

TREMATODES OF MARINE FISHES FROM THE PERUVIAN FAUNISTIC PROVINCE (PERU AND CHILE), WITH DESCRIPTION OF *Lecithochirium callaoensis* N. SP. AND NEW RECORDS

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ABSTRACT: Luque, J. & M. Oliva. 1993. Trematodes of marine fishes from the Peruvian faunistic province (Perú and Chile), with description of *Lecithochirium callaoensis* n. sp. and new records. *Revista de Biología Marina, Valparaíso* 28(2): 271-286.

A revision of the trematode fauna of marine fishes from the Peruvian Faunistic Province (Central Peruvian and Northern and Central Chilean coast) is presented. *Lecithochirium callaoensis* n. sp. (Hemiuridae), parasite of the teleost fish *Gymnothorax wienersi* Steindachner, is described and illustrated. *Lecithocladium falklandicum* Gaevskaja & Kovaleva 1978 is considered junior synonym of *Lecithocladium cristatum* (Rudolphi 1919). Moreover, 11 new geographical records and 16 new host records are also presented. A list of the known species of Trematoda parasitic in marine fishes from the Peruvian faunistic province is included. Four distinct components of the trematode fauna of this area can be defined: oceanic and/or circumtropical species; species widely distributed in the world; species belonging to the Pacific and Atlantic American coast, including the Caribbean; and endemic species.

Key words: Trematoda, Digenea, Aspidobothrea, *Lecithochirium callaoensis* n. sp., marine fish parasites, Perú, Chile.

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Se realiza una revisión de la fauna de tremátodos de peces marinos de la provincia faunística peruana (costa central del Perú y costa del centro y norte de Chile). Se describe e ilustra la nueva especie *Lecithochirium callaoensis* (Hemiuridae), parásito de *Gymnothorax wienersi* Steindachner (Pisces; Teleostei). *Lecithocladium falklandicum* Gaevskaja & Kovaleva 1978, (Hemiuridae) es considerado sinónimo de *Lecithocladium cristatum* (Rudolphi 1919). Se indican además 11 nuevos registros geográficos y 16 nuevos registros de huéspedes. Se entrega una lista de las especies de tremátodos parásitos en peces marinos de la zona. Se pueden identificar cuatro componentes en la fauna de digeneos: especies oceánicas y/o circumtropicales, especies ampliamente distribuidas, especies propias de las costas del Pacífico y Atlántico de América, incluyendo el Caribe, y especies endémicas de la zona.

Palabras claves: Tremátoda, Digenea, Aspidobothrea, *Lecithochirium callaoensis* n. sp., parásitos peces marinos, Perú, Chile.

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INTRODUCTION

The knowledge of the trematode fauna (Digenea and Aspidobothrea) of fishes along the south American Pacific coast (Perú and Chile) is recent and limited. The first paper on Digenea parasitic in marine fishes from Perú, was written by Mateo (1972), and from Chile by Oliva (1982). Recent paper are those of González & Sarmiento (1986), Tantaleán & Rodríguez (1987, 1990) and Tantaleán (1991) from Perú; and Fernández (1987) and Oliva & Guerra (1987, 1988), from Chile. Aspidobothreans have been studied by Oliva & Carvajal (1984) and Fernández *et al.* (1986) from the Chilean coast, and by Oliva & Luque (1989) from the Peruvian and Chilean coast. Recently, Luque *et al.* (1991) published a list of parasites of marine teleost fishes from Perú which included 13 species of Trematoda. In this paper, descriptions of a new species and geographical and host records of trematodes parasites of marine fishes from the Peruvian faunistic Province are given and a first approach to the zoogeography of digenea from marine fishes is presented. As a result of this work the number of known trematode species parasitic in marine fishes from the Peruvian faunistic Province increased to 46.

MATERIAL AND METHODS

Fishes were obtained fresh from Chorrillos (12° 30'S 76° 50'W) and Callao (12° 06'S 77° 10'W), in Perú; and Antofagasta (23° 26'S 70° 36'W), in Chile. Parasites were pressed between slides, fixed with AFA, preserved in ethanol 70%GL, stained with Delafield's hema-

toxylin and/or Semichon's carmine and mounted in Canada balsam. Drawings were made with the aid of a camera lucida and measurements are given in millimeters (mm) unless otherwise stated. Diameter is considered as (length + width)/2. Type and voucher specimens were deposited in the United States National Museum, Helminthological Collection (USNMHC); Museo de Historia Natural Javier Prado, Lima-Perú (MHNP) and/or the Colección Helminológica de la Universidad Ricardo Palma, Lima Perú (CHURP). The systematic arrangement of Yamaguti (1971) was followed for family levels. Genera and species are arranged alphabetically. Quantitative data of the hosts and parasites studied are cited as follows: (N° host examined / N° hosts infected / Mean intensity). Fishes were identified according to Chirichigno (1974).

