SCI. MAR., 58(3): 269-272 SCIENTIA MARINA 1994

NOTE

Helminth parasites of *Illex coindetii* (Cephalopoda: Ommastrephidae) off the Galician coast (NE Atlantic)*

S. PASCUAL[1], B. LORES[1], C. ARIAS[1], A. GONZÁLEZ[2] and Á. GUERRA[2]

[1]Laboratorio de Parasitología, Facultad de Ciencias, Universidad de Vigo, Ap. 874, Vigo, Spain.
[2]Instituto de Investigaciones Marinas, CSIC, Eduardo Cabello, 6, 36208 Vigo, Spain.

SUMMARY: This paper analyses the helminth fauna of the flying squid *Illex coindetii* (Vérany, 1839) collected from natural stock off Galician shelf waters (NW Spain). Aspects of the morphology of the parasites and the host status of squid harbouring intestinal helminth larvae are discussed.

Key words: Helminth fauna, *Illex coindetii*, NW Spain.

RESUMEN: HELMINTOFAUNA DE *Illex coindetii* (CEPHALOPODA: OMMASTREPHIDAE) EN LAS COSTAS DE GALICIA. — En el presente trabajo se analiza la helmintofauna de la pota *Illex coindetii* (Vérany, 1839) procedente de un stock poblacional en aguas de la plataforma Gallega (NO España). Se discuten ciertos aspectos de la morfología de éstos parásitos y el papel de ésta especie en los ciclos vitales de los helmintos larvales examinados.

Palabras clave: Helmintofauna, *Illex coindetii*, NO España.

INTRODUCTION

The squid *Illex coindetii* is a monocyclic species inhabiting mainly te far-neritic waters along the coasts of the North-eastern Atlantic Ocean. It has recently acquired a major commercial importance in the Atlantic waters off Spain where it is one of the key functional elements of the pelagic community (GONZÁLEZ *et al.* , 1992).

As HOCHBERG (1990) highlighted, evidence indicates that cephalopods play a similar role to carnivorous fish species in the transmission of parasites in the sea. In addition to the taxonomic and public health significance of the worms (SMITH and WOOTTEN, 1978), characterisation of cephalopod parasites is of considerable importance owing to the feasibility of using parasites as biological tags in squid population studies (BOWER and MARGOLIS, 1990). Prior to this study, no information was avalaible in the literature on cephalopod parasites found in waters off Spain. The aim of this article is to establish the identity of helminth parasites present in *Illex coindetii*. Once the identity of the intestinal helminths is established, they could be used as biological markers to speculate on the biotic and trophic relationship of *Illex coindetii* on the Galician coast.

* Received April 4, 1993. Accepted September 3, 1993.

MATERIALS AND METHODS

Seventy post-recruit *Illex coindetii* were collected from the fishing grounds on the North Galician Shelf

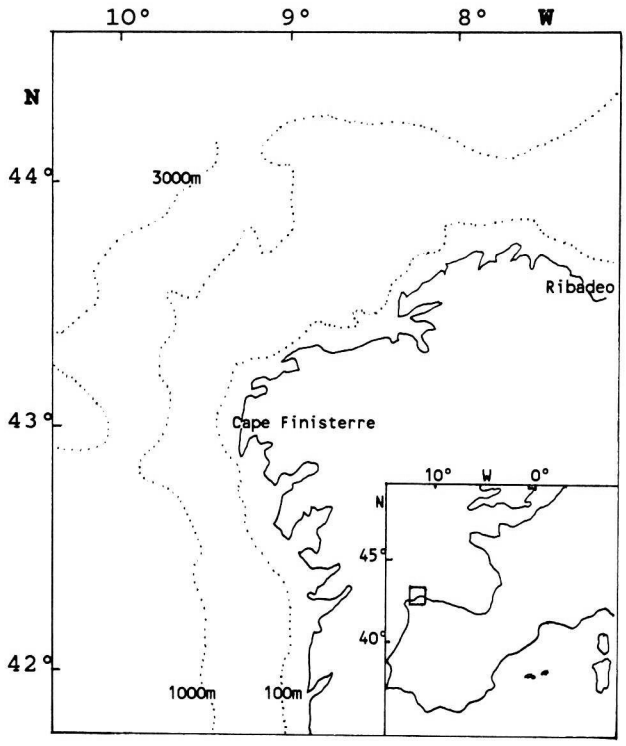

FIG. 1. — Chart of Galicia (NW Spain) showing the sampling area (Ribadeo to Finisterre) where *Illex coindetii* were collected.

