Revta bras. Ent. 35(4):663-669 02.12.1991

A COMPARATIVE STUDY OF THE EXTERNAL CHORIONIC ARCHITECTURE OF THE EGGS OF SOME NEOTROPICAL SPECIES OF THE GENUS *HOPLOPLEURA* ENDERLEIN, 1904 (PHTHIRAPTERA, ANOPLURA)

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ABSTRACT. A COMPARATIVE STUDY OF THE EXTERNAL CHORIONIC ARCHITECTURE OF THE EGGS OF SOME NEOTROPICAL SPECIES OF THE GENUS *HOPLOPLEURA* ENDERLEIN, 1904 (PHTHIRAPTERA, ANOPLURA). The authors describe comparatively the chorionic morphology of six *Hoplopleura* species: *H. griseoflavae; H. scapteromydis; H. andina; H. sciuricola; H. fonsecai* and *H. argentina*. An attempt to typify all external features present in the eggs, and a standard for descriptions of the eggs of other species of the genus *Hoplopleura* is proposed.
KEYWORDS. PHTHIRAPTERA, ANOPLURA, *HOPLOPLEURA*, EGGS.

INTRODUCTION

The literature concerning the external chorionic morphology of the eggs of *Hoplopleura* spp. is restricted to a previous paper published by us (CASTRO *et al.*, 1990). By this reason, in the present contribution we deal with the chorionic morphology of six other *Hoplopleura* spp. parasitic on Neotropical Rodents belonging to the families Cricetidae and Sciuridae. Along with this, we attempt to typify all the external features present in the eggs, and propose a standard for description of the eggs of other species within this genus.

MATERIAL AND METHODS

The eggs were taken from the different host species attached to the hairs, air dried during 15 days, labelled an stored in coded vials. The eggs-laying sites in each individual host are carefully mapped in appropriate printed cards and stored in files for further studies.

For SEM studies, the eggs were cleaned during 20-30 seconds in Acetone 100° by means of an ultrasonic vibrator. Then, they were mounted on several stubs in different positions, coated with gold-palladium in a Jeol vacuum metallizer, and subsequently examined with a Jeol T 100 Scaning Electron Microscope.

For each *Hoplopleura* species, identification of the eggs has been carefully checked by comparison with mature eggs isolated by dissection from identified female specimens.

Pictures. For SEM photographs a Kodak Verichrome Pan® VP 120 (ASA 125/22 DIN) film was used.

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Eggs measurements. They were taken under a binocular microscope at high magnifications by means of an appropriate calibrated eyepiece. All measurements are in mm.

RESULTS

External chorionic architecture of the eggs

The chorion is formed by the follicle cells of the polytrophic ovariola, as it is the rule among the Phthiraptera.