RESULTS

ASPIDOBOTHREA

Aspidogastridae Monticelli, 1888

Lobatostoma kemostoma (MacCallum & MacCallum, 1913)

Host: *Trachinotus paitensis* Cuvier (Carangidae) (10/4/2.5)

Site of infection: intestine

Locality: Chorrillos, Perú

Voucher specimens: CHURP N:580 (ten stained whole mounts) Measurements: (based on six specimens), total length 4.90 (2.85-5.50), maximum width 0.53 (0.42-0.60). Ventral disk length 1.60 (1.18-1.95). Eggs 45 x 40 µm.

Remarks: our specimens agree well with the description of this worm but there are differences in the number of alveoli. According to Yamatugi (1963), *L. kemostoma* has 56-60 alveoli whereas our specimens possess 66 alveoli. *L. kemostoma* was found associated with *L. pacificum* Manter, 1940 in all the infected fishes. This is the first time that two species of *Lobatostoma* appear, simultaneously, in one host specimen. This is the first record of this parasite from the Pacific coast of South American, *T. paitensis* is a new host record.

DIGenea

Accacoeiliidae (Odhner, 1911)

Accacoeilium macrocotyle (Diesing, 1858)

Host: *Mola ramsayi* (Giglioli) (Molidae)
(1/1/2).

Site of infection: intestine

Locality: Antofagasta, Chile

Voucher specimens: MHNP N:1054 (two stained whole mounts). Measurements: (based on two specimens), total length 9.17 and 10.47, maximum width 1.65 and 1.88. Oral sucker diameter 0.29 and 0.31, acetabular diameter 0.78 and 0.90, sucker width ratio 1:2.69 and 1:2.90. Testes diameter 0.99 and 1.02, ovary diameter 0.73 and 0.76. Eggs 29 x 16 µm.

Remarks: two specimens were obtained from one fish, that also was infected with the cestode *Anchistrocephalus microcephalus* (Pseudophyllidae). The main characteristics of our material agree well with the redescription made by Bray & Gibson (1977), but our specimens are larger than those studied by Villalba & Fernández (1985) from the same host caught at

Eastern Island, Chile.

Fellodistomidae Nicoll, 1909

Proctoeces lintoni Siddiqi & Cable, 1960

Hosts: *Anisotremus scapularis* (Tschudi)
(Pomadasyidae) (13/3/43).

Isacia conceptionis (Cuvier) (Pomadasyidae) (18/6/5).

Site of infection: intestine

Localities: Chorrillos, Perú and Antofagasta, Chile

Voucher specimens: CHURP N:581 (four stained whole mounts)

Measurements: (based on 14 specimens), total length 1.68 (1.10-2.15), maximum width of 0.73 (0.58-0.90). Oral sucker diameter 0.19 (0.15-0.22), acetabular diameter 0.42 (0.38-0.46), sucker width ratio 1: 2.2. Testes diameter 0.17 (0.15-0.19), ovary diameter 0.13 (0.11-0.14). Eggs 45 x 19 µm.

Remarks: this parasite has been found in the gonads of gastropods of the genus *Fissurella* Brugiere and in the intestine of the teleost fish *Sicyases sanguineus* Müller & Troschel in Chile (Oliva & Zegers 1988). Recently it was reported as a parasite of the paleal cavity of the cephalopod *Octopus vulgaris* Linnaeus from the central Peruvian coast (Reátegui et al. 1989). The specimens now studied are smaller than those reported from molluscs, and their size reinforces the postulate of Oliva & Zegers (1988) concerning the effects of the host on the morphometric variability of *P. lintoni*. This is the first record of *P. lintoni* on the Peruvian coast. *A. scapularis* and *I. conceptionis* are new host records for this parasite.

