

CHAETOTAXY OF THE CERCARIAE OF *FASCIOLA HEPATICA* (TREMATODA: FASCIOLIDAE) FROM *LYMNAEA TRUNCATULA* SNAILS COLLECTED IN LEÓN, NW SPAIN

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ABSTRACT: The chaetotaxy of cercariae of the species *Fasciola hepatica* (Linnaeus, 1758), obtained from naturally infected snails of the species *Lymnaea truncatula* collected in Spain (Iberian Peninsula) was studied. The results obtained were compared with the chaetotaxy of cercariae of the same species obtained from the same snail host species *L. truncatula* collected in Bulgaria (Balkan Peninsula). Papillae 0-7DI and 0-1PIII, which have not been observed in cercariae from Bulgaria, were identified in the cercariae from Spain. These differences are discussed with respect to the present day concept of the species, subspecies, variations and adaptive forms of *F. hepatica*.

KEY WORDS: *Fasciola hepatica*, chaetotaxy, *Lymnaea truncatula*, Iberian Peninsula.

INTRODUCTION

BAYSSADE-DUFOUR *et al.* (1980) described the number of papillae and the pattern of chaetotaxy of cercariae of the species *Fasciola hepatica* (Linnaeus, 1758) (Trematoda: Fasciolidae), obtained from material from Bulgaria, in the Balkan Peninsula.

The aim of the present work was to study the chaetotaxy of *F. hepatica* cercariae obtained from the snail species *Lymnaea truncatula* (Müller, 1774) collected in Spain (Iberian Peninsula), and to compare them with the cercariae of the same species obtained from the same snail species from Bulgaria (Balkan Peninsula).

MATERIAL AND METHODS

Cercariae of *F. hepatica* spontaneously shed by *L. truncatula* snails, collected in localities where *L. truncatula* infected with *F. hepatica* had been found by MANGA-GONZALEZ, GONZALEZ-LANZA & OTERO-MERINO (1991), at 5 points in the upper and middle Porma basin, León, NW Spain, were used. Live snails have been airshipped to Sofia for further laboratory studies.

Thirty-seven cercariae were impregnated by the method of COMBES, BAYSSADE-DUFOUR & CASSONE (1976). The description of the integumentary papillae is according to the nomenclature of BAYSSADE-DUFOUR *et al.* (1989). The basic statistical parameters [interval of confidence of the mean arithmetical (ME), standard deviation (SD) and coefficient of variation (CV)] for the acetabular and the tail UV papillae are calculated using methods described by SEPETLIEV (1980). Examinations, drawings and photomicrographs were made with a light microscope «Opton» supplied with camera lucida, videomat and automatic photocamera.

RESULTS

In each half of the cephalic region, the body and the tail, as well as all papillae on the acetabular surface of the cercariae, are arranged as follows:

1) Cephalic region (Fig. 1 a, b, c):

$C_I = 1\ C_{I1}$ (invaginated), $2\ C_{I4}$
 $C_{II} = 2\ C_{II1}, 2-3\ C_{II2}, 2-3\ C_{II3}, 9-10\ C_{II4}$
 $C_{III} = 2\ C_{III1}, 1-2\ C_{III2}, 3\ C_{III3}, 3-10\ C_{III4}$
 $C_{IV} = 2-3\ C_{IV1}, 2-6\ C_{IV2}$
 $C_V = 1-2\ C_{V1}, 2-5\ C_{V2}$

2) Body (Fig. 2 a, b):

a) ventral papillae:

$A_I = 0$ or $1-2\ A_{I1}V$
 $A_{II} = 0$ or $1\ A_{II}V$
 $A_{III} = 0$ or $1\ A_{III}V$
 $P_{III} = 0$ or $1\ P_{III}V$

b) dorsal papillae:

$A_I = 0$ or $2-4\ A_{I1}D$

c) acetabular papillae:

$S = 0$ or $1-2\ S_I$

d) lateral papillae:

$VL = 7-15$
 $DL = 0-7$

3) Tail papillae (Fig. 2 c, d):

$U = 16-23\ U_V, 2-4\ U_{II}, 10-18\ U_I$

The number of papillae on circles from the cephalic region is: $C_I = 6$; $C_{II} = 32-35$; $C_{III} = 20-31$; $C_{IV} = 10-15$; $C_V = 9-14$. Their total number in both halves of the cephalic region varies from 77 to 101, groups C_{I1} , C_{I4} and C_{II1} having the most constant characteristics.

