

COMMUNICATION

**Size and distribution of *Pandarus satyrus* (Copepoda: Pandaridae)  
on the blue shark *Prionace glauca* (Carcharhiniformes: Carcharhinidae)  
in Costa Rica**

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Received 13-III-2000. Corrected 14-VIII-2000. Accepted 19-IX-2000.

**Abstract:** A total of 80 specimens of *Pandarus satyrus*, a cosmopolitan ectoparasitic copepod, were taken from fishery catches of blue sharks (*Prionace glauca*) in the Eastern Pacific coast of Costa Rica. All specimens were found in the dorsal surface of pectoral fins (8-30 per shark). Longer specimens were most abundant.

**Key words:** *Pandarus satyrus*, Copepoda, ectoparasite, *Prionace glauca*, Eastern Pacific, Costa Rica.

The copepod fauna of the Costa Rican Pacific coast is poorly known (Morales-Ramírez 1996). Scattered reports include lists of marine copepods from the Gulf of Nicoya, Coronado Bay, Golfo Dulce, the Caribbean Coast and the Costa Rican dome thermic region (see Morales & Vargas 1995, Morales-Ramírez 1996 and Suárez & Gasca 1989). However no parasitic forms (occasionally found in the plankton collection) were reported and none of them cited the genus *Pandarus*. This genus comprises ectoparasites of the body surface and gill archs of sharks. Their adhesion pads, stout, and powerful maxillipeds seemingly are advantageous on such a surface (Benz 1986, 1992). Sharks infested by *Pandarus* are reported by Cressey (1967) and Benz (1981, 1986, 1992). The aim of this paper is to report the presence, body distribution and abundance of this parasite in the blue shark *Prionace glauca* (Linnaeus, 1758) in Costa Rica.

Ectoparasites were taken from blue sharks (*Prionace glauca*) between October 5 and 19, 1998 in the Eastern Pacific coast (6°5'24"N-87°48'42"W and 7°21'72"N- 87°43'83"W). Copepods were counted, washed with seawater and fixed in formaldehyde 10% and then transferred to 70% ethanol for preservation. Identification was performed following Cressey (1967). Copepods were measured to the nearest 0.01 mm. Voucher specimens were deposited in the Museum of Zoology of the University of Costa Rica under catalogue number UCR 2313-01.

We found copepod ectoparasites in four out of 13 blue sharks captured. The copepod species was *Pandarus satyrus* Dana, 1852, a cosmopolitan ectoparasite. Previous records include the Atlantic coast of United States (Wilson 1914), Japan (Shino 1957), the Gulf of Mexico (Bere 1936, Benz 1981, 1986), the North Western Atlantic, the Indian Ocean and the Eastern South Pacific (Cressey 1967).

A total of 80 specimens (between 6.00 y 8.81 mm total length) were counted. The arbitrary class intervals show that longer specimens were the most abundant (Table 1). This observation can be related with life history features, mainly with the fitness, reduction of predation rates (especially by Echenidae suckerfishes, escort of blue sharks), survival rates and recruitment (Benz 1981, Rohde 1993). The maximum and minimum number of copepods were 30 and 8, respectively. All specimens were gathered from the host's pectoral fins. Attachment was invariably on the dorsal surface of the pectoral fins, near the trailing edge closest to the body. Similar clusters have been observed in others species of the Pandaridae (i.e. *Dinemoura latifolia* (Steenstrup and Lutken, 1861), *Pandarus cranchii* Leach, 1819, *P. sinuatus* Say, 1817, *P. smithii* Rathbun, 1886 and *Phyllothereus cornutus* (Milne-Edwards, 1840)) (Benz 1981, 1986, 1992). Except for one male all specimens were adult ovigerous females; Cressey (1967) and Benz (1981, 1986, 1992), also reporting the presence of adult males among female clusters.

TABLE 1

*Length distribution of Pandarus satyrus*

Length interval (mm)	Number of specimens
6.00-6.50	2
6.51-7.00	0
7.01-7.50	14
7.51-8.00	21
8.01-8.50	29
8.51-9.00	14
<b>Total</b>	<b>80</b>

As reported by Benz (1986), we only observed infection of *P. satyrus* in *P. glauca* individuals despite that fact that other species were also caught along side with this shark species (*Alopias superciliosus*, *Carcharninus*

*falciformis*, *Sphyrna lewini*, *S. zygaena* and Rays), osteichthyes (*Coryphaena hippurus*, *Makaira mazara*, *Tretapterus audax*) and turtles (*Lepidochelys olivacea*). This finding is an interesting record to improve the knowledge of the crustacean fauna of Costa Rica.

## ACKNOWLEDGMENTS

The authors thank George Benz (Tennessee Aquarium and Southeast Aquatic Research Institute) for taxonomic help and ad hoc literature, Marco Acosta Nassar (Centro Náutico Pesquero del Instituto Nacional de Aprendizaje) for logistic support during the cruise, and Moises Mug for reviewing the manuscript and for his helpful suggestions and comments. This work was funded by the Instituto de los Recursos Costeros y Marinos de Costa Rica (INRE-COSMAR).

## RESUMEN

Un total de 80 especímenes de *Pandarus satyrus*, un copépodo ectoparásito cosmopolita, fueron tomados de tiburones azules (*Prionace glauca*) capturados en la costa del Pacífico Oriental de Costa Rica. Todos los especímenes fueron encontrados en la superficie dorsal de las aletas pectorales (entre 8 y 30 por tiburón). Los parásitos más grandes son los más abundantes.

## REFERENCES

- Benz, G. 1981. Observations on the attachment scheme of the parasitic copepod *Pandarus satyrus* (Copepoda: Pandaridae). *J. Parasitol.* 67: 966-967.
- Benz, G. 1986. Distributions of siphonostomatoid copepods parasitic upon large pelagic sharks in the Western North Atlantic. *Sylogae* 58: 211-219.
- Benz, G. 1992. How *Pandarus* species (Copepoda: Pandaridae) attach to their shark hosts. *J. Parasitol.* 78: 368-370.
- Bere, R. 1936. Parasitic copepods from Gulf of Mexico fish. *Amer. Midl. Nat.* 17: 577-625.
- Cressey, R. 1967. Revision of the family Pandaridae (Copepoda: Caligoida). *Proc. U. S. Nat. Mus.* 121: 1-129.

- Morales-Ramírez, A. 1996. Checklist of copepods from Gulf of Nicoya, Coronado Bay and Golfo Dulce, Pacific coast of Costa Rica, with comments on their distribution. *Rev. Biol. Trop.* 44: 103-113.
- Morales, A. & J. Vargas. 1995. Especies comunes de copépodos (Crustacea: Copepoda) pelágicos del Golfo de Nicoya. *Rev. Biol. Trop.* 43: 207-218.
- Rohde, K. 1993. *Ecology of Marine Parasites*. Second Edition. Pergamon, Oxford. 298 p.
- Suárez, E. & R. Gasca. 1989. Copépodos calanoides epipelágicos del Domo de Costa Rica (Junio-Agosto, 1982). *Ciencias Marinas* 15: 89-102.
- Shino, S. 1957. Copepods parasitic on Japanese fishes, 13: Parasitic copepods collected off Kesenuma, Miyagi Prefecture. *Rep. Fac. Fish. Pref. Unive. Mie.* 2: 359-375.
- Wilson, C. 1914. The male of *Pandarus satyrus* Dana. *Sci. Bull. Mus. Brooklyn Inst. Arts. And Sci.* 2: 71-72.