ISSN: 0001-5113 AADRAY	ACTA ADRIAT., 42 (2): 65-70, 2001	UDC: 597.587.9 (262.3-17) 591.16 Original scientific paper

Eimeria palavensis n. sp. (Apicomplexa: Eimeriidae) from the Blackmouth Catshark, *Galeus melastomus* (Chondrichthyes : Scyliorhinidae)

Adam MARQUÈS[1] and Christian CAPAPÉ[2]

[1]*Laboratoire de Parasitologie, case 096, Université Montpellier II, Sciences et Techniques du Languedoc, Montpellier cedex 5, France*
[2]*Laboratoire d'Ichtyologie, case 102, Université Montellier II, Sciences et Techniques du Languedoc, Montpellier cedex 5, France*

Out of 143 samples of blackmouth catsharks, Galeus melastomus *caught from off the coast of Languedoc (southern France, northern Mediterranean), 123 specimens were infested by a coccidian. It is a new species belonging to the genus* Eimeria (s. l.) *SCHNEIDER, 1875* sensu *LOM and DYKOVA (1982) and named* Eimeria palavensis n. sp. *The species was described and its parasitic incidence on* G. melastomus *is detailed. The coccidian density is relatively high in both sexes, is the category of specimens (juvenile or adult) and is also slightly related to the reproductive state of the adult females.*

Key words: Apicomplexa, Coccidia, Eimeriidae, *Eimeria palavensis* n. sp., Chondrichthyes, Scyliorhinidae, *Galeus melastomus*, Coast of Languedoc, southern France, northern Mediterranean

INTRODUCTION

Coccidian parasitizing fishes form the subject of annotated lists (PELLERDY, 1974; LOM and DYKOVA, 1981; DYKOVA and LOM, 1981, 1983; DAOUDI *et al.*, 1987, 1993). The infested elasmobranchs were rarely cited. This characteristic is probably due to fact that few species and specimens were observed according to BOULARD (1977). Previously, UPTON *et al.* (1986, 1988) described two species from *Urolophus halleri*, from similar locations, MARQUÈS *et al.* (1991) showed that a sample of smallspotted catfish, *Scyliorhinus canicula* (L., 1758) from the coast of Languedoc (southern France) was noticeably infested by a coccidian. Furthermore, in this study, they pointed out the relationship between the parasitical density and the reproductive state in both sexes.

In many blackmouth catsharks, *Galeus melastomus*, caught from off the same marine area, the posterior part of the intestine was abundantly infested by a coccidian, unknown to date. This coccidian is described and its incidence infestation in the host is detailed, according to the sex and the reproductive state of the specimens (juvenile and adult).

MATERIAL AND METHODS

Sampling method

Blackmouth catsharks, *G. melastomus*, were collected off the coast of Languedoc from 1992 to 2000 (Fig. 1). One hundred and forty-

three specimens were observed, among them 49 males (33 juveniles and 16 adults) and 94 females (51 juveniles and 43 adults). The total length (*TL*, mm) of all the specimens was measured following COMPAGNO (1984).