Monorchiidae Odhner, 1911

Lasiotocus glebulentus Overstreet, 1971

Host: *Mugil cephalus* Linnaeus (Mugilidae)
(25/7/5.14)

Site of infection: intestine

Locality: Chorillos, Perú

Voucher specimens: CHURP N:582 (five stained whole mounts)

Measurements: (based on five specimens), total length 0.95 (0.60-1.10), maximum width 0.38 (0.26-0.45). Oral sucker diameter 0.55 (0.50-0.60), acetabulum diameter 0.36 (0.33-0.38), sucker width ratio 1: 0.65. Testis diameter 0.42 (0.40-0.50), ovary diameter 0.39 (0.36-0.42). Eggs 16 x 14 µm.

Remarks: our specimens closely resemble those described by Overstreet (1971). This species is reported for the first time from the South American Pacific coast.

Lasiotocus longicaecum (Manter, 1940)

Host: *Anisotremus scapularis* (Tschudi)
(Pomadasyidae) (13/4/4.25).

Site of infection: intestine

Localities: Chorillos, Perú and Antofagasta, Chile

Voucher specimens: CHURP N:583 (three stained whole mounts)

Measurements: (based on six specimens), total length 1.05 (0.9-1.22), maximum width 0.29 (0.27-0.35). Oral sucker diameter 0.17 (0.14-0.19), acetabulum diameter 0.8 (0.7-0.9), sucker width ratio 1:0.40. Testis diameter 0.17 (0.15-0.18), ovary diameter 0.12 (0.11-0.14). Eggs 26 x 12 µm.

Remarks: this species was originally described by Manter (1940) as *Proctotrema*

longicaecum, from the related host *Anisotremus interruptus* (Gill) from the Galápagos Islands. Yamaguti (1958) transferred this species to the genus *Lasiotocus* Looss, 1907 because the morphological characteristics of Manter's specimens resemble *Lasiotocus* rather than *Proctotrema*. This species is a common parasite of pomadasyids of the genus *Anisotremus* and has been found in *A. virginicus* (Linnaeus), *A. davidsoni* (Steindachner) and *A. pacificum* (Günther) from the northern Pacific coast of South America (Yamaguti 1971). This is the most southern record for *L. longicaecum*. *A. scapularis* is a new host record.

Monorchis latus Manter, 1942

Host: *Anisotremus scapularis* (Tschudi)
(Pomadasyidae) (13/2/5.5).

Site of infection: intestine

Localities: Chorillos, Perú and Antofagasta, Chile

Voucher specimens: CHURP N: 584
(three stained whole mounts)

Measurements: (based on five specimens), total length 0.96 (0.89 - 0.98), maximum width 0.78 (0.74-0.82). Oral sucker diameter 0.16 (0.14-0.19), acetabulum diameter 0.09 (0.08-0.12), sucker width ratio 1: 0.56. Testis diameter 0.16 (0.13-0.19), ovary diameter 0.14 (0.13-0.16). Eggs 34 x 32 µm.

Remarks: this parasite was described by Manter (1942) on the basis of material obtained from *Anisotremus virginicus* (Linnaeus) and *Haemulon plumieri* (Lacépède), in Florida, USA. Our material closely resembles that described by Manter (1942).

This is the first record of *M. latus*

on the Peruvian coast. *A. scapularis* is a new host record.

Zoogonidae Odhner, 1911

Diphtherostomum brusinae (Stossich, 1888)

Host: *Isacia conceptionis* (Cuvier)
(Pomadasyidae) (18/6/4).

Site of infection: intestine

Locality: Chorrillos, Perú

Voucher specimens: CHURP N:585 (three stained whole mounts)

Measurements: (based on nine specimens), total length 1.04 (0.95-1.15), maximum width 0.29 (0.22-0.37). Oral sucker diameter 0.08 (0.06-0.11), acetabulum diameter 0.15 (0.11-0.17). Testes diameter 0.08 (0.07-0.10), ovary diameter 0.10 (0.08-0.11), sucker width ratio 1: 1.87. Eggs $32 \times 13 \mu\text{m}$.

Remarks: this parasite has a very low host specificity, and has been found as a parasite in at least 35 species of fishes of the families Sparidae, Gobiidae, Labridae, Blennidae, Clinidae, Nemipteridae, Synodontidae, Ostraciontidae, Anguillidae and Pomadasyidae (Bray 1986). Our specimens resembles those described by Nahhas & Cable (1964), as *D. anisotremi*, currently a junior synonym of *D. brusinae*, according to Bray (1986). *I. conceptionis* is a new host record for *D. brusinae* which is recorded for the first time from the south American Pacific coast.

