

Additional distribution and ecology records of the deep-water isopod *Rocinela murilloi* Brusca & Iverson, 1985 (Isopoda, Aegidae) in western Mexico

Michel E. Hendrickx  orcid.org/0000-0001-9187-6080

Laboratorio de Invertebrados Bentónicos, Unidad Académica Mazatlán, Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México.
P.O. Box 811. Mazatlán, 82000, Sinaloa, Mexico.

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ABSTRACT

A series of specimens of the fish external parasite *Rocinella murilloi* Brusca and Iverson, 1985, is reported from 12 localities off western Mexico. These records are the first for southwestern Mexico (four) and add six new localities off the west coast of the Baja California Peninsula where the species was known from a single record. The specimens were recovered from bottom-operated nets, between 700 and 1235 m, slightly shallower than previous records. Environmental conditions confirm the presence of *R. murilloi* below the core of the Oxygen Minimum Zone, and this species appears to be highly tolerant to moderate to severe hypoxic conditions. General distribution of the species in the eastern Pacific is presented.

KEY WORDS

Isopods, deep sea, eastern Pacific, environmental parameters

INTRODUCTION

Species of the genus *Rocinela* Leach, 1818, in the eastern tropical Pacific were reviewed by Brusca and France (1992). The deep-water isopod *Rocinela murilloi* Brusca and Iverson, 1985, was originally described from material collected by the “Velero IV” off Punta Guiones on the coast of Costa Rica at 1,866 m depth. Later records by Brusca and France (1992) indicated that this is a widely distributed species, occurring in Californian waters, particularly from the San Diego area, off the Baja California west coast (one locality at Punta Descanso), Mexico, off Peru (near Lobos de Tierra and Lobos de Afuera Islands), and off Arica, Chile. Until 2008 the only locality reported for the Gulf of California was at 21°19'N 106°24'W, at 1201 m depth, but a series of specimens was reported in six new localities in the southern Gulf (Hendrickx, 2008). Despite its wide distribution, *R. murilloi* has been scarcely reported from the eastern Pacific except from off California (Brusca and

CORRESPONDING AUTHOR

Michel E. Hendrickx
michel@ola.icmyl.unam.mx

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France, 1992), and there are large latitudinal intervals with single or no records, e.g., the SW coast of Mexico, south of the Gulf of California, off Central America except Costa Rica, and off Pacific Colombia and Ecuador.

During exploratory cruises off the west coast of the Baja California Peninsula and off SW Mexico, more material of *R. murilloi* was collected in 12 localities, thus extending our knowledge on the distribution and occurrence of this large species of Aegidae off western Mexico. Additional information on its ecology was also obtained. Two additional records from the Gulf of California are also included in this report.

MATERIAL AND METHODS

The specimens on which this study is based were collected during the TALUD VIII (April 2005), X (February 2007; Gulf of California), XII (April 2008; SW Mexico), XV (July–August 2012), and XVI-B (May 2014) (both off Baja California west coast) cruises aboard the R/V “El Puma” of the Universidad Nacional Autónoma de México (UNAM). Material was collected in depths of 700–1235 m with a benthic sledge operating in a global depth interval of 300–2300 m. Environmental data near the bottom (epibenthic) were obtained with a Seabird CTD (water temperature) and by direct titration of oxygen concentration in water samples collected with General Oceanic Niskin bottles. Sediments were collected with a multicore meiofauna sampler. Organic matter was determined by the ignition method. Depth was measured with ship echosounders (see Papiol *et al.*, 2016 for further details). The material has been deposited in the Regional Invertebrate Collection (ICML-EMU), UNAM, in Mazatlán, Mexico. Abbreviations: St., station; spec., specimen(s); TL, total length (± 0.1 mm). SEM (Scanner Electron Microscope) photographs of appendages were obtained during this study.

SYSTEMATICS

Aegidae White, 1850

***Rocinela* Leach, 1818**

***Rocinella murilloi* Brusca and Iverson, 1985**
(Figs. 1–4)

Rocinella murilloi Brusca and Iverson, 1985: 44, fig. 14 a–j.— Brusca and France, 1992: 258, figs. 1A–B, 2, 4A, 5H, 15–17. — Espinosa-Pérez and Hendrickx, 2001, 47 (list). — Hendrickx, 2008: 1260.

Material examined. TALUD VIII, St. 20 (25°56'56"N 110°43'W), Apr 19, 2005, 1 spec. (TL 14.1 mm), BS, 700–750 m (ICML-EMU-9971).

TALUD X, St. 9 (27°52'51"N 112°15'53"W), Feb 10, 2007, 1 spec. (TL 18.5 mm), BS, 1205–1215 m (ICML-EMU-9969).

TALUD XII, St. 13 (17°45'16"N 102°0'29"W), Mar 30, 2008, 1 spec. (TL 34.5 mm), BS, 1198 m (ICML-EMU-10630-A); St. 23 (18°33'43"N 103°57'45"W), Apr 1, 2008, 50 spec. (TL 25.4–34.4 mm), BS, 1058–1088 m (ICML-EMU-9973); St. 27 (18°40'28"N



Figure 1. *Rocinella murilloi* Brusca and Iverson, 1985, female, 33.6 mm (ICML-EMU-9973), dorsal view.