The ventral, dorsal and lateral papillae are variable in number and are located mainly in the preacetabular region between circles A_I and A_{III} (with the exception of groups 0-1 $P_{III}V$ and 0-1 $P_{III}L$). The basic statistical parameters [(at probability $P(T) > 99.9$)] for the total number of acetabular papillae have the following values: ME = 0.79 ± 0.15 ; SD = 0.72; CV = 9.1. No papillae were found in immediate proximity to the acetabulum. In

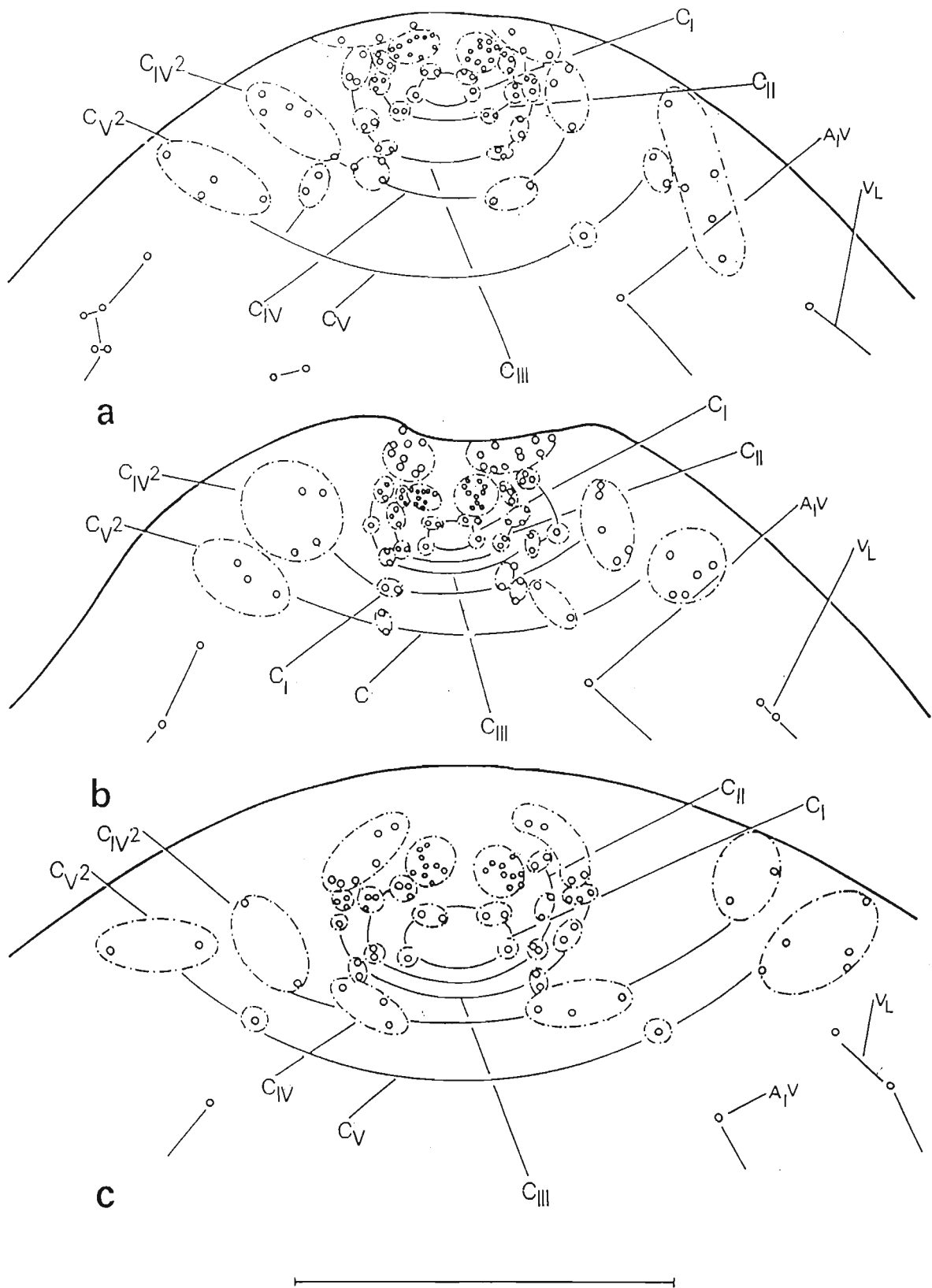


Fig. 1.— Cercarial chaetotaxy of *Fasciola hepatica*: three models of arrangement (a, b, c) of the papillae around the oral sucker opening. Scale bar: 100 μ m.