Zoogonus rubellus (Olsson, 1868)

Host: *Merluccius gayi peruanus* Ginsburg
(Merlucciidae) 14/2/2.5)

Site of infection: intestine

Locality: Callao, Perú

Voucher specimens: MHNJP N:1107 (two

stained whole mounts).

Measurements: (based on four specimens), total length 1.23 (0.95-1.33), maximum width 0.54 (0.48-0.62). Oral sucker diameter 0.20 (0.19-0.22), acetabulum diameter 0.15 (0.12-0.16), sucker width ratio 1:0.75. Testes diameter 0.12 (0.09-0.13), ovary diameter 0.12 (0.10-0.14). Eggs $22 \times 20 \mu\text{m}$.

Remarks: reported by Durán & Oliva (1980) from the peruvian hake *Merluccius gayi peruanus* taken off Callao, as *Zoogonus* sp. The analysis of the material of Durán & Oliva (1980) shows that the parasites are conspecific with *Zoogonus rubellus*. This is a parasite with a low degree of host specificity. Bray (1986) listed 20 species of host fishes, belonging to 10 different families. *M. g. peruanus* is a new host record for this parasite, that is found for the first time on the Pacific coast of South America.

Opecoelidae Osaki, 1925

Helicometrina nimia Linton, 1910

Hosts: *Hemilutjanus macrophthalmus*
(Tschudi) (Serranidae) (5/1/3).
Cheilodactylus variegatus Valenciennes
(Cheilodactylidae) (12/3/2.6).
Genypterus maculatus (Tschudi)
(Ophidiidae) (3/3/4.6).
Mugiloides chilensis (Molina)
(Mugiloididae) (6/4/5.75)

Site of infection: intestine

Locality: Antofagasta, Chile

Voucher specimens: MHNJP N:1051 (two stained whole mounts)

Measurements: (based on eight specimens), total length 2.02 (1.65-2.30), maximum width 0.58 (0.40-0.64). Oral sucker diameter 0.14 (0.11-0.16),

acetabulum diameter 0.20 (0.18-0.21), sucker width diameter 1: 1.42. Eggs $58 \times 30 \mu\text{m}$.

Remarks: this is a very common fish parasite in Antofagasta and neighbouring regions, and has been found in fishes belonging to three families (Oliva & Muñoz, 1985a). At least two of the known hosts for this parasite from the Chilean coast, have been studied in Perú: *Paralabrax humeralis* (Valenciennes) and *Anisotremus scapularis* (Tschudi) but this parasite was not been found there. The four fish species infected with *H. nimia* are new host records for this parasite.

Helicometra fasciata (Rudolphi, 1819)

Host: *Stellifer minor* (Tschudi) (Scianidae)
(20/7/5.4),

Menticirrhus ophicephalus (Jenyns)
(Sciaenidae) 35/4/4.75)

Labrisomus philippi (Steindachner)
(Clinidae) (12/1/2)

Palabrax humeralis (Valenciennes)
(Serranidae) 25/18/6.2)

Site of infection: intestine and intestinal caeca

Locality: Chorrillos, Perú

Voucher specimens: CHURP N:587 (five stained whole mounts)

Measurements: (based on 12 specimens), total length 3.1 (2.75-3.5), maximum width 0.58 (0.55-0.82). Oral sucker diameter 0.21 (0.19-0.22), acetabulum diameter 0.29 (0.28-0.31), sucker width ratio 1:1.38. Testes 0.24×0.27 (0.22-0.25 $\times$ 0.24-0.29), ovary 0.15×0.26 (0.13-0.17 $\times$ 0.23-0.29). Eggs $53 \times 32 \mu\text{m}$.

Remarks: this is a very common species (Bray, 1987b) and was found previously in *Gymnothorax wienersi* Steindachner from the Peruvian coast (Mateo 1972)

and in *P. humeralis* from Chile (Oliva & Muñoz 1985a). The four fish species listed above are new host records for *H. fasciata*.

Bucephalidae Poche, 1907

Bucephalus introversus Manter, 1940

Host: *Seriola mazatlanensis* Steindachner
(Carangidae) (3/2/12.5)

Site of infection: intestine and pyloric caeca

Locality: Antofagasta, Chile

Voucher specimens: MHNP N:1052 (two stained whole mounts)

Measurements: (based on twelve specimens), total length 2.50 (1.72-2.94), maximum width 0.35 (0.27-0.47). Acetabulum diameter 78 (72-82) μm . Testes diameter 0.17 (0.14-0.19). Ovary 0.25 long., 0.12 wide. Eggs $23 \times 17 \mu\text{m}$.