(Ribadeo to Finisterre) between October 1991 and April 1992 (Fig. 1). Seven samples of ten individuals, collected at random, were taken each month. Squids were measured, weighed and stored on ice for dissection and examination on arrival at the laboratory. The viscera were removed and examined, while fresh, for intestinal helminths. Larval nematodes were killed and fixed with Berland's fluid or warm ethanol, stored in Loos' fluid, cleared in lactophenol and temporarily mounted in Jelly's glycerine. Metacestodes were removed, fixed in warm ethanol, stained with Semichon's acetic carmine and mounted in Canada Balsam. Voucher specimens were deposited in the University of Vigo, Parasitology Division, Vigo,Spain. The terms "prevalence" and "mean intensity" were applied, as proposed by MARGOLIS *et al.* (1982). Prevalence refers to the percentage of infected hosts in a sample and mean intensity refers to the mean number of individuals of a particular parasite species per infected host in a sample. Data on prevalence and mean intensity for *Phyllobothrium sp,* the largest of the parasites, was quantified together with those of *Dinobothrium septaria* due to the small size and low level of infection of the latter.

RESULTS

A total of 70 squid were examined for their helminth parasite burden. Two genera of cestodes were recorded, while a single genus of nematodes was found. Plerocercoid larvae of *Phyllobothrium sp.* with a variable size (4-30 mm) were found. They have a scolex characteristically formed by a single apical sucker and four large folded flaps or bothridia with undulating edges, each with an accesory sucker. In small larvae, the edges of the bothridia were flat whereas in the large individuals, they were undulating (Fig. 2). From 1 to 22 larval cestodes were found, localised in the mantle cavity (10.2 %), stomach (49.8 %) and caecum (40 %).

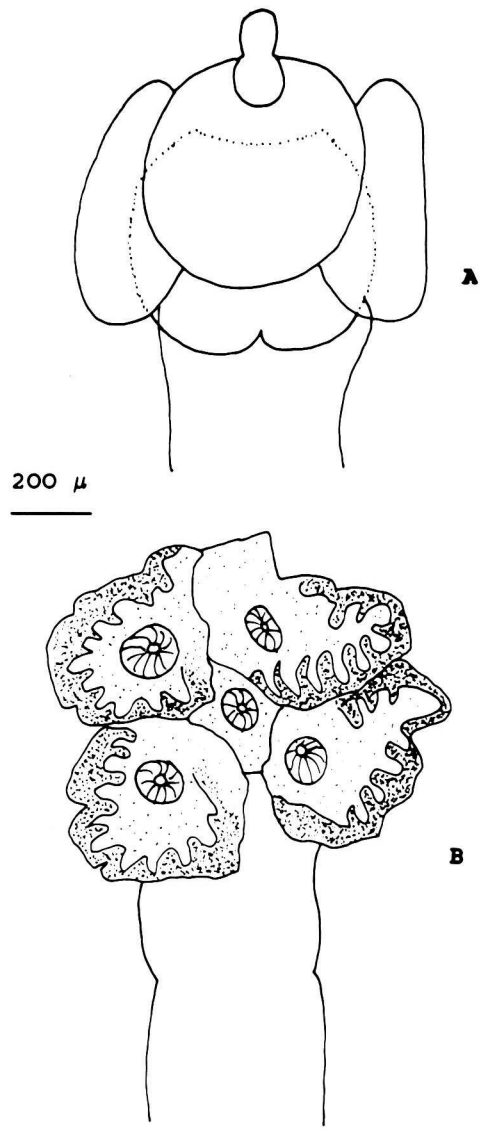

FIG. 2. — *Phyllobothrium sp.* **A.** small plerocercoid **B.** large plerocercoid.

