



Latin American Journal of Aquatic Research

E-ISSN: 0718-560X

lajar@ucv.cl

Pontificia Universidad Católica de Valparaíso
Chile

Granados-Amores, Jasmín; Hochberg, Frederick G.; Salinas-Zavala, César A.
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Latin American Journal of Aquatic Research, vol. 41, núm. 3, julio, 2013, pp. 595-599

Pontificia Universidad Católica de Valparaíso
Valparaiso, Chile

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Short Communication

**New records of *Lolliguncula (Lolliguncula) argus* Brakoniecki & Roper, 1985
(Myopsida: Loliginidae) in northwestern Mexico**

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ABSTRACT. Seven specimens of *Lolliguncula (Lolliguncula) argus*, were collected in the shrimp fisheries of the Gulf of California and five specimens from the western coast of Baja California Peninsula, deposited in the Santa Barbara Museum of Natural History (USA), are examined and reported. These records expand species geographic distribution range for approximately 950 km and report the maximum size of mantle length 38.8 mm for males and 60.8 mm for females. Morphometric data of the 12 collected specimens are presented, and species funnel organ and statoliths are described.

Keywords: Loliginidae, squid, statoliths, funnel organ, Gulf of California, Mexico.

**Nuevos registros de *Lolliguncula (Lolliguncula) argus* Brakoniecki &
Roper, 1985 (Myopsida: Loliginidae) en el noroeste de México**

RESUMEN. Se reportan y examinan siete ejemplares de *Lolliguncula (Lolliguncula) argus*, recolectados en la pesquería de camarón del golfo de California y cinco ejemplares depositados en el Museo de Historia Natural de Santa Bárbara (USA), provenientes de la costa occidental de la península de Baja California Sur. Estos registros amplían la distribución geográfica de la especie aproximadamente 950 km y la máxima longitud de manto de 38.8 mm en machos y 60.8 mm en hembras. Se presentan datos morfométricos de los 12 ejemplares colectados y se describe el órgano del sifón y los estatolitos de la especie.

Palabras clave: Loliginidae, calamar, estatolitos, órgano del sifón, golfo de California, México.

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Squids from the family Loliginidae (Suborder: Myopsida) are represented by 47 species grouped in ten genera and nine subgenera (Jereb *et al.*, 2010). They are widely distributed in neritic zones of tropical, subtropical, and temperate seas around the world, excepting Polar Regions (Young, 1972; Okutani, 1980; (Roper *et al.*, 1984; Hanlon *et al.*, 1992). In Mexico, loliginids are commonly fished artisanally, and also caught as by-catch in trawl fisheries for shrimp (*e.g.*, *Litopenaeus stylirostris*, *L. vannamei*, *Farfantepenaeus californiensis*, and *F. brevirostris*), off the Pacific coast of Mexico and in the Gulf of California Roper *et al.*, 1984, 1995; Cardozo & Valdivieso, 1988; Barrientos & Garcia-Cubas, 1997; Alejo-Plata *et al.*, 2001, 2002).

Five species have been reported off the Pacific coast of Mexico and in the Gulf of California: *Lolli-*

guncula (Lolliguncula) panamensis Berry, 1911, *Lolliguncula (Lolliguncula) argus* Brakoniecki & Roper, 1985, *Lolliguncula (Loliolopsis) diomedae* (Hoyle, 1904), *Doryteuthis (Amerigo) opalescens* Berry, 1911, and *Pickfordiateuthis vossi* Brakoniecki, 1996. *Lolliguncula (L.) argus* is endemic to the Eastern Tropical Pacific Ocean with known distribution from southeast Gulf of California, Mexico to Peru (Jereb *et al.*, 2010). Little is known about its biology. It is a small species in which mantle lengths of males do not exceed 30 mm and females 39 mm (Roper *et al.*, 1995; Jereb *et al.*, 2010). The species is characterized by: its small size at maturity (mantle lengths of males 20.8 to 29.6 mm and females 20.6 to 38.8 mm); the lack of buccal suckers; and it is the only myopsid squid in which the right ventral arm is hectocotylized instead of the left (Figs. 2a, 2b and 2d) (Brakoniecki & Roper, 1985).

In this study, new records of *L. (L.) argus* are reported from Mexico, in the Gulf of California and off the west coast of the Baja California peninsula, captured as by-catch in shrimp fisheries. New records of maximum size of mantle length are presented, as well as morphometric data of the collected specimens. In addition the species funnel organ and statolith are described.

