

## SCANNING ELECTRON MICROSCOPY OF LARVAL INSTARS AND IMAGO OF *OESTRUS CAUCASICUS* (GRUNIN, 1948) (DIPTERA: OESTRIDAE)

GUITTON C.\*, PEREZ J.M.\*\* & DORCHIES P.\*\*\*

### Summary :

*Oestrus caucasicus* (Grunin, 1948) is a larval parasite of the nasal cavities of *Capra caucasica*, *Capra ibex* and *Capra pyrenaica*. This study is the first description of the parasite using scanning electron microscopy. The first larval instar shows minor differences with *Oestrus ovis*. The second larval instar shows important synapomorphic features common to *Oestrus ovis* but, also, distinctive features as the spines-crown or the currycomb-shaped spines. The third larval instar shows many differences with *Oestrus ovis*, mostly in the ventral and dorsal spines. The imagos of the two species have closely related morphologies. This study is a contribution to a revision of phylogeny of Oestridae family.

**KEY WORDS :** Scanning electron microscopy, *Oestrus caucasicus*, larval parasite.

### Résumé : MICROSCOPIC ÉLECTRONIQUE À BALAYAGE DES STADES LARVAIRES ET IMAGO D'*OESTRUS CAUCASICUS* (GRUNIN, 1948) (DIPTERA : OESTRIDAE)

*Oestrus caucasicus* (Grunin, 1948) est un parasite larvaire des cavités nasales de *Capra caucasica*, *Capra ibex* et *Capra pyrenaica*. Cette étude constitue la première description du parasite en microscopie électronique à balayage. Le premier stade larvaire montre peu de différences avec *Oestrus ovis*. Le second stade larvaire montre d'importantes synapomorphies avec *Oestrus ovis* mais, également, des caractères distinctifs comme la couronne d'épines ou les épines ventrales en forme d'étrilles. Le troisième stade larvaire présente d'importantes différences avec *Oestrus ovis*, surtout concernant les épines ventrales et dorsales. Les imagos des deux espèces ont des morphologies voisines. Cette étude est une contribution à une révision de la phylogénie de la famille des Oestridae.

**MOTS CLÉS :** Microscopie électronique à balayage, *Oestrus caucasicus*, parasite larvaire.

## INTRODUCTION

*Oestrus caucasicus* or « asiatic goat nasal bot fly » is a larval parasite described from *Capra ibex* in Central Asia and *Capra cylindricornis* in Caucasus (Grunin, 1957). Later, this oestrid was also found parasiting *Capra sibirica* in Mongolia (Minar *et al.*, 1985). Recently, the parasite was identified in Spania (Perez *et al.*, 1996) from *Capra pyrenaica* and samples were collected for analysis. In *Oestrus* genus, the type species *Oestrus ovis* (Linnaeus 1758) was very precisely described by Zumpt (1965) in his complete revision of the Oestridae. On the contrary, *Oestrus caucasicus* was very briefly described for the third larval instar and the imago, the first and second larval instars were, until today, unknown. Using scanning elec-

tron microscopy, we described the larval instars and the imago of *Oestrus caucasicus* and stressed differences with the type species *Oestrus ovis*. This work is a contribution to a more general study for the revision of phylogeny of Oestridae (Papavero, 1977) using scanning electron microscopy (Guitton & Dorchies, 1993; Guitton, Dorchies & Morand, 1996, 1997).

## MATERIALS AND METHODS

Larval instars and imagos were collected in National Park of Sierra Nevada (Spain). Samples were fixed in cold 70 % ethanol, washed several times by projection and ultrasonized for between 30 sec and 3 min. They were dehydrated by passage in progressive ethanol concentrations up to absolute ethanol. Residual humidity was extracted to the critical point. For observation, samples were stuck on studs with self adhesive tape. They were covered with gold with M scope 500. The scanning electron microscope used was HITACHI S 520 under 20 kV. One to for samples of each larval instar were observed. For the imago, only males were collected and studied.

\* Centre de Biologie et d'Écologie Tropicale et Méditerranéenne (URA 698 CNRS), Université de Perpignan, 66860 Perpignan Cedex, France.

