnii* are found in the same *O. avicularia*

Fig 4 : Prevalence of *H. syrnii* in *Strix aluco*



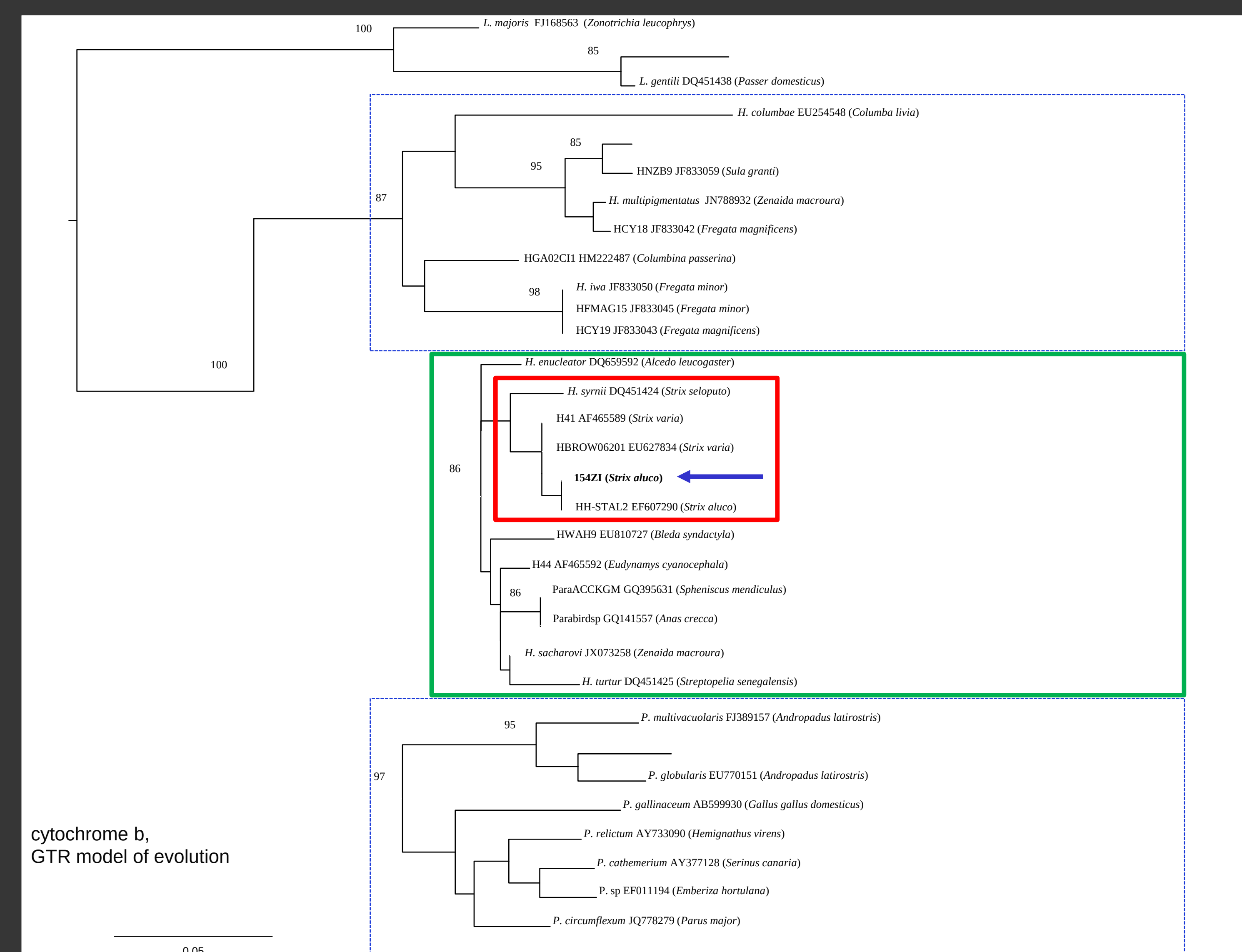
→ 60% of adult owls harbour *H. syrnii* instead of 3% of the juveniles

Conclusions :

Haemoproteus syrnii was observed in the blood of 60 % of the adult *Strix aluco* but only in one of the 33 juveniles (3%). The volutin grains appear in the young gametocyte stage as an initial grain which will multiply. The mature parasites are loaded with these grains. We consider the volutin granules as been constant in a given species, and although they may be overlooked when the staining is insufficient, to have a taxonomic value.

The parasite develops in the pupiparous and thus should be reclassified in the *Haemoproteus* subgenus. Additionally, the phylogenetic analysis clusters with the sequences of the parasites from different *Strix* available in GenBank. This clade is in a mixed group, in which are some parasites of the subgenera *Haemoproteus* and *Parahaemoproteus*.

Fig 5 : Phylogenetic analysis:



→ The new material analysed in this study (*H. syrnii* 154 ZI) clusters with the parasites from other *Strix*, inside a group containing the parasites of both subgenera *Haemoproteus* and *Parahaemoproteus*