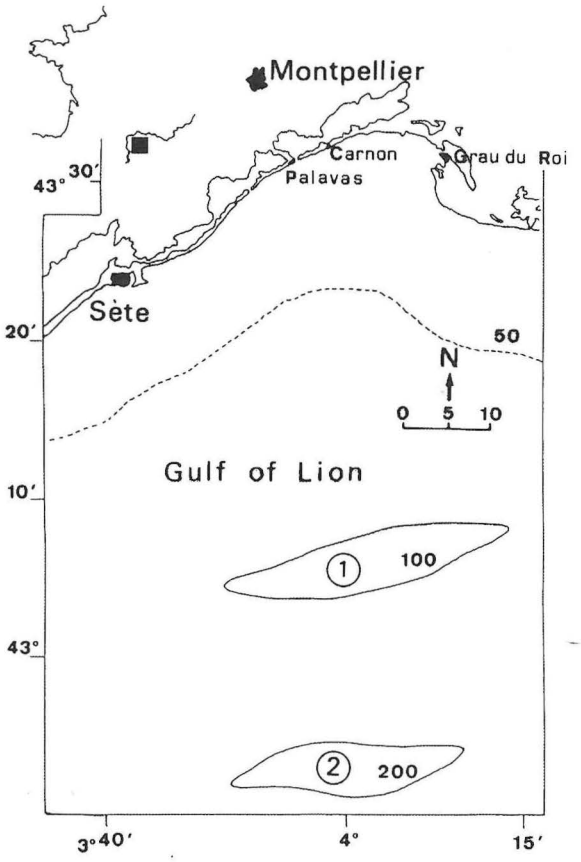

Fig. 1. The coast of Languedoc. Sampling areas: 1. Smallspotted catfish, Scyliorhinus canicula; 2. *Blackmouth catshark,* Galeus melastomus

The determination of the specimens follows SPRINGER (1979), CADENAT and BLACHE (1981) and COMPAGNO (1984). Taxonomic state follows ESCHMEYER (1998), trivale name follows QUÉRO (1984).

Protocol of parasitological study

Coccidian oocysts were observed in blackmouth catsharks from pieces (1cm²) of spiral valves removed from posterior part of ventral intestine.

The description of the coccidian follows the guideline proposed by DUSZYNSKI and WILBER (1997).

Coccidian oocysts numeration was made by using phase contrast light microscopy, magnification x 20, from six distinct fields. Only developing and mature oocysts clearly identified were counted. Intestinal smears were air dried, fixed in methanol and stained by GIEMSA from R. A. L.

Relative abundance (*RA*) was classified as follows: 0 - negative; 1 - rare (< 5 oocysts per field); 2 - few (5 - 25 p. f.); 3: moderate (25 - 30 p. f.); 4: high (30 - 100 p.f.); 5: very high abundance (>100 oocysts per field). Six categories of coccidian parasite density were distinguished and confirmed by two controls at least.

RA was related to size and categories of blackmouth catsharks. Males and females were considered separately and among them juveniles and adults. The reproductive state of adult females was also considered (e. g. occurrence or non-occurrence of egg-capsules in oviducts).

Tests for significance ($p < 0.05$) were performed by using analysis of percentages and χ^2.

RESULTS

Description of the species

Eimeria palavensis n. sp. (Figs 2, 3, 4, 5, 6)

Description of sporulated oocysts (32 specimens measured). Oocysts rounded from 12.00

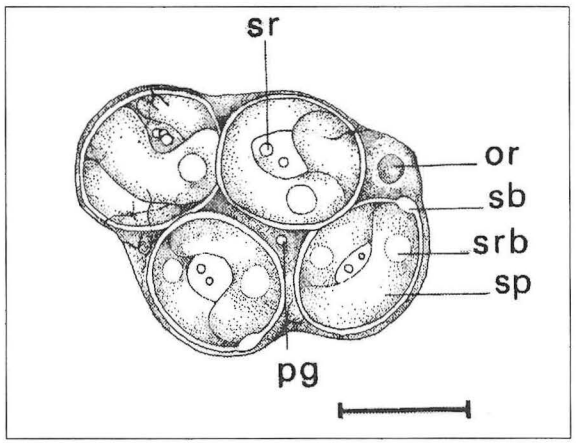

Fig. 2. Eimeria palavensis n. sp., *lines drawing of the coccidian oocyst with the four sporocysts, showing the essential structural parts: or, oocyst residuum; pg, polar granule; sb, Stieda body; sp, sporozoite; sr, sporocyst residuum; srb, sporozoite refractile body. Scale bar = 5 μm*

