

Short Communication

First record of the association between *Lychnorhiza lucerna* (Scyphozoa, Rhizostomeae) and *Cyrtograpsus affinis* (Decapoda, Varunidae)

Agustín Schiariti^{1,2}, María Paz Sal Moyano¹, Diego A. Giberto^{1,2} & Hermes W. Mianzan^{1,2}

¹Instituto de Investigaciones Marinas y Costeras (IIMyC), FCEyN, CONICET
Universidad Nacional de Mar del Plata

Diagonal J.B. Alberdi 2695, 7600, Mar del Plata, Argentina

²Instituto Nacional de Investigación y Desarrollo Pesquero (INIDEP)
Paseo V. Ocampo N°1, Mar del Plata, Argentina

ABSTRACT. We report the association between the jellyfish *Lychnorhiza lucerna* and the crab *Cyrtograpsus affinis*. Numerous examples of associations between medusae and brachyurans have been observed in the field and noted in the literature. All of these cases involve medusae of the Class Scyphozoa and crabs belonging to the families Majidae and Portunidae. The presence of three individuals of *C. affinis* within the subgenital space of *L. lucerna* constitutes a striking finding since none species of this brachyuran family (Varunidae) has been previously reported associated to scyphomedusae.

Keywords: symbiosis, jellyfish, brachyurans, Río de la Plata, southwestern Atlantic, Argentina.

Primer registro de la asociación entre *Lychnorhiza lucerna* (Scyphozoa, Rhizostomeae) y *Cyrtograpsus affinis* (Decapoda, Varunidae)

RESUMEN. Se reporta la asociación entre la medusa *Lychnorhiza lucerna* y el cangrejo *Cyrtograpsus affinis*. Existen numerosos ejemplos de asociaciones entre medusas y brachiuros mencionados en la literatura. Todos ellos involucran a las medusas de la Clase Scyphozoa y a cangrejos pertenecientes a las familias Majidae y Portunidae. La presencia de tres individuos de *C. affinis* dentro de la cavidad subgenital de *L. lucerna* es un hecho llamativo dado que, hasta el momento, no se había reportado a ninguna especie de esta familia de brachiuros (Varunidae) asociada con medusas de la Clase Scyphozoa.

Palabras clave: simbiosis, medusas, braquiuros, Río de la Plata, Atlántico sudoccidental, Argentina.

Corresponding author: Agustín Schiariti (agustin@inidep.edu.ar)

Several medusae species have been intensively investigated in recent times within the context of their hypothetical biomass increases and the socioeconomic and environmental problems caused by their mass occurrences (see Purcell *et al.*, 2007; Uye, 2008). In particular, rhizostome medusae have acquired greater importance since species of this taxon are characterized by their frequent outbreaks, and some of them constitute important food resources for several countries (Arai, 1997; Kingsford *et al.*, 2000; Omori & Nakano, 2001). Therefore, there is a need of increasing knowledge about the ecological role they play in marine environments.

Medusae form symbiotic relationships with many species, including small fishes (see references in Arai, 1997), and a broad taxonomic spectrum of invertebrates including cnidarians, platyhelminthes, nematods, gastropods, cephalopods, echinoderms, pycnogonids and crustaceans (*e.g.* Arai, 1997; Towanda & Thuesen, 2006). These animals may profit from the mobile nature of their hosts, allowing otherwise benthic organisms to access to the benefits of a pelagic lifestyle. On the other hand, any potential advantage seems unlikely for the medusae (Corrington, 1972). Based on these hypothetical effects of one species on the other, these associations have been characterized

as commensalism or parasitism (see Towanda & Thuesen, 2006).

The jellyfish *Lychnorhiza lucerna* Haeckel, 1880 is the most frequent rhizostome medusa inhabiting the coastal waters from southeastern Brazil (22-23°S) to northern Argentina (36-38°S) (Mianzan & Cornelius, 1999), at a point its commercial exploitation is currently under consideration (Schiariti, 2008). *L. lucerna* adult medusae were observed as host of seven different species including fishes (*Chloroscombrus chrysurus* and *Hemicaranx amblyrhynchus*; Morandini, 2003), digenean parasites (*Opechona* sp.; Morandini *et al.*, 2005), shrimps (*Periclimenes pava*; Martinelli *et al.*, 2008), isopods (*Synidotea marplatensis*, Nogueira & Silva, 2005) and crabs (*Libinia ferreirae* and *L. spinosa*; Moreira, 1961; Vaz-Ferreira, 1972; Mianzan *et al.*, 1988; Zamponi, 2002; Nogueira & Haddad, 2005; Santos *et al.*, 2008). In the present work, we report for the first time the association between *L. lucerna* and *Cyrtograpsus affinis* Dana, 1851 constituting the first example of a varunid crab in association with medusae.