Remarks: the specimens studied agree well with the original description given by Manter (1940). They differ however in the relation between the size of the cirrus sac and body length (about 1/2 - 1/3 in Manter's specimens and 1/4 - 1/5 in ours).

This difference is not considered significant and may be due to intraspecific variability and/or host influence.

Hemiuridae Lühe, 1901

Gonocercella pacifica Manter, 1940

Host: *Trachinotus paitensis* Cuvier
(Carangidae) (16/3/3.6)

Site of infection: intestine.

Localities: Chorrillos, Perú and Antofagasta, Chile

Voucher specimens: MHNJP N:1053 (one stained whole mount), CHURP N:588 (three stained whole mounts)

Measurements: (based on six specimens), total length 3.5 (3.0-4.5), maximum width 0.65 (0.55-0.70). Oral sucker diameter 0.40 (0.35-0.42), acetabulum diameter 0.85 (0.82-0.90), sucker width ratio 1: 2.12. Testes diameter 0.26 (0.24-0.27), ovary diameter 0.25 (0.23-0.27). Eggs 37x20 μ m.

Remarks: the characteristics of the specimens are in agreement with the information given in the original description by Manter (1940). *T. paitensis* is a new host record for this worm, and Antofagasta is the southern limit known for *G. pacifica*.

Lecithochirium callaoensis n. sp. (Figs. 1-2)

Type host: *Gymnothorax wieneri*
Steindachner (Muraenidae)

Site of infection: stomach and intestine

Type locality: Callao, Perú

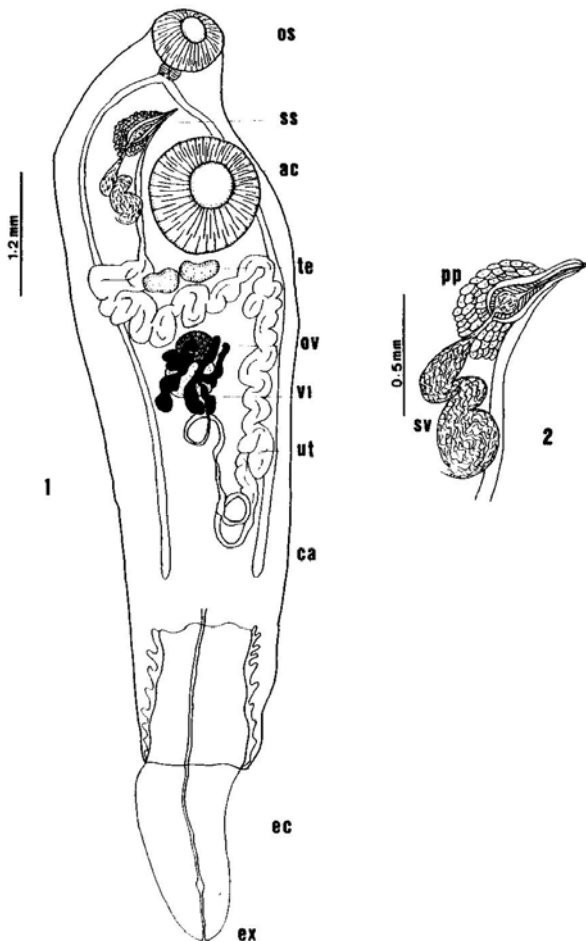
Holotype: USNMHC N:82028

Paratypes: USNMHC N: 82039 (three stained whole mounts), CHURP N: 589 (three stained whole mounts)

Description: (based on eight specimens). With the characteristics of *Lecithochirium* Lühe, 1901. Body (Fig. 1) fusiform 7.79 (4.37-8.72) long., ecsoma 31% - 51% of body length. Maximum width 1.78 (1.36 - 2.15) at acetabular level. Preoral lobe not observed. Oral sucker subterminal, 0.37 in diameter; prepharynx absent, pharynx globular, 60 x 55 μ m; esophagus very short; intestinal caeca do not penetrate ecsoma. Acetabulum in anterior third of

body, 1.20 (1.01-1.67) in diameter. Presomatic pit absent. Sucker width ratio 1:3.2. Testes reniform, small, postacetabular, 0.27 (0.23-0.30) in diameter, seminal vesicle bipartite (Fig. 2), extend to midlevel of acetabulum, pars prostatica well developed, external, sinus sac (*sensu* Gibson & Bray 1979) "separogermiductus - type", ejaculatory vesicle small, hermaphroditic duct very short. Ovary 0.28 (0.25-0.30) in diameter, separated from testes by uterine coil, oviduct reaches ootype that in turn is surrounded by the Juel's organ and Mehlis's gland; vitellaria consisting of two compact mass with 3 and 4 digitiform processes, uterus initially descends, but does not penetrates ecsoma, reaching the posttesticular level and cross horizontally to right side of body, ascend between the acetabulum and seminal vesicle, reaching the hermaphroditic duct. Eggs, 28 x 12 (25 - 32 x 10-12.5) μ m.