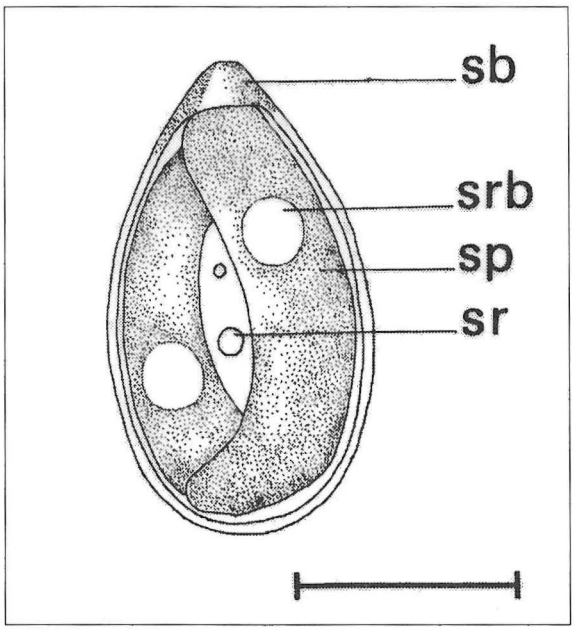

Fig. 3. Eimeria palavensis *n. sp., lines drawing of the coccidian sporocyst, showing the essential structural parts: sb, Stieda body; sp, sporozoite; sr, sporocyst residuum; srb, sporozoite refractile body. Scale bar = 5 μm*

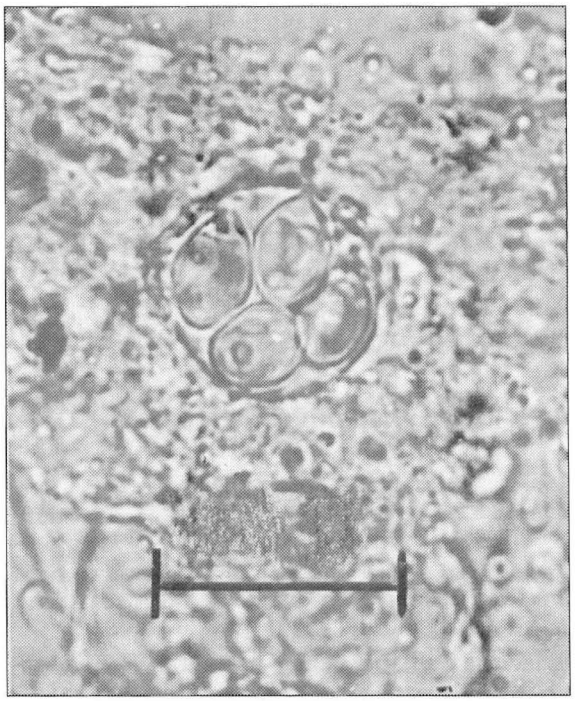

Fig. 4. Light microscopy of a mature Eimeria palavensis *n.sp., coccidian oocyst. Scale bar = 20 μm*

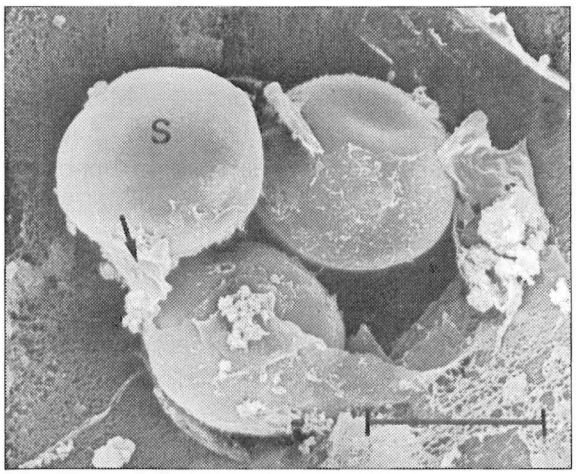

Fig. 5. Scanning electromicroscopy of a mature Eimeria palavensis *n.sp. showing soft layer of the oocyst (arrow) and the sporocysts (S). Scale bar = 5 μm*