\*\* Departamento de Biología Animal, Biología Vegetal y Ecología. Facultad de Ciencias Experimentales. Universidad de Jaén. E-23071 Espagne.

\*\*\* UAR/INRA laboratoire de Parasitologie, École Nationale Vétérinaire, 23 chemin des Capelles, 31076 Toulouse Cedex, France.

Correspondence : Christophe Guitton.

## RESULTS

### FIRST INSTAR LARVAE (L1) (Figs 1, 2)

Measuring 1 mm in length, it bears very numerous spines and shows no significant differences with the first larval instar of *O. ovis*.

#### Pseudocephalon (Fig. 2)

Antennary lobes are not very prominent but well separated. Anterior hooks are very strong and laterally directed. They seem to be less curved than those of *O. ovis*. A spines-crown almost completely surrounds the anterior end. It is lightly interrupted dorsally.

#### Segments 3 to 11 (Fig. 1)

Ventral spines are arranged regularly along the body in 2 to 4 rows of single and sharply pointed spines looking like teeth. Laterally, posterior part of each segment show sensorial structures in a bunch of small bristles.

#### Segment 12

Ventrally two post-anal tuberosities bear about twenty hooks looking like cat-claws.

### SECOND INSTAR LARVAE (L2) (Figs 3-8)

This larval instar measures from 3,5 to 12 mm in length.

#### Pseudocephalon (Fig. 4)

Antennary lobes are less separated but more large as with the first larval instar giving to pseudocephalon of second larval instar a triangular shape. The buccal funnel is well structured. Cephalic hooks are large (length = 2/3 of the pseudocephalon height) and ventrally curved as with *O. ovis*. The dorsal spines-crown has no lateral extend which is an important difference with *O. ovis*.

#### Segments 3 to 11 (Figs 3-5)

The ventral spines are disposed on several rows on the front edge of each segment. The number of spines rows remains almost constant from the front to the bottom of the body. The ventral spines have a special currycomb shape as with *O. ovis* which constitutes an important synapomorphy. This synapomorphy distinguish the two species of the other species of *Oestrus* genus. Yet, the currycombs show less points than with *O. ovis*.

#### Segment 12 (Figs 6-8)

Stigmatic plates are quite visible but a bit smaller than with *O. ovis*. Pores are smaller and more numerous than those of *O. ovis*. The channel is indicated by a distinct suture. There are no spines on the dorsal margin surrounding the stigmatic plates as in *O. ovis*. The spines surrounding the anal outline seem to be the same in the two species. Stigmatic margins show ten sensorial papillae regularly spaced in the two species, they are ciliated as with *O. ovis*.

### THIRD INSTAR LARVAE (L3) (Figs 9-11)

These larva, measuring about 20 mm in length, are more easily described with photonic microscope. Scanning electron microscopy allows nevertheless a fine description of hooks, spines and stigmatic plates.

#### Pseudocephalon (Fig. 9)

The cephalic hooks are small, relatively parallels and forward directed.

#### Segments 3 to 11 (Fig 9)

Ventrally the segments bear spines rows arranged very regularly. These spines have a shape very different from *O. ovis*. They look like triangular flattened blades when these of *O. ovis* have a broad rounded base and a constricted extremity.

#### Segment 12 (Figs 10, 11)

Stigmatic plates have a structure similar to *O. ovis*. They show very small and very numerous pores. The central button without suture is large as with *O. ovis*.