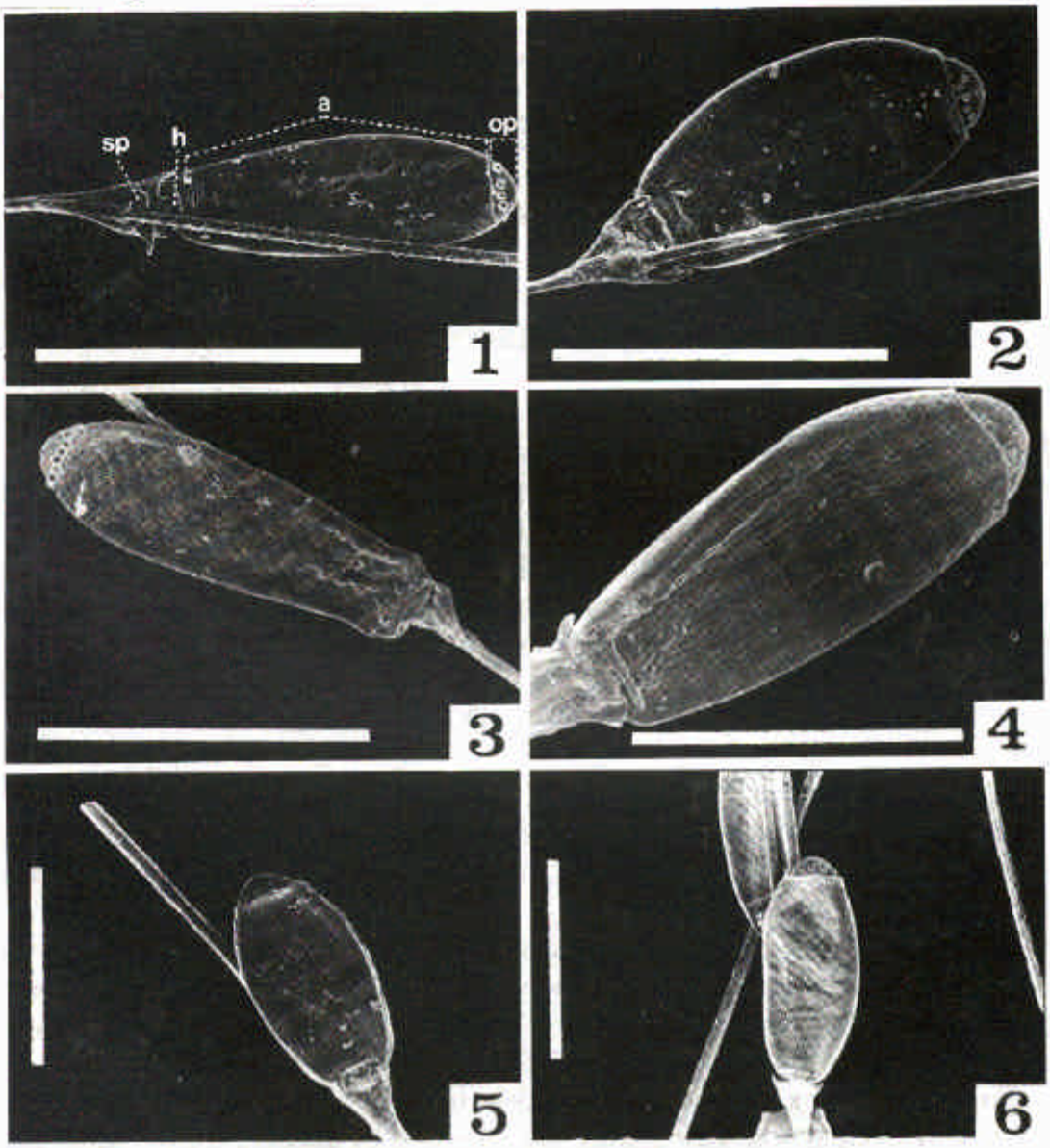

Fig. 1 - 6, SEM pictures of eggs of *Hoplopleura* spp. 1, *H. griseoflavae* Castro, 1980; 2, *H. scapteromydis* Ronderos, 1965; 3, *H. andina* Castro, 1981; 4, *H. sciuricola* Ferris, 1921; 5, *H. fonsecai* Werneck, 1932; 6, *H. argentina* Werneck, 1937 (a = anphora; h = localization of the chorionic hydropyla; op = operculum; sp = spumaline). Scales = 500 μm.

After the deposition of the endochorionic layer over the vitelline membrane, the exochorionic layer starts to be secreted. The latter is not produced uniformly, but is deposited more rapidly at the edges of the follicle cells than at their central

area and, in consequence, some kinds of areolate, reticulate or scaly appearance of the external surface of the eggs, is the result of the imprints of the follicle cells which produce it. (see BEAMENT, 1946).

We follow for reason of uniformity, our previous criterion (CASTRO *et al.*, 1990) as records of nomenclature of anatomical regions of *Hoplopleura* eggs: operculum, anphora and hydropyle.