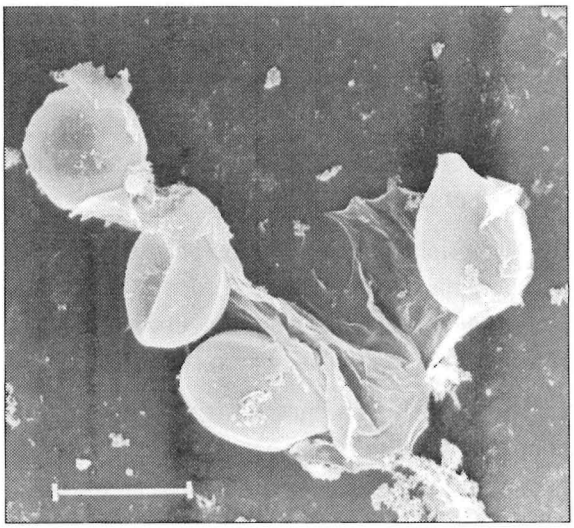

Fig. 6. Scanning electromicroscopy of a mature Eimeria palavensis *n.sp. showing the four sporocysts . Scale bar = 5 μm*

to 14.40 μm in diameter (mean: 12.68 μm). Cyst wall colourless and composed of a membraneous layer. Oocyst residuum present and micropyle absent. From two to four rounded polar granules, they range from 0.8 to 1.6 μm in diameter (mean: 1.25 μm). The sporocyst tapering toward one end and blunt at the other. A small cap-like Stieda body is located at the former end. Length of the sporocysts ranges from 9.70 to 12.10 μm (mean: 10.90 μm), width from

4.80 to 6.40 μm (mean: 5.60 μm). The ratio length/width is 1.9. Sporocyst residuum is granular, constituted by one or two refringent granules. These granules are located at the mid-part or at the posterior end of the sporocyst. The two sporozoites are vermiform, arranged from head to tail. Their posterior end is broader than their anterior end. Their length ranges from 8.80 to 9.40 μm (mean 9.10 μm), their width from 2.00 to 2.30 μm (mean: 2.10 μm).

Taxonomic summary

Host: Blackmouth catshark, *Galeus melastomus* RAFINESQUE 1810, Chondrichthyes, Elasmobranchii, Pleurotremata, Scyliorhinidae.

Type locality: coast of Languedoc, off Palavas (southern France, northern Mediterranean), from 100 m to 300 m depth.

Prevalence: Among the 143 specimens examined, 123 proved to be infected by this new species of coccidia from genus *Eimeria* SCHNEIDER, 1875 according to LOM and DYKOVA (1982), that represents 86.02 % of the total sample.

Site of infection: Spiral valve of the posterior part of the intestine.

Material deposited: Holotype and paratype, photographs of the sporulated oocysts in the collection de Biologie parasitaire, Protistologie et Helminthologie, MNHN, Paris, ref. n° 1 PAB.

Etymology: The nomen trivale is given to honor the locality of Palavas (cf. Fig. 1), in respect to the fishermen who provided us the host.

Remarks

E. palavensis resembles *E. kotorensis* DAOUDI *et al.*, 1987 and *E. philypnodoni* MOLNAR and ROHDE, 1988. This is due to fact that the sporocyst of these three species is morphologically very similar. However, the sporocyst size of the first species is greater than that of the other two.

E. gigantea (LABBÉ, 1896) and *E. otojiroveci* (LOM and DYKOVA, 1981) were found in elasmobranchs caught off the French coasts. *E. palavensis* differs from them in size and shape of the sporocyst and the host. This species was never recorded and described.

Incidence of the coccidian parasitosis

The blackmouth catsharks are significantly parasitized by *E. palavensis*, 86.02 % of the total sample. Moreover, the specimens strongly infested were significantly more numerous than the non-infested ones. Sex, size and reproductive state did not significantly influence the *RA* (Table 1 and 2). Table 1 reveals that the specimens moderately parasitized ($1<RA<3$) were significantly the most numerous. Moreover, whatever the *RA* was, the percentage of males and of females are very similar. In opposite, Table 2 shows that the adult females (21.95%) are significantly more infested than juveniles (7.45%). In the total sample, 16 females bearing egg-capsules in their oviducts were observed, among them only 4 specimens were infested. The specimens moderately or strongly parasitized are not the subject of changes according to the sex and the reproductive state of the observed *G. melastomus*.