Specimens collected as by-catch in shrimp fisheries off the coast of Mexico in the northern Gulf of California and off the Pacific coast of the Baja California Peninsula were analyzed. Five specimens in the cephalopod collection located in the Santa Barbara Museum of Natural History (SBMNH), California, USA, also were analyzed.

Specimens were identified according to Brakoniecki & Roper (1985), Roper *et al.* (1995), and Jereb *et al.* (2010). Sixteen measurements were taken from each individual using a digital calliper to the nearest 0.01 mm. All measurements are defined by Roper & Voss (1983). Measurements included: dorsal mantle length (ML); mantle width (MW); right fin length (RFL); fin width (FW); head length (HL); head width (HW); eye diameter (ED); arm I length (AIL); arm II length (AIIL); arm III length (AIILL); arm IV length (AIVL); hectocotylus (H); tentacle length (TL); tentacular club length (TCL); funnel width (FuW); and funnel length (FL).

Both the funnel organ and statolith of this species are described based in McGowan & Okutani (1968), Clarke (1978), and Lipinski *et al.* (1991).

The differences in the funnel organ are easily distinguishable in organisms preserved in formaldehyde; in fresh organisms and organisms preserved in alcohol differences are not that noticeable to the naked eye. In these cases, the use of methylene blue as an aid to bring out the structures is recommended. Statoliths of each specimen were cleaned from tissue excess with a soapy solution, posteriorly, they were saved in endendorff tubes with etanol 70%.

Voucher specimens of identified organisms were selected and deposited in the collection of the Laboratorio de Cefalópodos at the Centro de Investigaciones Biológicas del Noroeste (CEFACIB), located at La Paz, Baja California Sur (BCS), Mexico.

Museum material examined

1 male 39 mm, 1 female 61 mm and 3 juveniles 13-23 mm ML; Mexico, Baja California Sur, off Cape San Lucas, surface coll. Orca Expedition, night light station, dip net, 17 March 1953; SBMNH 60043.

Twelve specimens of *L. (L.) argus* were identified from localities that greatly expanded the species known distribution range. The northern most record extends the range approximately 950 km towards northwestern Mexican Pacific. Of the specimens examined seven individuals were collected as by-catch in shrimp trawls from the northern Gulf of California and western coast of Baja California Peninsula (Fig. 1). The remaining five specimens analyzed came from the cephalopod collection of the Santa Barbara Museum of Natural History (SBMNH), California,

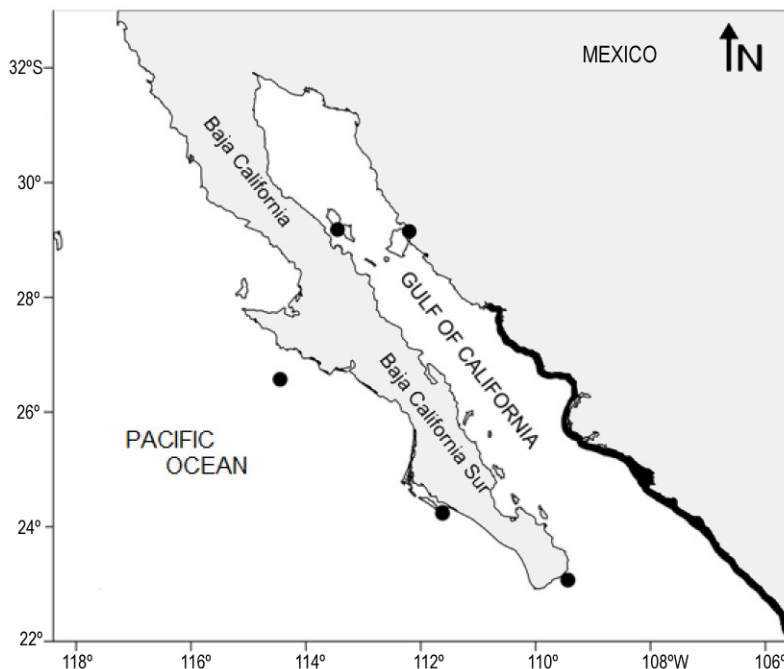


Figure 1. Study area. Known geographical range (coastal shadow band) of Argus brief squid, *Lolliguncula (Lolliguncula) argus*, Gulf of California; newly observed species distribution (●) off west coast of Baja California Sur and in the Gulf of California.