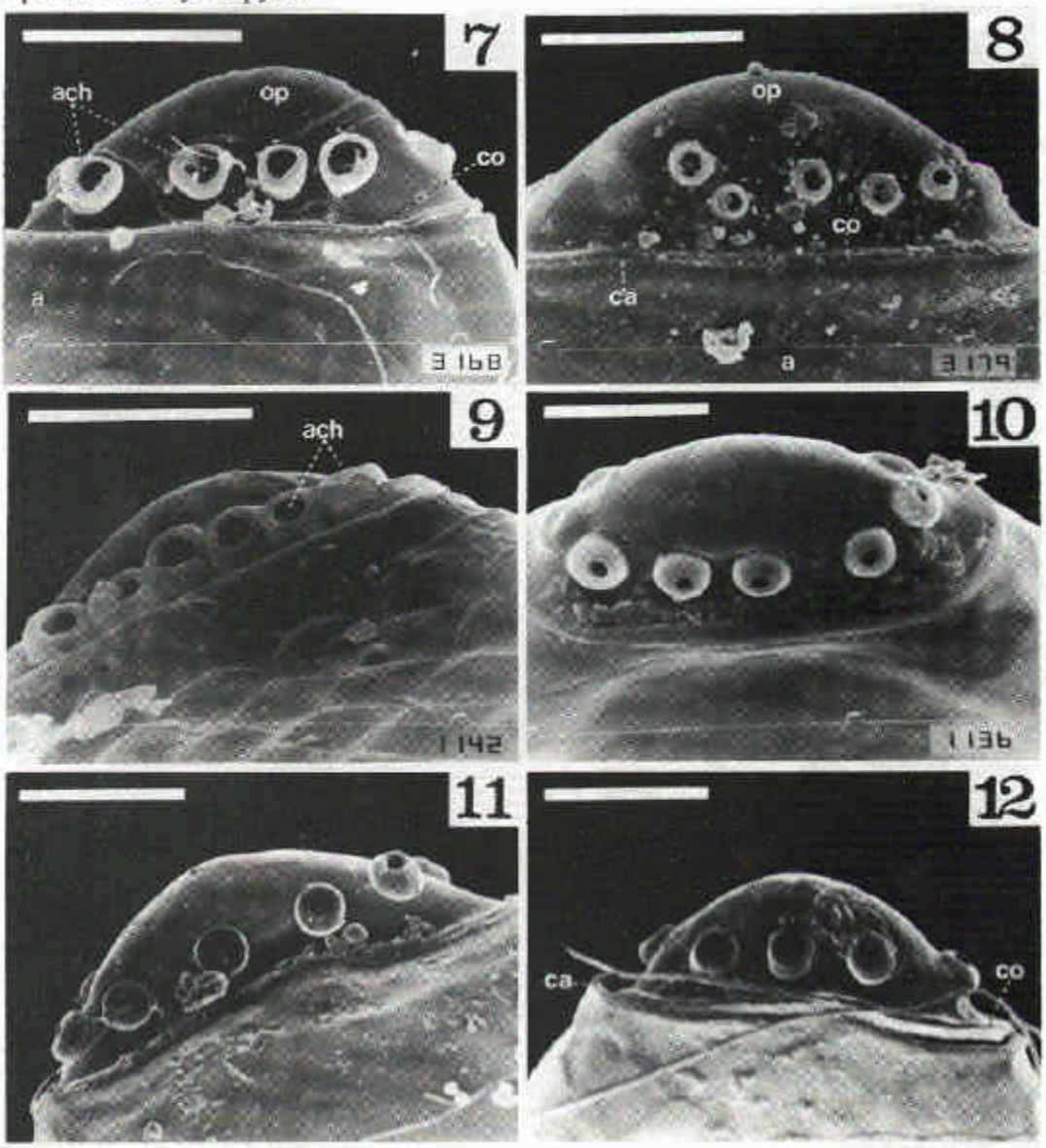

Fig. 7 - 12, SEM pictures of operculi of *Hoplopleura* spp. 7, *H. griseoflavae* Castro, 1980; 8, *H. scapteromydis* Ronderos, 1965; 9, *H. andina* Castro, 1981; 10, *H. sciuricola* Ferris, 1921; 11, *H. fonsecai* Werneck, 1932; 12, *H. argentina* Werneck, 1937 (a = anphora; ach = air chamber (s); ca = callus of the anphora; co = callus of the operculum; op = operculum). Scale = 50 μm.