The second genus infecting *Illex coindetii* was *Dinobotrium septaria*, also a member of the Phyllobothriidae family. Identification was based on the presence of spine-like projections in the angles of the bothridia. Bothridia were long, without bends and occupied approximately a third of the total length of the body. Each one had a frontal accesory sucker. These plerocercoids were found encysted on the walls of the caecum (96.6 %) and occasionally on the walls of the stomach(3.4 %). The average size found was 4 mm.

All the nematodes were *Anisakis simplex* at stage III of development and presented the morphological features of that stage (BERLAND, 1961). These nematodes were large and pink in color while alive. The body was compact and measured 12.14-17,21 mm in length by 0.25-0.38 mm in width. The larvae were mainly located on the external wall of the stomach (92 %), and several free individuals in the mantle cavity (6.8 %) or gonads (1.2 %). The prevalence and mean intensity of infection for *Phyllobothrium sp.* , *Dinobothrium septaria* and *Anisakis simplex* L_3 in *Illex coindetii* are shown in Table 1.

TABLE 1. – Prevalence P(%) and mean intensity (I) of larval helminths in *Illex coindetii*. October 1991-April 1992. Cestodes (*Phyllobotrium sp* + *Dinobothrium septaria*). Nematodes (*Anisakis simplex* L_3).

Sample	No. squid examined	CESTODES P(%)	CESTODES I	NEMATODES P(%)	NEMATODES I
1	10	70	4.8	–	–
2	10	80	5.2	20	1
3	10	80	6.2	–	–
4	10	100	9.3	–	–
5	10	88.8	5.4	20	1
6	10	100	7.6	30	2
7	10	90	6.5	–	–
Total	70	87	6.4	10	1.3

DISCUSSION

The plerocercoids recorded from *Illex coindetii* in Galicia resemble those illustrated by BROWN and THRELFALL (1968) of *Illex illecebrosus illecebrosus* found off Newfoundland. The main difference between the metacestodes *Phyllobothrium sp.* reported here and those of BROWN and THRELFALL is that the

TABLE 2. – A: Host register for *Phyllobothrium sp.* (from EUZET, 1959; BROWN and THRELFALL, 1968; GAEVSKAYA and NIGMATULLIN, 1978; NIGMATULLIN, 1989; HOCHBERG, 1990). B: Host register for *Dinobothrium sp.* (from GAEVSKAYA and NIGMATULLIN, 1978; HOCHBERG, 1990).

A PROCERCOID LARVAE First interm. host	PLEROCERCOID LARVAE Second interm. host	ADULT Final host
Copepods: *Acartia discaudata* *Acartia clausi* *Eucalanus sp* Euphausiids: *Thysanoessa sp* *Meganyctiphanes sp*	Squids: *Loligo pealei* *Loligo patagonica* *Illex argentinus* *Illex coindetii* *Todarodes angolensis* *Todaropsis sp* *Ommastrephes bartramii* *Martialia hyadesi* *Sepia officinalis* *Eledone moschata* Porpoises Whales: *Globiocephala melaena*	Sharks: *Carharodon sp* *Isurus dekayi* *Mustelus canis*
B PROCERCOID LARVAE First interm. host	**PLEROCERCOID LARVAE Second interm. host**	**ADULT Final host**
Unknown	Squids: *Loligo pealei* *Illex argentinus* *Illex coindetii* *Illex illecebrosus* *Todaropsis sp* *Sepia sp*	Sharks: *Carcharodon sp* *Cethorinus sp* *Lamma cornubica*