### IMAGO (Figs 12-14)

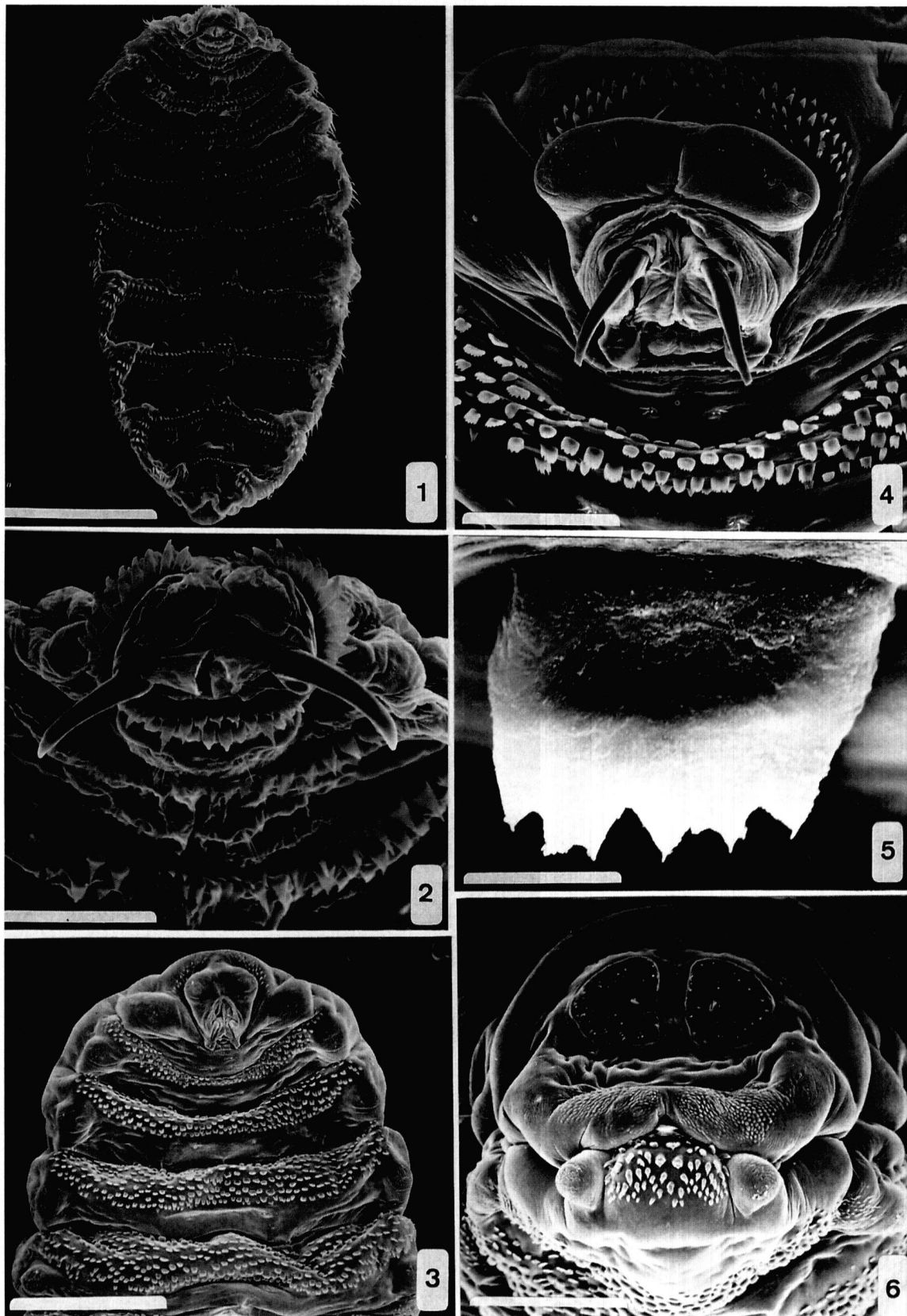
The parafrontalia bears numerous circular cracks with central spines. These cracks are less numerous in *O. ovis*. The tubercles with central spines are numerous and about of the same height on the first 2/3 of the mesotonum. They are, on the terminal part of the mesotonum and on the scutellum, irregular in number and disposition, as with *O. ovis*. The dorsal face of the abdomen seems less heavy as in *O. ovis*.

## DISCUSSION

The scanning electron microscopy study of larval instars and imago of *O. caucasicus* give a fine morphologic knowledge of this species, the first and second larval instars had not been described before.