Structure of operculum. External surface smooth or inconspicuously impressed, with opercular callus poorly developed. The air chambers, always prominent, consist of two compartments unequally developed: an outer and inner chamber, communicated by an internal opening. The outer air chamber communicate with the external environment by means of the external opening. The micropila opens on the floor of the inner chamber, usually at the apex of a crater-

like elevation. As the micropyles are not plugged with spumaline or any other substance, as occur in most insect orders, they provide a route for ambiental air oxygen, to pass without barrier into the subchorionic air space (HINTON, 1977). Also micropyles may play an important role in respiration when the eggs are submerged in water (e.g. those of *H. scapteromydis* and *H. oxymycteri*), by means of the mechanism described by HINTON (1977).

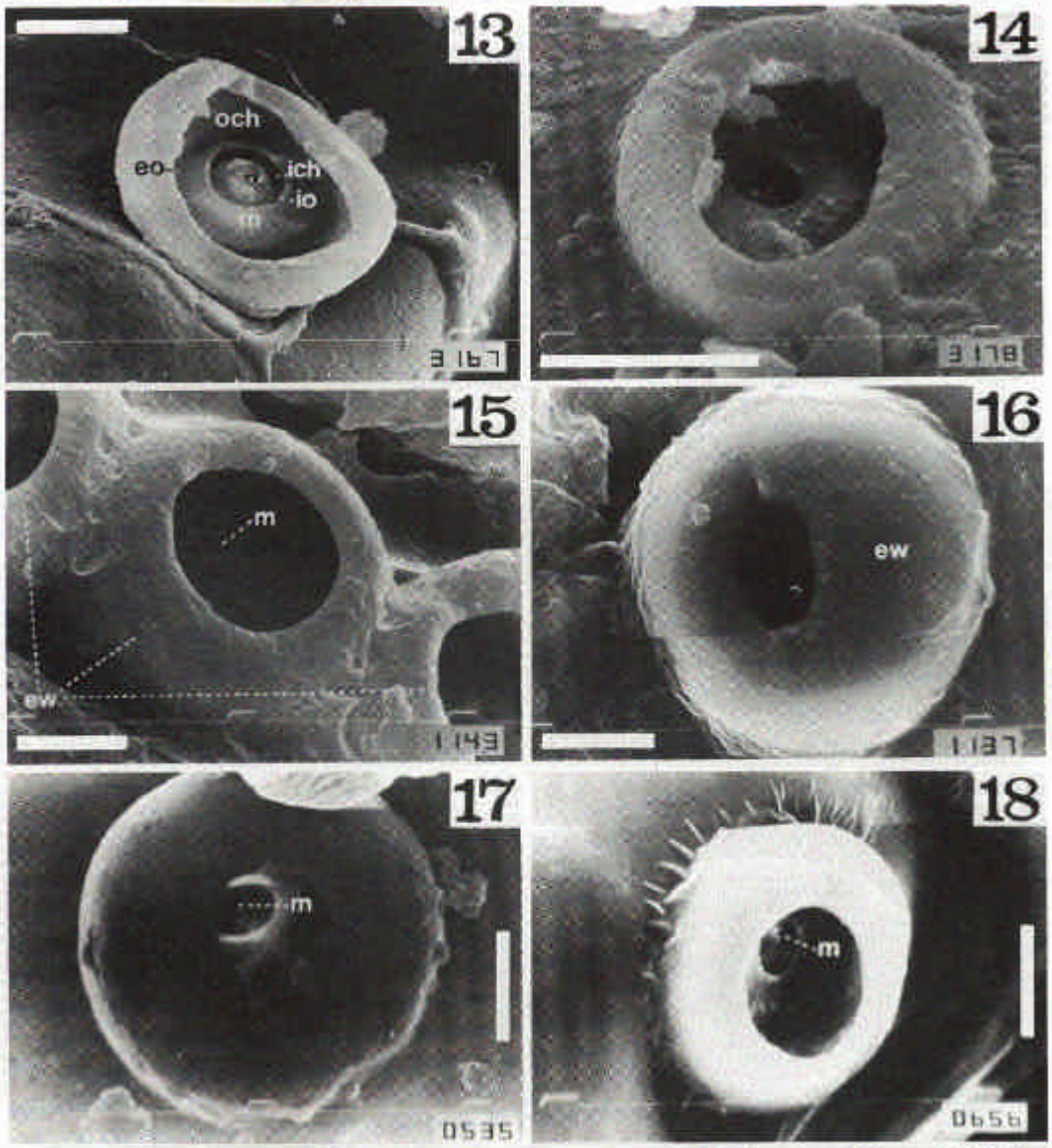

Fig. 13 - 18, SEM pictures of air chambers of *Hoplopleura* spp. 13, *H. griseoflavae* Castro, 1980; 14, *H. scapteromydis* Ronderos, 1965; 15, *H. andina* Castro, 1981; 16, *H. sciuricola* Ferris, 1921; 17, *H. fonsecai* Werneck, 1932; 18, *H. argentina* Werneck, 1937 (eo = external opening; ew = external wall; ich = inner chamber; io = internal opening; m = micropyla; och = outer chamber). Scale = 5 μm.

Regarding the external morphology of the air chamber, we typify them into two categories:

a) ampullaceae: external wall of the outer chamber globose, inflated (*H. andina, sciuricola, fonsecai, argentina* and *reducta*).

b) flattened: external wall of the outer air chamber scarcely elevated (*H. griseoflavae* and *scapteromydis*).

Taking in mind the size of the external opening in:

a) Normal: diameter of external opening less (usually much less) than a half of the diameter of the external wall of the air chamber (*H. sciuricola* and *fonsecai*).

b) Fenestrate: diameter of external opening greater (usually considerably greater) than a half of the diameter of the external wall (*H. griseoflavae, scapteromydis, andina, argentina* and *reducta*).

Relationship among air chambers. They are always placed near the opercular cellus in a single regular or irregular circular row, isolated or clustered.

a) isolated: each air chamber is individual (*H. griseoflavae, scapteromydis, sciuricola, fonsecai* and *argentina*).

b) coalescent: the external wall of each air chamber is partially or totally continuous with the remaining ones, resulting in discrete clusters of air chambers (*H. reducta*) or in a continuous ring (*H. andina*).