Remarks: *Lecithochirium* Lühe, 1901 is a complex hemiurid genus which comprises about 100 nominal species (Bray 1991). Other extensive studies of this genus were made by Nasir & Diaz (1971) and Gibson & Bray (1979, 1986). According to Bray (1991), the species described above can be included in the "Magnus-group", that includes two species, *L. magnus* (Yamaguti 1938) and *L. concavovesiculatus* (Reid, Coil & Kuntz 1965). This group is characterized by the presence of digitiform vitelline masses, terminal genitalia of the "separogermiductus-type", seminal vesicle muscular distally and pre-somatic pit absent. *L. callaoensis* n. sp. differs from the



Lecithodirium callaoensis n. sp. Fig. 1: Holotype, ventral view. Fig. 2: Genitalia terminal.

os: oral sucker, ss: sinus sac, ac: acetabulum, te: testes, ov: ovary, vi: vitellaria, ut: uterus, ca: caecum, ec: ecsoma, ex: excretory pore, pp: pars prostatica, sv: seminal vesicle.

species listed above by a combination of characters that includes (1) preoral lobe absent, (2) pars prostatica well developed, (3) sucker width ratio and (4) eggs size. Another species of *Lecithochirium* parasite of fishes of the genus *Gymnothorax* from the Peruvian faunistic province is *L. selkiriensis* Oliva & Guerra, 1988. This species possess terminal genitalia of the "separogermiductus-type" and a bipartite seminal vesicle, but can be easily differentiated from *L. callaoensis* n. sp. by the presence of the lobed vitelline masses and short pars prostatica.

Lecithocladium cristatum (Rudolphi, 1919)

Host: *Seriotelella violacea* Guichenot
(Centrolophidae) (16/12/5)

Site of infection: stomach

Localities: Corrillos, Perú and Antofagasta, Chile

Voucher specimens: MHNP N:1050 (two stained whole mounts), CHURP N:590 (three stained whole mounts)

Measurements: (based on seven specimens), total length 4.64 (1.70-9.40), maximum width 0.90 (0.40-1.74). Ecsoma 1.82 (0.13-4.42) long. Oral sucker diameter 0.20 (0.16-0.23), acetabulum diameter 0.23 (0.20-0.24), sucker width diameter 1: 1.15. Testes diameter 0.13 (0.10-0.16), ovary diameter 0.15 (0.13-0.17). Eggs 19 x 9 µm.

New synonym: *Lecithocladium falklandicum* Gaevskaya & Kovaleva, 1978

Remarks: our material agree well with the redescription given by Gibson (1976) from material obtained in the Falkland Islands as parasites of the related fish,

Stromateus maculatus Lutken. Differences found refers to the size of the worms; parasites from *S. violacea* are larger than those from *S. maculatus*. Gaevskaja & Kovaleva (1978) considered the parasites from the Falkland Islands as a new species, named *L. falklandicum*. The most important characteristics considered in the proposal of the new species were the suckers width ratio, body size, and the proportions of the internal organs. The morphometric analysis of our material, showed that the suckers width ratio varies greatly from worm to worm and it is not affected by the worm size. thus, the acetabulum can be smaller than, larger than or as large as the oral sucker. Size of mature specimens also shows a wide range. The proportions of the body and internal organs also vary with the age (size) of the worms, because allometric growth patterns can be affected by the age of the parasites as proposed by Gibson (1976). The effect of the host in allometric growth patterns, studied by Fischthal *et al.* (1980) and Oliva & Zegers (1988), among others; also was observed in this study (see comments about *P. lintoni*). We therefore consider *L. falklandicum* as junior synonym of *L. cristatum*. Moreover, the revision of the genus is recommended and new species should not be described until the proposed revision, because practically all the taxonomy of the group is based on morphometric characters (see for instance, Reid *et al.* 1965; Fischthal & Thomas, 1971; Amato, 1983, among others), that are strongly affected at least, by the host species, location in the host and parasite density (Oliva & Zegers, 1988).