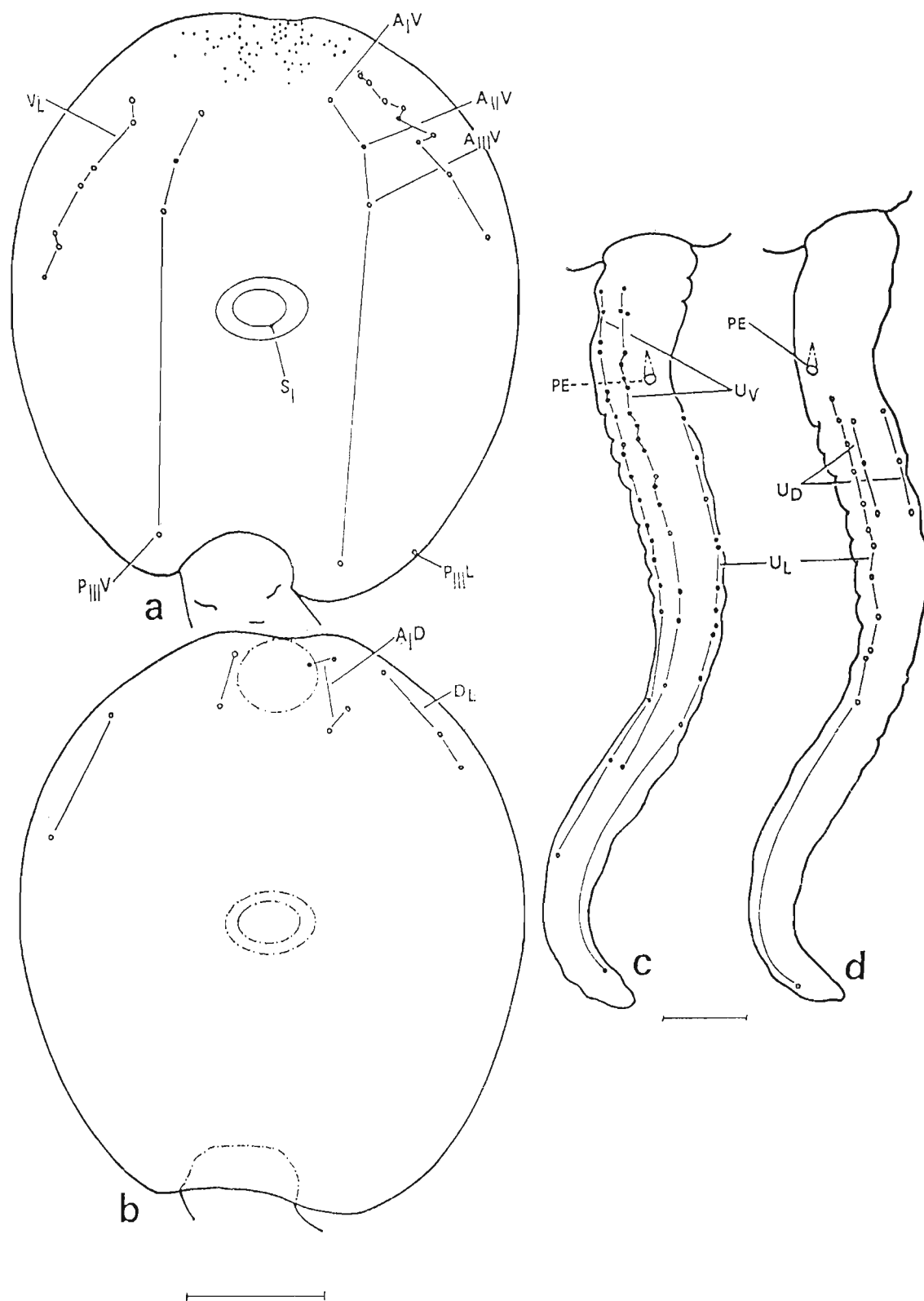


Fig. 2.— Cercarial chaetotaxy of *Fasciola hepatica*; arrangement of the papillae on the ventral (a) and dorsal (b) surface of the body, and on the ventral (c) and dorsal (d) surface of the tail. Scale bar: 100 μ m.

some of the cercariae, no papillae were found on the body and acetabulum.