Table 1. Record designation, data, locations, Sex, and dimensions (in millimeters) of specimens of *Lolliguncula (Lolliguncula) argus*, ML= Mantle length, MW= mantle width, RFL= right fin length, FW= fin width, HL= head length, HW= head width, ED = eye diameter, AIL= arm I length, AII= arm II length, AIII= arm III length, AIV= arm IV length, H= hectocotylus, TL= tentacle length, TCL= tentacular club length, FL= funnel length, FuW= funnel width, F= Female, M= Male. Los Cabos Baja California Sur, Mexico (geographical coordinates are not available).

Record designation	CEFA-CIB-4	CEFA-CIB-5	CEFA-CIB-6	CEFA-CIB-7	CEFA-CIB-8	CEFA-CIB-9	CEFA-CIB-10	SBMNH-60043	SBMNH-60043	SBMNH-60043	SBMNH-60043	SBMNH-60043
Data	06-06-11	07-06-11	08-06-11	09-06-11	12-12-04	12-12-04	28-03-06	17-03-53	17-03-53	17-03-53	17-03-53	17-03-53
Latitude (N)	24.236	24.236	24.236	24.236	29.18	29.15	26.57	Los Cabos	Los Cabos	Los Cabos	Los Cabos	Los Cabos
Longitude (W)	111.62	111.62	111.62	111.62	113.45	112.2	114.45	Los Cabos	Los Cabos	Los Cabos	Los Cabos	Los Cabos
Sex	M	F	F	M	M	F	M	M	F	F	F	F
ML	36.3	42.0	41.1	38.5	32.7	23.8	30.9	38.8	60.8	13.2	14.2	22.7
MW	10.8	11.0	10.3	9.5	9.3	6.9	7.4	8.2	13.2	5.1	5.0	5.6
RFL	13.4	13.7	13.9	12.2	10.1	6.0	9.7	12.1	20.5	3.7	4.0	6.3
FW	17.2	19.9	20.6	15.6	14.2	7.8	13.2	17.0	26.1	6.9	6.2	9.0
HL	9.6	10.0	9.1	8.9	7.3	5.7	6.3	5.9	9.5	2.8	2.9	4.0
HW	9.1	10.8	9.4	9.2	9.8	7.7	7.9	4.6	7.2	1.9	2.2	3.0
ED	5.6	7.1	6.1	6.1	5.5	4.1	5.4	5.4	6.8	2.2	2.0	2.9
IAL	9.7	12.1	9.0	8.2	7.7	4.2	6.8	9.3	10.4	2.5	2.4	3.7
IIAL	12.9	14.7	13.4	11.2	10.1	5.6	9.5	12.7	17.4	4.4	3.0	5.4
IIIAL	15.9	17.0	16.9	14.1	12.6	7.9	10.5	11.2	19.6	4.4	3.8	6.7
IVAL	14.1	14.6	16.4	13.4	11.6	7.0	12.1	14.0	20.7	3.8	3.3	6.5
H	19.9	14.7	15.9	15.4	12.0	7.0	17.6	18.9	20.3	3.8	3.3	6.4
TL	19.0	28.4	33.7	23.1	23.5	12.9	9.7	12.1	21.2	4.6	4.4	6.2
TCL	5.8	6.9	9.2	6.6	6.4	4.4	4.4	5.8	13.0	2.9	1.4	3.2
FL	7.5	9.8	8.0	8.0	6.5	3.9	6.3	4.6	7.7	3.2	3.2	3.6
FuW	4.5	5.1	4.9	5.2	4.5	3.0	3.8	10.0	13.2	4.7	4.1	6.1

USA. Of the specimens examined, five are males and seven are females respectively, with sizes ranging from 13.2 to 60.8 mm ML. The animals were collected in front of San Ignacio Bay, off Cape San Lucas, BCS, and in the great islands region of the Gulf of California, Mexico (Table 1). *Lolliguncula (L.) argus* is a small species. The previously reported size for mature animals was 30 mm for males and 39 mm for females (Roper *et al.*, 1995). As a result of our research, new records of maximum MLs are 38.8 mm for males and 60.8 mm for females.