DISCUSSION

As pointed out by Bray (1987a), any study about zoogeography of little known groups should be prefaced with reservations. This recommendation also applies to geographical areas where the fauna remains unknown for many zoological groups.

The Peruvian faunistic province includes the Peruvian Central coast and the Northern and Central Chilean coast. These areas are strongly affected by the Perú-Chile cold water current, which causes an upwelling system of high productivity. In spite of knowledge of the trematode fauna of the Peruvian faunistic province, we give some comments in order to attempt a first approach to zoogeographical characteristics of the Trematoda on the Southeastern Pacific coast of South America.

The most obvious characteristic of this fauna is the presence of seven species (15.2%) parasites of circum-tropical and/or oceanic fishes, that are atypical of the coastal cold water of this zone. The presence of such host species is explained by the occurrence of the aperiodic "El Niño" Southern Oscillation (ENSO Phenomenon), which increases the water temperature and affects the composition of the fauna and flora of this zone. The effect of the ENSO phenomenon also is reflected in the parasite fauna (Oliva 1984; Oliva & Muñoz 1985b).

We can consider a second group of trematodes that is found in the Peruvian faunistic province, which consists of species that are widely distributed in the world and comprise 19.5% of the material listed in Table 1. The main characteristic of this group is that all these species possess a low host specificity. (i.e. *D. brusinae* and *Z. rubellus*, considered as stenoxenic and euryxenic zoogonids by Bray 1987a). The third component can be defined as parasites of the Pacific and Atlantic coasts of America and the Caribbean; to this category belong 11 species (23.9%) and their occurrence is mainly explained by the geographical distribution of their fish hosts. Exception is made by *Mugil cephalus*, a species that harbours different parasites in different geographical areas (Fernández 1987). One species, *Phagicola longa* shows a peculiar distribution (Fernández 1987) and can be found on both the Pacific and Atlantic coasts of America and also in the Mediterranean Sea. Another species, *Lecithochirium genyptery* Manter 1954, is found in Chile and New Zealand (first marine parasitological evidence of faunistic similarities between New Zealand and the Pacific coast of South America?). Finally, 14 species (30.4%) are endemic to the Peruvian faunistic province. The number of endemic species can be increased by further studies on the parasites of endemic fish species. According to Chirichigno (1974), as many as 566 fish species are known from the Peruvian coast, of which, 97 are endemic. A similar picture is expected for the Chilean ichthyological marine fauna.

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Table 1. List of known Aspidobothrean and Digenetic trematodes from the Peruvian faunistic Province [Chilean (C) and Peruvian (P) marine fishes]. New geographical records are indicated by (r) and new host records by (h). Species of oceanic and/or circumtropical fishes are indicated by (O), species widely distributed in the world by (W), species of the Pacific, Atlantic American coast and/or Caribbe by (A), species with a special distribution by (S) and endemic species by (E).

References (*): this paper, (1): Oliva & Carvajal 1984, (2): Oliva & Luque 1989, (3): Fernández *et al.* 1986, (4): Fernández & Durán (1985), (5): Villalba & Fernández 1986b, (6): Villalba & Fernández 1986a, (7): Durán & Oliva 1980, (8): Fernández 1987, (9): Oliva 1982, (10): Luque *et al.* 1991, (11): Therlfall & Carvajal 1986, (12): Tantaléan 1991, (13): Villalba & Fernández 1985, (14): Oliva 1984, (15): Oliva & Zegers 1988, (16): Tantaléan & Rodríguez 1987, (17): Tantaléan & Rodríguez 1990, (18): Leggett & Mateo 1982, (19): Oliva & Muñoz 1985a, (20): Mateo 1972, (21): Fernández 1985, (22): Oliva & Guerra 1988, (23): George-Nascimento & Huet 1984, (24): Rivera & Sarmiento 1990, (25): López & Tantaléan 1985, (26): Mateo *et al.* 1985.