On one hand, this study allows to clearly differentiate *O. caucasicus* from the typespecies of the genus *O. ovis*. The second larval instar of *O. caucasicus* differs from *O. ovis* by the morphology of the spines-crown and currycomb shaped spines. The third larval instar differs by the shape and the number of ventral and dorsal spines. The imago differs especially by hairs and tubercles on the head.

On other hand, this study shows the proximity between the two species by important synapomorphic features especially for the second instar, the presence of currycomb-shaped spines and the peri-stigmatic ciliated papillae. These species, narrowly related, seem to be sister-species.



Figs 1-14. - *Oestrus caucasicus*. Fig. 1. - Ventral view of first larval instar. Bar = 300  $\mu$ m. Fig. 2. - Ventral view of pseudocephalon of first larval instar. Bar = 60  $\mu$ m. Fig. 3. - Ventral view of anterior part of second larval instar. Bar = 1 000  $\mu$ m. Fig. 4. - Ventral view of pseudocephalon of second larval instar. Bar = 200  $\mu$ m. Fig. 5. - Ventral curycomb-shaped spines of second larval instar. Bar = 12  $\mu$ m. Fig. 6. - Posterior view of posterior end of second larval instar. Bar = 500  $\mu$ m.

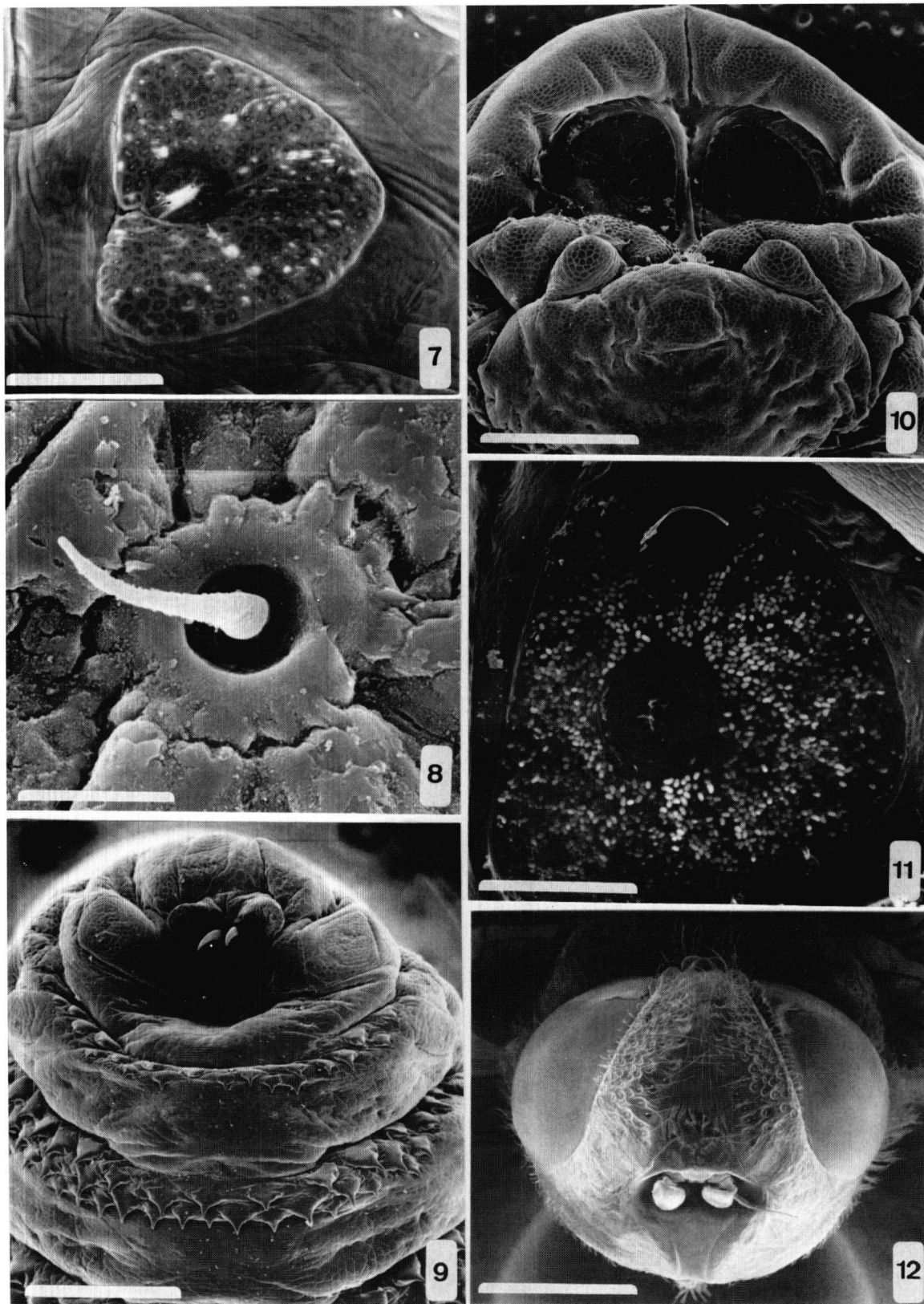


Fig. 7. – Posterior view of stigmatic plate of second larval instar. Bar = 150  $\mu$ m. Fig. 8. – Peri-stigmatic ciliated papillae of second larval instar. Bar = 8,6  $\mu$ m. Fig. 9. – Ventral view of anterior part of third larval instar. Bar = 1500  $\mu$ m. Fig. 10. – Posterior view of posterior end of third larval instar. Bar = 1500  $\mu$ m. Fig. 11. – Posterior view of stigmatic plate of third larval instar. Bar = 500  $\mu$ m. Fig. 12. – Frontal view of the head of the imago. Bar 1500  $\mu$ m.



Fig. 13. – Dorsal view of the imago. Bar = 1500 µm. Fig. 14. – Ventral view of the imago. Bar = 1500 µm.