apical sucker in the plerocercoids from *Illex illebrosus illecebrosus* appeared less well developed than the forms from *Illex coindetii*. In addition, in the stomachs of squids, the cestodes lead a mobile form of life and do not differ morphologically from similar larvae observed in various fish species. Likewise, larval cestodes in bony fish do not, as a rule, attain as large a size as those found in squids. It is probable that, having entered a squid, they undergo further development. Strobilisation was evident in the largest larvae. It may, therefore, be conjectured that squids are not reservoir hosts, in which the accumulation of parasites usually occurs without further growth, but rather that they are obligatory hosts. Since only two squids were infected with *Dinobothrium sp* we may surmise that the infection of the squid was merely accidental, the squid not being a normal intermediate host. With regard to tetraphyllidean cestodes, *Illex coindetii* shares almost all the genera of the cosmopolitan parasites found in other far-neritic ommastrephid squids in all the seas of the world (Table 2). This indicates an equivalent trophic position of these squids wherever they are found. On the other hand, it would seem that development of *Anisakis* does not occur in these organisms and it is very likely that an adaption of the parasite to the completion of its life cycle takes place here. We may, therefore, assume that squids in Galician waters are reservoir hosts for larval nematodes of the genus *Anisakis*. Squids eaten as a food can apparently transmit infective *Anisakis* larvae to marine mammals (GONZÁLEZ *et al.* ,1993), which are the definitive hosts for this genus (SMITH and WOOTTEN, 1978). In addition, SOLEIM (1976) pointed out that differences in monthly values of infection may be due to the size of the host (intraspecific related aspects) but, in the final count, it is also due to fluctuations in the ecological condition of the biotopes and the type of prey consumed during the ontogeny of the squid.

Taking these results into account, it would be logical to surmise that *Illex coindetii*, which occupies an eco-niche together with a wide number of bony fish species, also provides a vital link for food-transmitted helminth parasites. Hence, there is undoubtable interest in the application of the results from parasitological investigations aimed at elucidating the biotic relationships of squids in the Galician marine environment.

REFERENCES

BERLAND, B. — 1961. Nematodes from some Norwegian marine fishes. *Sarsia*, 2: 1-5O.

BOWER, S. M. and L. MARGOLIS. — 199O. Potential use of helminth parasites in stock identification of flying squid, *Ommastrephes bartrami*, in North Pacific waters. *Can. J. Zool.*, 69: 1124-1126.

BROWN, E. L. and W. THRELFALL. — 1968. Helminth parasites of the Newfoundland short-finned squid, *Illex illecebrosus illecebrosus* (LeSeur) (Cephalopoda: Decapoda). *Can. J. Zool.* , 46: 1O59-1O7O.

EUZET,L. — 1959. Reserches sur les cestodes tétraphyllides des sêlaciens des côtes de France. Thèse Fac. Sci. Montpellier, grade de Docteur ès-sciences naturalles.

GAEVSKAYA, A. V. and Ch. M. NIGMATULLIN. — 1978. The helminth fauna of Atlantic squids of the family Ommastrephidae (Cephalopoda: Oegopsida). *Malac. Rev.* , 11: 134-135.

GONZÁLEZ, A. F., M. RASERO and Á. GUERRA. — 1992. *Illex coindetii* and *Todaropsis eblanae* (Cephalopoda, Ommastrephidae): their present status in Galician Fisheries. *International Council for the Exploration of the Sea. C. M.* 1992/K: 5.

GONZÁLEZ, A. F., A. LÓPEZ, Á. GUERRA and A. BARREIRO. — 1993. Cephalopods in the diet of marine mammals stranded in the coast of Galicia (NW Spain). *Fisheries Research* (in press).

HOCHBERG, F. G. — 199O. Diseases of Mollusca: Cephalopoda. Diseases caused by protistans and metazoans. In: Kinne,O. (ed.). *Diseases of marine animals*,vol III., Cephalopoda to Urochordata. Biologisches Anstalt Helgoland, Hamburg,pp. 47-227.

MARGOLIS, L, G. W. ESCH, J. C. HOLMES, A. M. KURIS and G. A. SCHAD. — 1982. The use of ecological terms in Parasitology. *J. Parasitol.* , 68(1): 131-133.

NIGMATULLIN, Ch. M. — 1989. Las especies de calamar más abundantes del Atlántico Sudoeste y sinópsis sobre la ecología del calamar (*Illex argentinus*). *Frente Marítimo*, Vol. 5. Sec. A: 71-81.

SMITH, J. W. and R. WOOTTEN. — 1978. *Anisakis* and Anisakiasis. *Adv. Parasitol*, 16: 93-163.

SOLEIM , O. — 1976. A comparison of *Thynnascaris adunca* populations in two different cod population. *Nor. J. Zool.* , 48: 195-198.

Scient. ed.: J. M. Gili