Lack of previous records of *L. (L.) argus* in the northeastern Pacific Ocean off the coast of Mexico can be an answer for the existing similarity within species from family Lolliginidae with distribution in Tropical Eastern Pacific. *Lolliguncula (L.) argus*, is a rare species characterized by the following features: a short, cylindrical, and bluntly pointed posterior mantle; small fins, nearly elliptical in outline (Figs. 2a-2b), head width about $\frac{1}{4}$ to $\frac{1}{3}$ of mantle length, slightly narrower in mature females than in mature males; mantle-funnel locking apparatus simple, straight, ridge-and-groove type; buccal membrane 7-lobed with support attached dorsally on arms I and II and ventrally on arms III and IV; buccal lobes reduced in size; buccal suckers absent; distinct manus and dactylus present but carpus absent (Fig. 2c) (Brakoniecki & Roper, 1985).

Males of *L. (L.) argus* differ from other species in the genus in that the left ventral arm is hectocotyized (Fig. 2d). The hectocotylus, is a valuable taxonomic character that can be used to separate species (Brakoniecki, 1986). However, in females there are no analogous external organs that have taxonomic value. Both funnel and statolith shapes are highly effective in species discrimination of loliginids (Amores-Granados *et al.*, unpublished data). The statolith is characterized by a smooth, rounded dorsal and lateral dome on its posterior region. In addition the lateral and dorsal domes are separated. The rostrum is short, wide, and ends in a rounded shape on its ventral end. Crests are not present in the ventral and dorsal clefts in the wing; nevertheless, the ventral cleft presents a marked excavation. The spur, is wide and its ventral part rounded (Fig. 2e). In the funnel organ, the dorso-lateral patches are elongate and wider on the superior part. Ventral patches are elongate and narrow, the superior part is sharply pointed, and the inferior ends are round. A fold is present on the internal part that covers 40% of the organs size. The funnel valve is narrow with a pair of folds on its lateral parts that end on the patches level (Fig. 2f).

The observed range of distribution constitutes a northward expansion of this species by more than 950

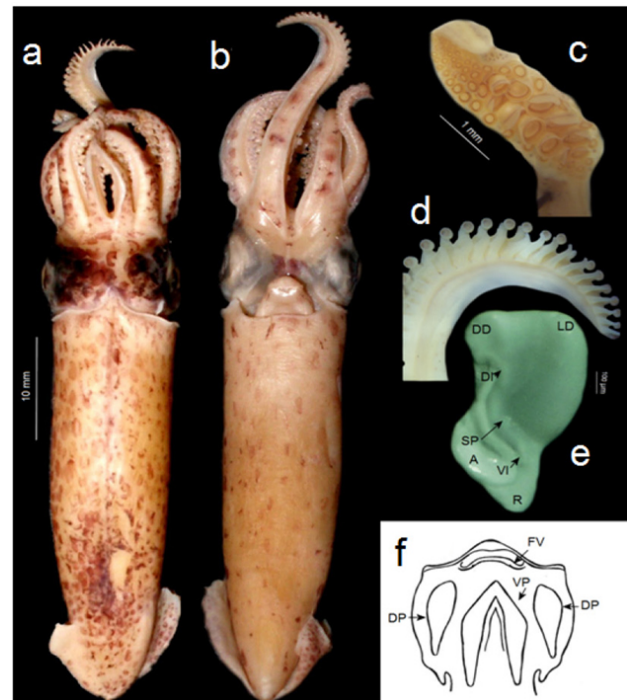


Figure 2. *Lolliguncula (L.) argus* (Male 30.9 mm ML CEFACIB-10). a) Dorsal view, b) ventral view, c) tentacular club, d) hectocotylus, e) left statolith anterior view (DD: dorsal dome, LD: lateral dome, A: wing, R: rostrum, DI: dorsal indentation, SP: spur, VI: ventral indentation), f) funnel organ: DP: dorsal pad, VP: ventral pad, and FV: valve funnel.

km. Analyzed specimens included both adult (male and female) and juvenile stages. This may indicate an established species population in the area off the west coast of BCS and in the Gulf of California. Nonetheless, further studies are required.

ACKNOWLEDGEMENTS

We gratefully thank to the captain and crew of RV 'BIP XII' for their support during all cruises. Staff at the Santa Barbara Museum of Natural History (SBMNH) provided access to the specimens, research work space, and resources during collections visits. This work was supported by the Consejo Nacional de Ciencia y Tecnología (CONACyT), and PADI aware project.