The tail papillae are located on six axes: two ventral, two dorsal and two lateral. The U_v papillae are the most numerous: 16-23 on either side of the tail surface. The main statistical data concerning them are the following [(at $P(T) > 99.9$): ME = 18.85 ± 0.22 ; SD = 1.50; CV = 7.95.

DISCUSSION

Based on the morphology of the adult worms, SINITSIN (1915), SKRJABIN & SHULTZ (1935) and SAZANOV (1973) considered *F. hepatica* as a polytypical species presented under names of different species, subspecies, variation or adaptive forms. BLAIR & McMANUS (1989) found no differences in the restriction enzyme mapping of ribosomal DNA of *F. hepatica* from various vertebrate and invertebrate hosts from different geographical regions. But AGATSUMA *et al.* (1994) found genetic variation in the triploids of Japanese *Fasciola* species.

In the present study it was found that cercariae of *F. hepatica* from Spain and Bulgaria showed no significant differences in the number and the topography of their chaetotaxy, except for the dorsolateral papillae (0-7 DL) and the 0-1 P_{III} groups, which have not been found in the cercariae of *F. hepatica* from Bulgaria described by BAYSSADE-DUFOUR *et al.* (1980). It is difficult to explain whether these differences between cercariae from Bulgaria in the Balkans and from Spain in the Iberian Peninsula are the results of intra-specific variability or of the examination of closely related cercariae belonging to two different subspecies or variations of a common species *F. hepatica*. Further studies are in process to settle this question.

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REFERENCES

- AGATSUMA (T.), TERASAKI (K.), YANG (L.) & BLAIR (D.), 1994.— Genetic variation in the triploids of Japanese *Fasciola* species, and the relationships with other species in the genus. *Journal of Helminthology*, 68: 181-186.
- BAYSSADE-DUFOUR (C.), ALBARET (J.L.), GRABDA-KAZUBSKA (B.) & CHABAUD (A.G.), 1989.— Nomenclature proposée pour la chetotaxie des cercaires de Plagiorchiata. *Annales de Parasitologie Humaine et Comparée*, 94: 426-432.
- BAYSSADE-DUFOUR (C.), ALBARET (J.L.), SAMNADJEV (P.), CASSONE (J.) & DIMITROV (V.), 1980.— Les structures argyrophiles tégumentaires des stades larvaires (miracidium, redie, cercaire) de *Fasciola hepatica*. Comparaison avec *F. gigantica*. *Annales de Parasitologie Humaine et Comparée*, 55: 535-564.
- BLAIR (D.) & McMANUS (D.P.), 1989.— Restriction enzyme mapping of ribosomal DNA can distinguish between fasciolid (liver fluke) species. *Molecular and Biochemical Parasitology*, 36: 201-208.
- COMBES (C.), BAYSSADE-DUFOUR (C.) & CASSONE (J.), 1976.— Sur l'impregnation et le montage des cercaires pour l'étude chetotaxique. *Annales de Parasitologie Humaine et Comparée*, 51: 399-400.
- MANGA-GONZALEZ (M.Y.), GONZALEZ-LANZA (C.) & OTERO-MARINO (C.B.), 1991.— Natural infection of *Lymnaea truncatula* by the liver fluke *Fasciola hepatica* in the Porma Basin, Leon, NW Spain. *Journal of Helminthology*, 65: 15-27.
- SAZANOV (A.M.), 1973.— On the polytypical nature of species of the genus *Fasciola* L., 1758. *Trudy Vsesausnova ordena Krasnaya znamenii Instituta gelmintologii imeni K. I. Skryabina*, 22: 155-161. (in Russian)
- SEPETLIEV (D.), 1980.— [Medical statistics]. *Medicine and Physical Training*, Sofia: 1-207. (in Bulgarian)
- SINITSIN (D.F.), 1915.— Listvianitsa (*Fasciola hepatica* L.) v Moskovskoi gubernii. [Liver fluke in the district of Moscow] [Russian text], 42 pp.
- SKRJABIN (K.I.) & SCHULTZ (R.S.), 1935.— Fasciolosis of animals and actions for protection. *Izdatel'stvo Akademii Nauk SSSR*, Moskva, 180 pp. (in Russian)