Lychnorhiza lucerna medusae (n = 306) were collected during March 2006 at the Río de la Plata Estuary (Argentina-Uruguay) (Fig. 1), during a fishery research cruise performed by the National Fishery Research Institute of Argentina (INIDEP) on board the R/V Capitán Cánepa. Hauls (n = 42) were carried out during daylight using a mini bottom trawl net (2.4 m² of net mouth, 25 mm mesh at wing, 10 mm mesh at codend). Medusae were measured across the bell diameter (BD, cm ± 0.1) and macroscopically examined for the presence of symbionts (exumbrella, oral arms, oral pillars, gastric cavity, subgenital space and gonads).

One of the medusae (BD = 22 cm), harbored three adult specimens of the crab *Cyrtograpsus affinis* and one of the spider crab *Libinia spinosa*. The *C. affinis* specimens were adult hard-shelled, including two ovigerous females (6.0 and 7.3 mm carapace width, CW) and a male (8.0 mm CW), while the *L. spinosa* was a hard-shelled adult male (4.5 cm CW). All individuals were found within the subgenital space of the medusa, each one occupying an individual subgenital pocket. No crabs were observed within the bottom trawl bycatch.

Cyrtograpsus affinis is a crab of relative small size and a common sublittoral species in the Río de la Plata Estuary (Boschi, 1964; Spivak & Cuesta, 2000; Giberto, 2008). *L. lucerna*, the largest planktonic species in the region, it is a rhizostome medusa with a mean diameter of 15-25 cm and up to 50 cm. Its occurrence is restricted to the warmer months (December-May) (Schiariti, 2008).

Having indirect development with a planktonic larval stage, the adult forms of *C. affinis* are confined entirely to the bottom (Spivak & Cuesta, 2000). Therefore, there are two alternatives to explain how the crab attains the medusa; either the medusa must descend to the substratum at least occasionally or else one of the larval stages of the crab must seek shelter within the medusa (Corrington, 1972).

Phillips *et al.* (1969), demonstrated that crabs enter in association with medusae when the jellyfish is near the bottom. Sal Moyano *et al.* (2012) observed that the moulting period from larval stages to adult crabs of the spider crab *L. spinosa* is longer even than the life span of medusae in the region. In addition, the presence of *L. spinosa* specimens bearing the anemone *Antholoba cf. achates* within *L. lucerna* suggest the crabs is capable of attaining the medusa after its larval stage has concluded (Schiariti *pers. obs.*). Based on these indirect evidences, it is reasonable to suppose the crabs have attained their host while the medusae have descended to the substratum near the bottom. In fact, the presence of medusae (*L. lucerna* and *Chrysaora lactea*) near the bottom has been observed in Río de la Plata Estuary by Álvarez-Colombo *et al.* (2003) and Cabreira *et al.* (2006), reinforcing this possibility.

Although in this study no crab larvae were found within *L. lucerna*, the presence of crab larval stages in association with scyphomedusae was reported several times (Corrington, 1972; Graham, 1994; Towanda & Thuesen, 2006), even for the same medusa species (Nogueira & Haddad, 2005). Furthermore, small juveniles and recently moulted individuals of *L. spinosa* have been found within *L. lucerna*. Therefore, the presence of the most vulnerable life stages (larvae, juveniles, and soft-shell individuals) in association with *L. lucerna* indicates this species may constitute one of the few available structures in the pelagic realm of the Río de la Plata Estuary giving protection against predation.

Numerous examples of associations between scyphomedusae and brachyurans have been observed in the field and noted in the literature. All of these cases involve medusae of the Class Scyphozoa and crabs belonging to the families Majidae and Portunidae (see references in Nogueira & Haddad, 2005; Towanda & Thuesen, 2006). Therefore, the presence of three specimens of *C. affinis* within *L. lucerna* constitutes the finding of a new brachyuran family (Varunidae) in association to medusae of the Class Scyphozoa. Nevertheless, the small number of animals requires further studies with distinguish symbionts from accidental occurrences.