REFERENCES

- Alejo-Plata, M.C. 2002. Sistemática de los calamares de importancia comercial del golfo de California y Pacífico Central Oriental. Tesis de Maestría, Universidad Nacional Autónoma de México, México, 146 pp.

- Alejo-Plata, M.C., G. Cardenas-Ladron de Guevara & J.E. Herrera-Galindo. 2001. Cefalópodos loliginidos en la fauna y acompañamiento del camarón. *Ciencia y Mar*, 14: 41-46.
- Barrientos, G. & A. Garcia-Cubas. 1997. Distribución y abundancia de la familia Loliginidae (Mollusca: Cephalopoda) en aguas mexicanas del golfo de México. *Rev. Soc. Mex. Hist. Nat.*, 47: 123-139.
- Berry, S.S. 1911. A note on the genus *Lolliguncula*. *Proc. Acad. Nat. Sci. Phil.*, 63(1): 100-105.
- Brakoniecki, T.F. 1986. A generic revision of the family Loliginidae (Cephalopoda; Myopsida) based primarily on the comparative morphology of the hectocotylus. Ph.D. Dissertation, University of Miami, Miami, 163 pp.
- Brakoniecki, T.F. 1996. A revision of the genus *Pickfordiateuthis* Voss, 1953 (Cephalopoda: Myopsida). *Bull. Mar. Sci.*, 58: 9-28.
- Brakoniecki, T.F. & C.F.E. Roper. 1985. *Lolliguncula argus*, a new species of loliginid squid from the Tropical Eastern Pacific. *Proc. Biol. Soc. Wash.*, 98: 47-53.
- Cardozo, F. & V. Valdivieso. 1988. *Lolliguncula tydeus* Brakoniecki, 1980 (Mollusca: Cephalopoda) registrado en Perú. *Bol. Inst. Mar Peru. Vol. Extraordinario*, 303-306.
- Clarke, M. 1978. The cephalopod statolithan-introduction to its form. *J. Mar. Biol. Assoc. U.K.*, 58: 701-712.
- Hanlon, R.T., S.V. Boletzky, T. Okutani, G. Perez-Gandaras, P. Sanchez, C. Sousa-Reis & M. Vecchione. 1992. Myopsida. In: M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.V. Boletzky (eds.). "Larval" and juveniles cephalopods: a manual for their identification. *Smithson. Contrib. Zool.*, 513: 37-53.
- Hoyle, W.E. 1904. Reports on the Cephalopoda. *Bull. Mus. Comp. Zool. Harv.*, 43(1): 1-72.
- Jereb, P., M. Vecchione & C.F.E. Roper. 2010. Family Loliginidae. In: P. Jereb & C.F.E. Roper (eds.). *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Myopsid and Oegopsid squids. FAO Species Catalog for Fishery Purposes*, Rome, 4(2): 38-117.
- Lipinski, M., E. Dawe & Y. Natsukari. 1991. Introduction to practical procedures of squid statoliths. A laboratory manual. In: P. Jereb, S. Ragonese & S. Von Bolerzky (eds.). *Squid age determination using statoliths. Italy Mazara del Vallo, NTRITPP*, pp. 77-82.
- McGowan, J.A. & T. Okutani. 1968. A new species of enoploteuthid squid, *Abraliopsis (Watasenia) felis*, from the California Current. *Veliger*, 11(1): 72-79.
- Okutani, T. 1980. Calamares de las aguas mexicanas. Breve descripción de los calamares existentes en aguas mexicanas. *Pesca, México*, 64 pp.
- Roper, C.F.E. & G.L. Voss. 1983. Guidelines for taxonomic descriptions of cephalopod species. *Mem. Nat. Mus. Victoria*, 44: 49-63.
- Roper, C.F.E., M.J. Sweeney & F.G. Hochberg. 1995. Cephalopods. In: W. Fisher, F. Krupp, W. Schneider, C. Sommer, K.E. Carpenter & V.H. Niem (eds.). *Guía FAO para la identificación de especies para los fines de la pesca. Pacífico centro-oriental. Plantas e invertebrados. FAO, Roma*, 1: 305-355.
- Young, R.E. 1972. The systematics and areal distribution of pelagic cephalopods from the seas off southern California. *Smithson. Contrib. Zool.*, 97: 1-159.

Received: 28 August 2012; Accepted: 8 May 2013