Parasite

Host

ASPIDOBOTHREA

Aspidogasteridae

Lobostoma anisotremum (E) (1, 2)
L. pacificum (A) (2)
L. veranoi (E) (2)
L. kemostoma (A) (*)

Anisotremus scapularis (C, P).
Trachinotus patiensis (C, P)
Menticirrhus ophicephalus (P)
T. patiensis (P, r, h)

Multalycidae

Trigonostoma callorhynchi (A) (3)

Callorhynchus callorhynchus (C)

DIGenea

Aporocotylidae

Aporocotyle australis (E) (4)
A. kelli (E) (5)
A. kuri (E) (5)
A. wilhelmi (E) (6)
A. ymalkara (E) (5)
Aporocotyle sp. (7)

Merluccius australis (C)
Genypterus chilensis (C)
G. maculatus (C)
Merluccius gayi gayi (C)
G. blacodes (C)
M. gayi peruanus (P)

Haploporidae

Dicrogaster fastigatus (A) (8)
D. fragilis (E) (8)
Saccocoeloides overstreeti (E) (8)
S. papernai (E) (8)

Mugil cephalus (C)
M. cephalus (C)
M. cephalus (C)
M. cephalus (C)

Haplospilanchnidae

Hymenocotta manteri (A) (9,10)

M. cephalus (C, P)

Azygiidae

Otodistomum cestoides (W) (11)
 (11)
O. veliporum (W) (12)
 (12)

Psammobatis scobina (C)
Raja flavirostus (C)
Squatina armata (P)
Psammobatis chilcae (P)

Accacoeliidae

Accacladocoelium macrocotyle (O) (13)*Tetrochetus coryphaenae* (O) (14)*Mola ramsayi* (C, R)*Coryphaena hippurus* (C)

Eelodistomidae

Bructoeces lintoni (A) (*)

(*)

(15)

A. scapularis (C, P, h)*Isacia conceptionis* (P, h)*Sicyases sanguineus* (C)

Gorgoderidae

Anaporrhutum albidum (W) (16)*Nagimnia peruviana* (E) (17)*Myliobatis peruviana* (P)*Mobula lucasana* (P)

Monorchidae

Lasiotocus glebulentus (A) (*)*L. longicaecum* (A) (*)*Monorchis latus* (A) (*)*M. cephalus* (P, r)*A. scapularis* (C, P, r, h)*A. scapularis* (P, r, h)

Zoogonidae

Diphtherostomum brusinae (W) (*)*Zoogonus rubellus* (W) (*)*I. conceptionis* (P, r, h)*M. gayi peruanus* (P, r, h)

Allocreadiidae

Villarrealina peruanus (E) (18)*Anisoporus* sp. (10)*Sciaena gilberti* (P)*Paralichthys woolmani* (P)

Opcoelidae

Helicometra fasciata (W) (19)

(20)

(*)

(*)

(*)

Helicometrina nimia (W) (19)

(19)

(*)

(*)

(*)

(*)

(19)

(19)

Paralabrax humeralis (C, P)*Gymnothorax wienneri* (P)*Labrisomus philippii* (P, h)*M. ophicephalus* (P, h)*Stellifer minor* (P, r)*Acanthistius pictus* (C)*A. scapularis* (C)*Cheilodactylus variegatus* (C, h)*G. maculatus* (C, h)*Hemilutjanus macrophthalmus* (C, h)*Pinguipes chilensis* (C, h)*P. humeralis* (C)*Sebastes capensis* (C)

Bucephalidae

Bucephalus introversus (A) (*)*Rhipidocotyle abdaculum* (O) (20)*Seriola mazatlanensis* (C, r, h)*Sarda sarda chilensis* (P)

Didymozoidae

Coeliodidymocystis kamegai (O) (14)*Katsuwonus pelamis* (C)

Hemiuridae

Derogenes varicus (W) (21)*Dinurus longisus* (O) (14)*Gonocercella pacifica* (A) (*)*Lecithochirium callaoensis* (E) (*)*L. selkiriensis* (E) (22)*M. australis* (C)*C. hippurus* (C)*T. patiensis* (C, r, h)*G. wienneri* (P)*G. porphyrea* (C)

<i>L. genypteri</i> (S) (23)	<i>G. maculatus</i> (C)
<i>Lecithocladium cristatum</i> (W) (*)	<i>Seriolella violacea</i> (C, P, r, h)
<i>Sterrhurus</i> sp. (24)	<i>L. philippii</i> (P)
Bathycotylidae	
<i>Bathycotyle coryphaenae</i> (O) (25)	<i>C. hippurus</i> (P)
Lampritremitidae	
<i>Lampritrema miescheri</i> (O) (14)	<i>Lampris regius</i> (C)
Heterophyidae	
<i>Phagicola longa</i> (S) (8,26)	<i>M. cephalus</i> (C, P)

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