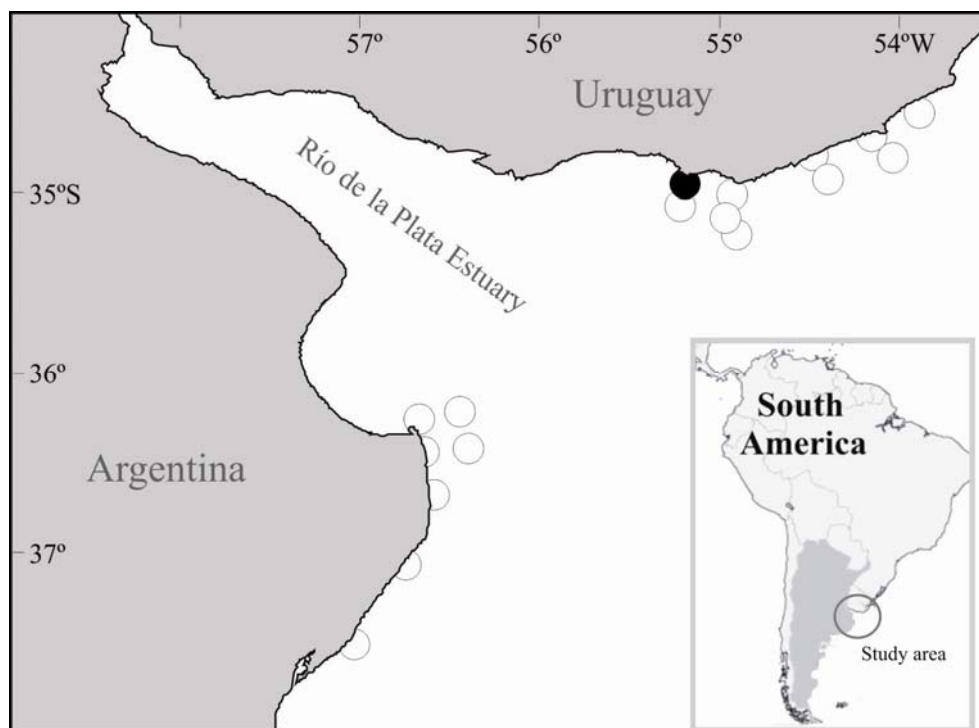


Figure 1. Map of the Río de la Plata Estuary showing the distribution of the sampling stations. White dots indicate the stations where *Lychnorhiza lucerna* were captured. Black dot shows the location of *Cyrtograpsus affinis* found in association with *L. lucerna*.

Figura 1. Mapa del estuario del Río de la Plata indicando la distribución de las estaciones de muestreo. Los puntos blancos representan las estaciones donde se capturó *Lychnorhiza lucerna*. El punto negro representa la estación donde fueron hallados los cangrejos *Cyrtograpsus affinis* dentro de *L. lucerna*.

ACKNOWLEDGEMENTS

We are grateful to Dr. María Andrea Gavio for her help and comments on the ms. This work was partially supported by FONCyT PICT-2007 N°02200. This is INIDEP contribution N°1738.

REFERENCES

- Álvarez-Colombo, G., H.W. Mianzan & A. Madirolas. 2003. Acoustic characterization of gelatinous-plankton aggregations: four case studies from the Argentinean continental shelf. *ICES J. Mar. Sci.*, 60: 650-657.
- Arai, M.N. 1997. A functional biology of Scyphozoa. Chapman & Hall, London, 316 pp.
- Boschi, E.E. 1964. Los crustáceos decápodos Brachyura del litoral bonaerense. *Bol. Inst. Biol. Mar.*, 6: 1-76.
- Cabreira, A.G., A. Madirolas, G. Álvarez-Colombo, E.M. Acha & H.W. Mianzan. 2006. Acoustic study of the Río de la Plata estuarine front. *ICES J. Mar. Sci.*, 63: 1718-1725.
- Corrington, J.D. 1972. Commensal association of a spider crab and a medusa. *Biol. Bull.*, 53: 346-350.
- Giberto, D.A. 2008. Estructura de la comunidad bentónica y nichos tróficos de Sciaenidae (Pisces: Osteichthyes) en el estuario del Río de la Plata. Tesis de Doctorado, Universidad Nacional del Comahue, Río Negro, 174 pp.
- Graham, W.M. 1994. The physical oceanography and ecology of upwelling shadows. Ph.D. Thesis, University of California, Santa Cruz, 205 pp.
- Kingsford, M.J., K.A. Pitt & B.M. Gillanders. 2000. Management of jellyfish fisheries, with special reference to the order Rhizostomeae. *Oceanogr. Mar. Biol. Ann. Rev.*, 38: 85-156.
- Martinelli, F.J.E., S.N. Stampar, A.C. Morandini & E.C. Mossolin. 2008. Cleaner shrimp (Caridea: Palaemonidae) associated with scyphozoan jellyfish. *Vie et Milieu*, 58: 133-140.
- Mianzan, H.W., G. Olague & R. Montero. 1988. Scyphomedusae de las aguas uruguayas. *Spheniscus*, 6: 1-9.