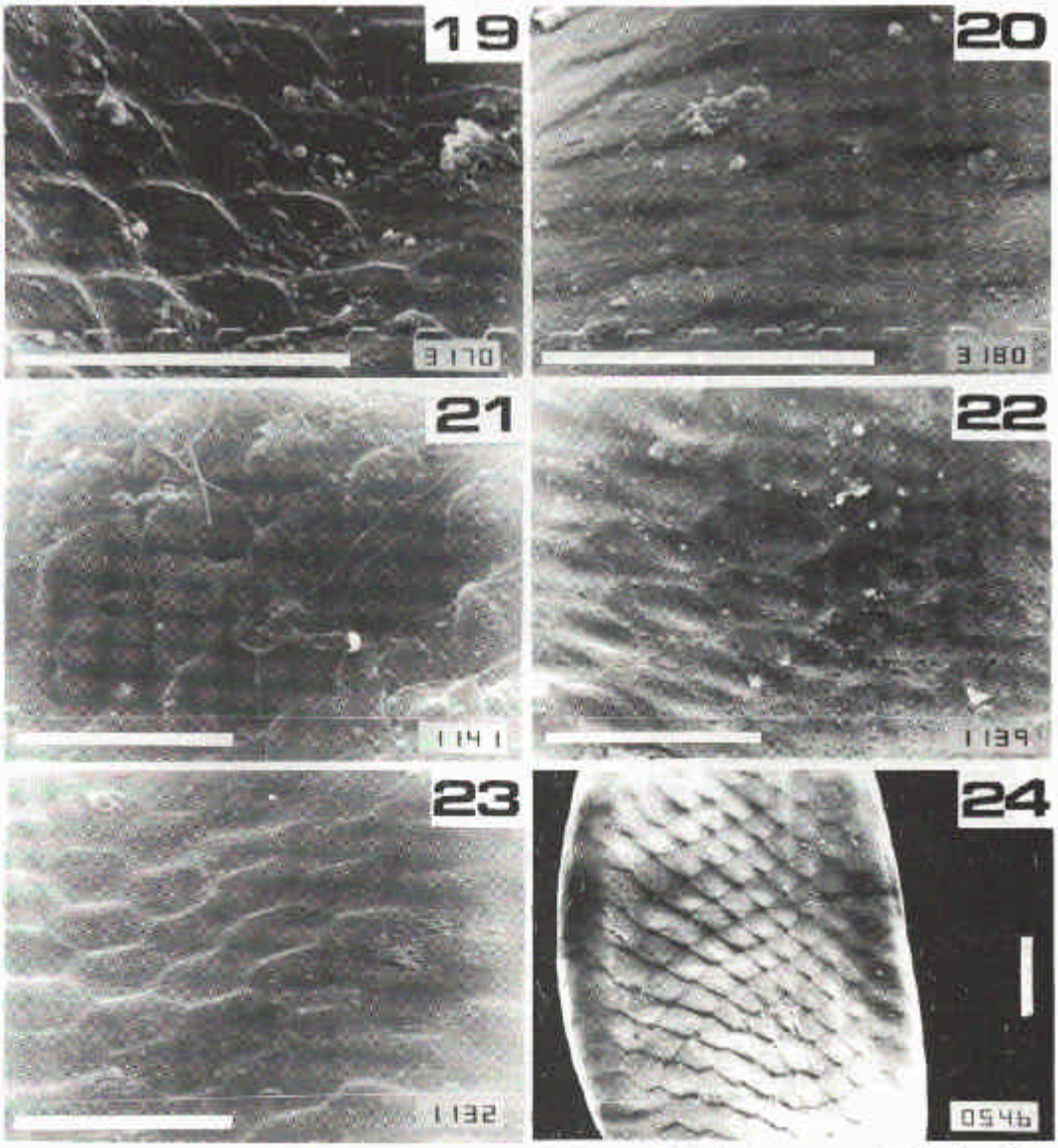

Fig. 19 - 24. SEM pictures of ornamentation of the anphorae of *Hoplopleura* spp.: 19, *H. griseoflavae* Castro, 1980; 20, *H. scapteromydis* Ronderos, 1965; 21, *H. andina* Castro, 1981; 22, *H. sciuricola* Ferris, 1921; 23, *H. oxymycteri* Ferris, 1921; 24, *H. argentina* Werneck, 1937. Scales = 50 μm.

External structure of the amphora: as we pointed out, different imprints of follicle cells are expected to be found in the chorion of different *Hoplopleura* species, leading to three major kinds of ornamentation of its external surface:

a) smooth: lacking any track or imprint (*H. fonsecai*).

b) pavimentose: hexagonal or subexagonal imprints, diversely marked or ornamented, (*H. sciuricola* and *H. oxymycteri*).

c) scaly: fish-like scale disposition, with different degrees of imprints. (*H. griseoflavae, scapteromydis, andina, argentina* and *reducta*).

Silhouette of the whole egg: we discriminate three categories according the ratio total length/maximun width:

a) ellipsoidal: ratio = 1 to 2 (*H. scapteromydis, fonsecai, argentina* and *oxymycteri*).

b) parabolic: ratio = 2 to 3 (*H. griseoflavae* and *sciuricola*).

c) elongated: ratio > 3 (*H. reducta*).

These combinated features: eggs silhouetes, anphoral ornaments, types and relationships of air chambers, and maximum length and width associated with the host identify allow, in most cases, the identification of *Hoplopleura* spp. present in each individual host. It is the case of the eight *Hoplopleura* spp. here studied (see table I).