Table 1. Incidence and relative abundance (RA) of Eimeria palavensis *n. sp. infection in* Galeus melastomus *from the Coast of Languedoc. Test of significance performed by* χ^2 *with* $p < 0.05$

RA	$RA = 0$	$1 < RA < 3$	$4 < RA < 5$	Total
Males	7 (14.28)	28 (57.14)	14 (28.57)	49
Females	13 (13.82)	53 (56.38)	28 (29.78)	94
Total	20 (13.98)	81 (56.64)	42 (44.68)	143

Table 2. Incidence and relative abundance (RA) of Eimeria palavensis *n. sp. infection in* Galeus melastomus *from the Coast of Languedoc in relation to sex and reproductive state*

RA	Males		Total	Females		Total
	Juveniles	Adults		Juveniles	Adults	
$RA = 0$	5 (15.15)	2 (12.50)	7	4 (7.84)	9 (21.95)	13
$1 < RA < 3$	18 (54.54)	10 (62.50)	28	31 (58.49)	22 (53.65)	33
$4 < RA < 5$	10 (30.31)	4 (25.00)	14	18 (33.96)	10 (24.39)	28

DISCUSSION

Sex and reproductive state do not seem to play an important role in the coccidian infestation of the blackmouth catsharks from our areas.

MARQUÈS *et al.* (1991) showed that 79 % of a *Scyliorhinus canicula* sample from the Gulf of Lion were infested by a coccidian, *Goussia lucida*. The percentage is higher from this calculated herein for *G. melastomus*, 86.02 %. This phenomenon is chiefly due to fact that the two sharks were not infested by the same coccidian species. *S. canicula* is infested by *G. lucida* , and *G. melastomus* by *E. palavensis* n. sp. Moreover, the former inhabits coralligenous areas at depths from 80 to 100 m, the latter lives in deeper marine areas from 100 to 300 m and it preferentially inhabits muddy bottoms. These latter observations mean that depth and habitat could play a role in elasmobranch infestation by coccidian, rather than other parameters, as sex and reproductive state.

REFERENCES

BOULARD, Y. 1977. Description d'*Eimeria quentini* n. sp. parasite intracellulaire du péritoine de la raie: *Aetobatus narinari* (Chondrichthyes, Myliobatidae) en Malaisie. Protistologica, 13: 529-533.

CADENAT, J. and J. BLACHE. 1981. Requins de Méditerranée et de l'Atlantique (plus particulièrement de la côte occidentale d'Afrique). Faune trop., 21: 1-330.

COMPAGNO, L.V. J. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of sharks species known to date. Part 2. Carcharhiniformes. FAO Fish Synop., (125) 4 (2): 251-655.

DAOUDI, F., B.M. RADUJKOVIĆ, A. MARQUÈS and G. BOUIX. 1987. Nouvelles espèces des genres *Eimeria* Schneider, 1875 et *Epieimeria* Dykova & Lom, 1981. Parasites des Poissons marins méditerranéens. Bull. Mus. Hist. nat. Paris, 4 ème série, Zool., 11 A: 743-753.

DAOUDI, F., B.M. RADUJKOVIĆ, A. MARQUÈS and G. BOUIX. 1993. Parasites des poissons marins du Monténégro: coccidies. Acta Adriat., 30 (1-2): 13-30.

DUSZYNSKI, D. W. and P. G. WILBER. 1997. A guideline for the preparation of species descriptions in the Eimeriidae. J. Parasitol., 83 (2): 333-336.

DYKOVA, I. and J. LOM. 1981. Fish coccidia: critical notes on life cycles, classification and pathogenicity. J. Fish Dis., 4: 487-505.

DYKOVA, I. and J. LOM. 1983. Fish coccidia: an annotated list of described species. Folia parasitol. (Praha), 30: 193-208.

ESCHMEYER, W. N. 1998. Catalog of Fishes. California Academy of Sciences, Anaheim, 2095 pp.