Finally, this study shows that the genus *Oestrus* is coherent and well separated from other genus in Oestridae family (Guitton, Dorchies & Morand, 1997).

## ACKNOWLEDGEMENTS

Authors wish to thank Mr. J.E. Granados for his help for obtaining larvae and adults of *Oestrus caucasicus*.

## REFERENCES

- GRUNIN K. Y. [Botflies (Oestridae). Fauna USSR, Insecta : Diptera 19 n° 3]. Academy of Sciences Moscou, 1957, 146 p. [in Russian].
- GUITTON C. & DORCHIES P. Étude des larves d'*Oestrus ovis* (Linné, 1761) en microscopie électronique à balayage. *Revue de Médecine Vétérinaire*, 1993, 144, 687-692.
- GUITTON C., DORCHIES P. & MORAND S. Scanning electron microscopy of larval instars and imago of *Rhinoestrus usbekistanicus* Gan, 1947 (Oestridae). *Parasite*, 1996, 3, 155-159.
- GUITTON C., DORCHIES P. & MORAND S. Morphological comparison of second stage larvae of *Oestrus ovis* (Linnaeus, 1758), *Cephalopina titillator* (Clark, 1816) and *Rhinoestrus usbekistanicus* Gan, 1947 (Oestridae) using scanning electron microscopy. *Parasite*, 1997, 4, 277-282.
- MINAR J., LOBACHEV S., KIEFER M. & BAZARDORZH D. New findings of warble flies (Hypodermatidae, Oestridae) of wild animals in Mongolia. *Folia Parasitologica*, 1985, 32, 89-91.
- PAPAVERO N. The world Oestridae (Diptera), Mammals and continental drift Series entomologicae 14. W. Junk bv Publishers, The Hague, 1977, 240 p.
- PEREZ J.M., GRANADOS J.E., SORIGUER R.C. & RUIZ-MARTINEZ I. Prevalence and seasonality of *Oestrus caucasicus* Grunin, 1948 (Diptera : Oestridae) parasitizing the Spanish ibex, *Capra pyrenaica* (Mammalia: Artiodactyla). *The Journal of Parasitology*, 1996, 82, 233-236.
- ZUMPT F. Myiasis in man and animals in old world. Butterworths, London, 1965, 267 p.

Reçu le 5 février 2001  
 Accepté le 26 mars 2001