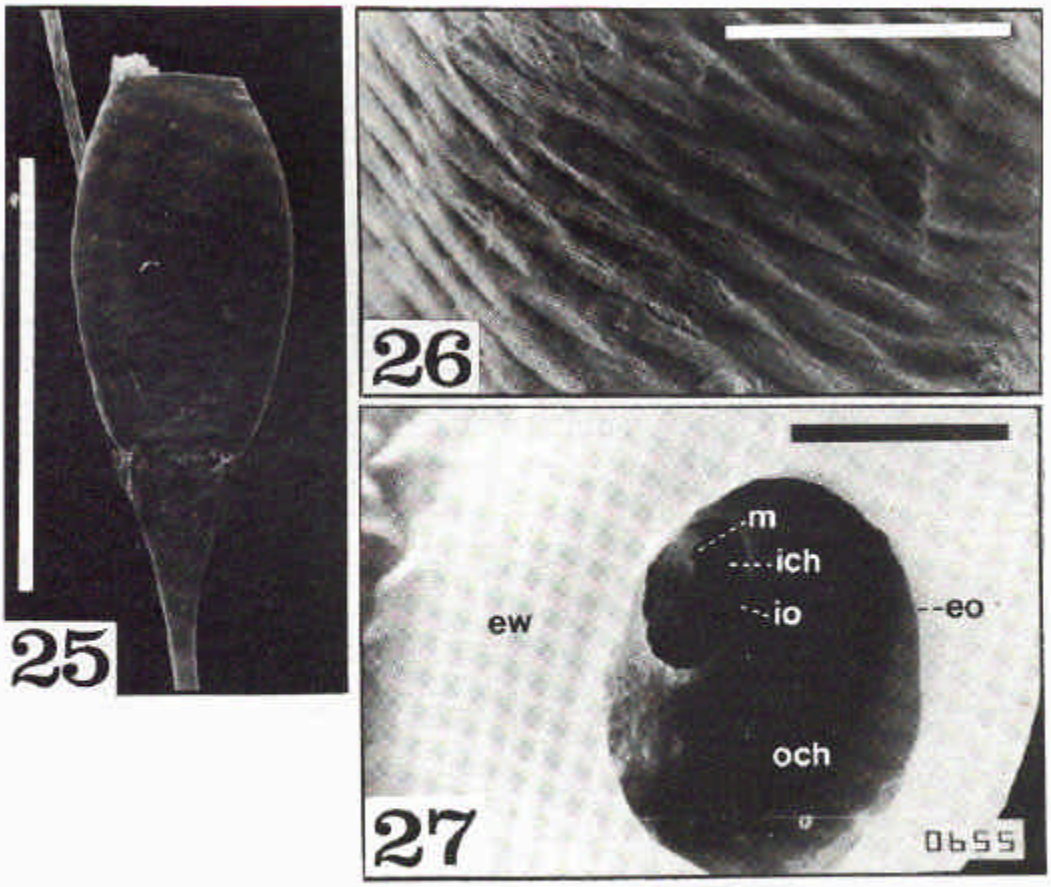

Fig. 25 - 27, SEM pictures of: 25, eggs of *H. oxymycteri* Ferris, 1921, lacking the operculum (scale = 500 μm); 26, ornamentation of the anphora, semi-polar view, of *H. andina* Castro, 1981 (scale = 50 μm); 27, air chamber of *H. argentina* Werneck, 1937, abbreviations as in figures 13 - 18 (scale = 5 μm.)

Table I. Comparative features and measurements of the eggs of different *Hoplopleura* spp.

Egg feature	*Hoplopleura* species							
	griseoflavae	*scapteromydis*	*andina*	*sciuricola*	*fonsecai*	*argentina*	*reducta*	*oxymycteri*
Silhouette (shape)	Parabolic	Ellipsoidal	Elongated	Parabolic	Ellipsoidal	Ellipsoidal	Elongated	Ellipsoidal
Amphoral ornament	Scaly, strongly impressed	Scaly, lightly impressed	Scaly, strongly impressed	Pavimentose, strongly impressed	Smooth	Scaly, strongly impressed	Scaly, strongly impressed	Pavimentose, lightly impressed
kind of air chamber	Flat, fenestrate	Flat, fenestrate	Ampullacea, fenestrate	Ampullacea, normal	Ampullacea, normal	Ampullacea, fenestrate	Ampullacea, fenestrate	?
Relationship among air chambers	Isolated	Isolated	Coalescent, forming a continous ring	Isolated	Isolated	Isolated	Coalescent, two clusters of five each	? ?
Total length ($\bar{X}$) mm	0,500	0,507	0,571	0,714	0,489	0,489	0,607	?
Maximum width ($\bar{X}$) mm	0,171	0,250	0,179	0,285	0,250	0,204	0,163	?

This fact becomes particularly useful when museum skins are the only source of lice specimens, and in which usually only the eggs remain attached. The information so obtained becomes also an excellent complement of data from fresh hosts when comparative studies of lice incidence into different areas are needed, or when hosts are rare (or extinct) species, or when they come from distant or almost inaccessible areas.

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Recebido em 11.06.1990; aceito em 19.07.1990.