LABBÉ, A. 1893. Sur deux coccidies nouvelles parasites de poissons. Bull. Soc. zool. Fr, 18: 202-204.

LABBÉ, A. 1896. Recherches zoologiques, cytologiques et biologiques sur les coccidies. Archiv. Zool. exp. gén. , 4: 517-654.

LOM, J. and I. DYKOVA. 1981. New species of the genus *Eimeria* (Apicomplexa: Coccidia) from marine fish. Z. Parasitenkd., 66: 207-220.

LOM, J. and I. DYKOVA. 1982. Some marine fish coccidia of the genera *Eimeria* Schneider, *Epieimeria* Dykova and Lom and *Goussia* Labbé. J. Fish Dis., 5: 309-321.

MARQUÈS, A., C. CAPAPÉ and G. BOUIX. 1991. Données sur la parasitose coccidienne à *Nucleogoussia lucida* (Labbé, 1893) de la petite roussette *Scyliorhinus canicula* (Linnaeus, 1758) (Pisces, Scyliorhinidae) du golfe du Lion (France méridionale). Ichtyophysiol. Acta, 14: 111-121.

MOLNAR, K. and K. ROHDE. 1988. New coccidians from freshwater fishes of Australia. J. Fish Dis., 11: 161-169.

PELLERDY, L. 1974. Coccidia and coccidiosis, 2nd ed. Akadémiai Kiadò, Budapest, Hungary, 959 pp.

QUÉRO, J. C. 1986. Scyliorhinidae. In: P. J. P. Whitehead, M. L. Bauchot, J. C. Hureau, J. Nielsen and E. Tortonese (Editors). Fishes of the North-Eastern Atlantic and the Mediterranean, September, Vol. 1. Les Presses de l'UNESCO, Paris, pp. 95-100.

SPRINGER, S. 1979. A revision of the catsharks, family Scyliorhinidae. NOAA Tech. Rep. NMRS Circ., (422): 1- 97.

UPTON, S. J., J. R. BRISTOL., S. L. GARDNER and D. W. DUSZYNSKI. 1986. *Eimeria halleri* sp. n. (Apicomplexa: Eimeriidae) from the round stingray, *Urolophus halleri* (Rajiformes: Dasyatidae). Proc. Helminth. Soc. Wash., 53: 110-112.

UPTON, S. J., S. L. GARDNER and D. W. DUSZYNSKI. 1988. The round stingray, *Urolophus halleri* (Rajiformes: Dasyatidae), as a host for *Eimeria choallensis* sp. nov. (Apicomplexa: Eimeriidae). Can. J. Zool., 66: 2049-2052.

Accepted: 18 June 2001

Eimeria palavensis n. sp., (Apicomplexa: Eimeriidae) kod crnoustog morskog psa, *Galeus melastomus* (Chondrichthyes : Scyliorhinidae)

Adam MARQUÈS[1] i Christian CAPAPÉ[2]

[1]*Laboratorij za parazitologiju , P.P. 096, Sveučilište u Montpellieru II, Znanosti i tehnika Languedoca, Montpellier cedex 5, Francuska*

[2]*Laboratorij za ihtiologiju, P.P. 102, Sveučilište u Montellieru II, Znanosti i tehnika Languedoca, Montpellier cedex 5, Francuska*

SAŽETAK

Od 143 uzorka crnoustog morskog psa, *Galeus melastomus*, koji su ulovljeni u blizini obale Languedoca (južna Francuska, sjeverni Mediteran), 123 primjerka su bila zaražena kokcidijima. To je nova vrsta koja pripada rodu *Eimeria* SCHNEIDER 1875 *sensu* LOM i DYKOVA (1982) i nazvana je *Eimeria palavensis* n.sp. Vrsta i učestalost parazita kod *G. melastomus* su detaljno opisani. Zastupljenost kokcidija je relativno visoka kod oba spola, u kategorijama uzorka (juvenilni ili odrasli primjerak) i također je povezana s reproduktivnim stanjem odraslih ženki.