- Mianzan, H.W. & P.F.S. Cornelius. 1999. Cubomedusae and Scyphomedusae. In: D. Boltovskoy (ed.). South Atlantic zooplankton. Backhuys Publishers, Leiden, pp. 513-555.
- Morandini, A.C. 2003. Estrutura populacional de *Chrysaora lactea* e *Lychnorhiza lucerna* (Cnidaria; Scyphozoa) em amostras de plâncton, com a redescoberta das espécies. Ph.D. Thesis, Universidade de São Paulo, São Paulo, 115 pp.
- Morandini, A.C., S.R. Martorelli, A.C. Marques & F.L. da Silveira. 2005. Digenean metacaria (Trematoda, Digenea, Lepocreadiidae) parasitizing "coelenterates" (Cnidaria, Scyphozoa and Ctenophora) from Southeastern Brazil. *Braz. J. Oceanogr.*, 53: 39-45.
- Moreira, M.G.B.S. 1961. Sobre *Mastigias scintillae* sp. nov. (Scyphomedusae, Rhizostomeae) das costas do Brasil. *Bolm. Inst. Oceanogr.*, São Paulo., 11: 5-30.
- Nogueira Jr., M. & M.A. Haddad. 2005. *Lychnorhiza lucerna* Haeckel (Scyphozoa, Rhizostomeae) and *Libinia ferreirae* Brito Capello (Decapoda, Majidae) association in southern Brazil. *Rev. Bras. Zool.*, 22: 908-912.
- Nogueira Jr., M. & J.L. Silva. 2005. Associações entre medusas (Cnidaria) e isópodos (Crustacea) nos litorais do Paraná e Santa Catarina, Brasil. *Acta Biol. Par.*, 34: 127-138.
- Omori, M. & E. Nakano. 2001. Jellyfish fisheries in southeast Asia. *Hydrobiologia*, 451: 19-26.
- Phillips, P.J., W.D. Burke & E.J. Keener. 1969. Observations on the trophic significance of jellyfishes in Mississippi Sound with quantitative data on the associative behaviour of small fishes with medusae. *Trans. Am. Fish. Soc.*, 98: 703-712.
- Purcell, J.E., S.I. Uye & W.T. Lo. 2007. Anthropogenic causes of jellyfish blooms and their direct consequences for humans: a review. *Mar. Ecol. Progr. Ser.*, 350: 153-174.
- Sal Moyano, M.P., Schiariti, A., Giberto, D.A., Diaz Briz, L., Gavio, M.A. & Mianzan, H.W. 2012. The symbiotic relationship between *Lychnorhiza lucerna* (Scyphozoa, Rhizostomeae) and *Libinia spinosa* (Decapoda, Epialtidae) in the Río de la Plata (Argentina-Uruguay). *Marine Biology*, 159: 1933-1941.
- Santos, L.A., S.J.C. Feres & A.T.L. Lopes. 2008. Primeiro registro da associação entre o caranguejo *Libinia ferreirae* (Crustacea; Decapoda; Majidae) e a medusa *Lychnorhiza lucerna* (Cnidaria; Scyphozoa; Rhizostomeae) para o Golfo Maranhense. *Bol. Lab. Hidrobiol.*, 21: 99-102.
- Schiariti, A. 2008. Historia de vida y dinámica de poblaciones de *Lychnorhiza lucerna* (Scyphozoa) ¿Un recurso pesquero alternativo? Ph.D. Thesis, Universidad de Buenos Aires, Buenos Aires, 209 pp.
- Spivak, E.D & J.A. Cuesta. 2000. Larval development of *Cyrtograpsus affinis* (Dana) (Decapoda, Brachyura, Varunidae) from the Río de la Plata estuary, reared in laboratory. *Sci. Mar.*, 64(1): 29-47.
- Towanda, T. & E.V. Thuesen. 2006. Ectosymbiotic behavior of *Cancer gracilis* and its trophic relationships with its host *Phacellophora camtschatica* and the parasitoid *Hyperia medusarum*. *Mar. Ecol. Progr. Ser.*, 315: 221-236.
- Uye, S.I. 2008. Blooms of the giant jellyfish *Nemopilema nomurai*: a threat to the fisheries sustainability of the East Asian Marginal Seas. *Plankton Benthos Res.*, 3: 125-131.
- Vaz-Ferreira, C. 1972. Relaciones de conveniencia entre *Libinia spinosa* Milne Edwards (Decapoda, Brachyura) y Discomedusae. *Bol. Soc. Zool.*, 2: 64-66.
- Zamponi, M.O. 2002. The association between the medusa *Lychnorhiza lucerna* (Scyphomedusae, Rhizostomeae) and the decapod *Libinia spinosa* (Brachyura, Majidae) recorded for the first time in neritic waters of Argentina. *Russ. J. Mar. Biol.*, 28: 267-269.

Received: 4 January 2012; Accepted: 12 October 2012