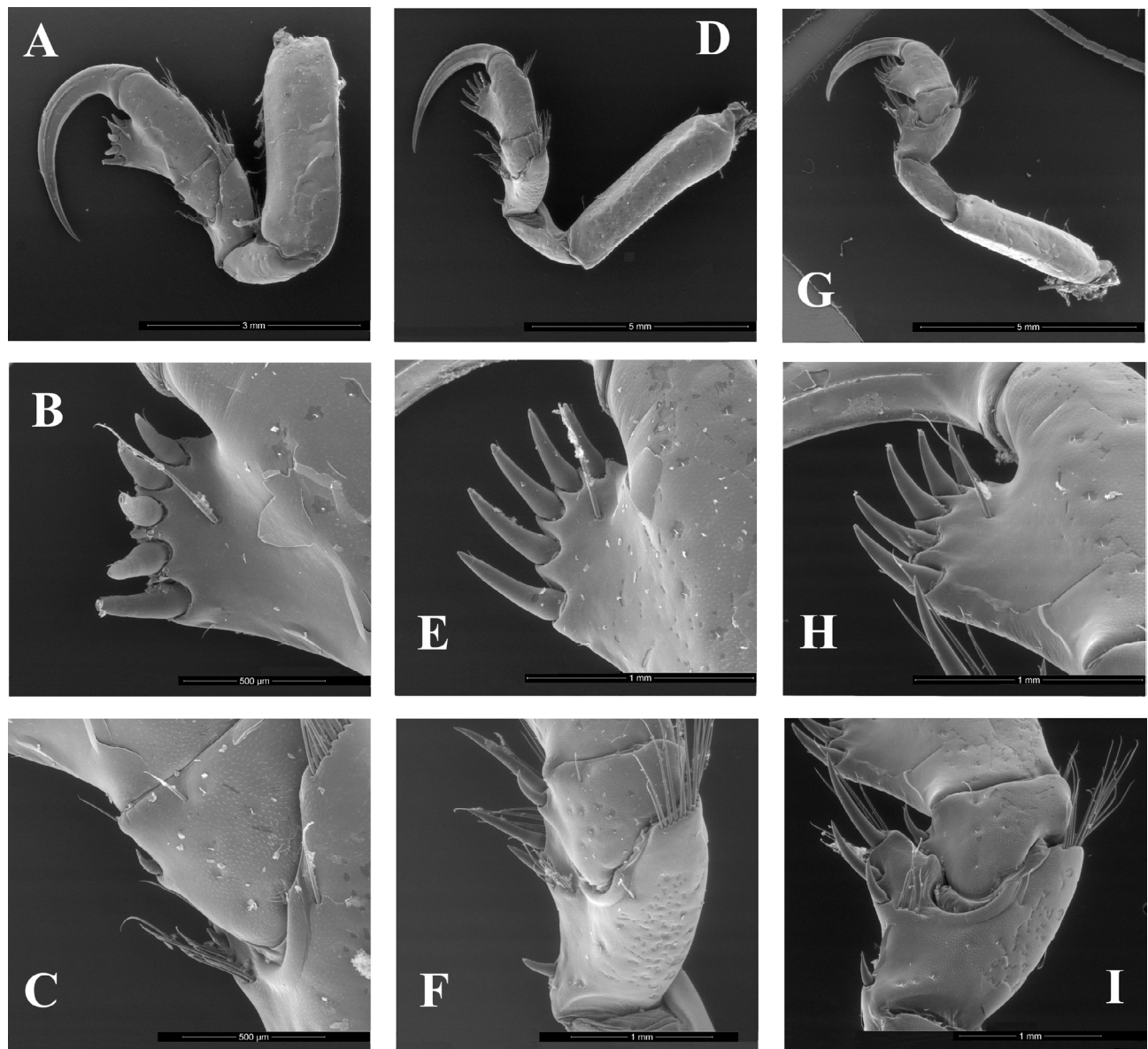


Figure 2. *Rocinela murilloi* Brusca and Iverson, 1985, female, 33.4 mm (ICML-EMU-9973), SEM photographs of pereopods. A, pereopod I; B, same, detail of propodus; C, same, detail of carpus and distal part of merus; D, pereopod II; E, same, detail of propodus; F, same, detail of carpus and merus; G, pereopod III; H, same, detail of propodus; I, same, detail of carpus and merus.

104°35'51"W), Apr 2, 2008, 4 spec. (TL 16.2–34.8 mm), BS, 1040–1095 m (ICML-EMU-9972); St. 28 (18°50'19"N 104°34'14"W), Apr 2, 2008, 1 spec. (TL 33.7 mm), BS, 1101–1106 m (ICML-EMU-9970).

TALUD XV. St. 1 (23°18' 40"N 111°19' 37"W), Aug 4, 2012, 4 spec. (TL 11.9–14.1 mm), BS, 750–850 m (ICML-EMU-10630-B); St. 5C (23°16'42"N 110°54'55"W), Aug 5, 2012, 4 spec. (TL 25.8–34.7 mm), BS, 980–1036 m (ICML-EMU-10632-A); St. 5E (23°05'22"N 110°27'54"W), Aug 5, 2012, 1 spec. (TL 34.8 mm), BS, 948–954 m (ICML-EMU-10630-C); St. 8 (24°54'48"N 112°38'06"W), Jul 30,

2012, 1 spec. (TL 33.3 mm), BS, 1212–1235 m (ICML-EMU-10631-B); St. 24 (27°5'42"N 114°35'30"W), Aug 1, 2012, 1 spec. (TL 32.1 mm), BS, 772–786 m (ICML-EMU-10631-A).

TALUD XVI-B, St. 5 (28°48'6"N 115°24'6"W), May 24, 2014, 1 spec. (TL 31.6 mm), BS, 772–776 m (ICML-EMU-10632-B).

Taxonomic remarks. The material examined fits well with the original description of the body of *Rocinela murilloi* by Brusca and Iverson (1985) and Brusca and France (1992): cephalon about twice as wide as

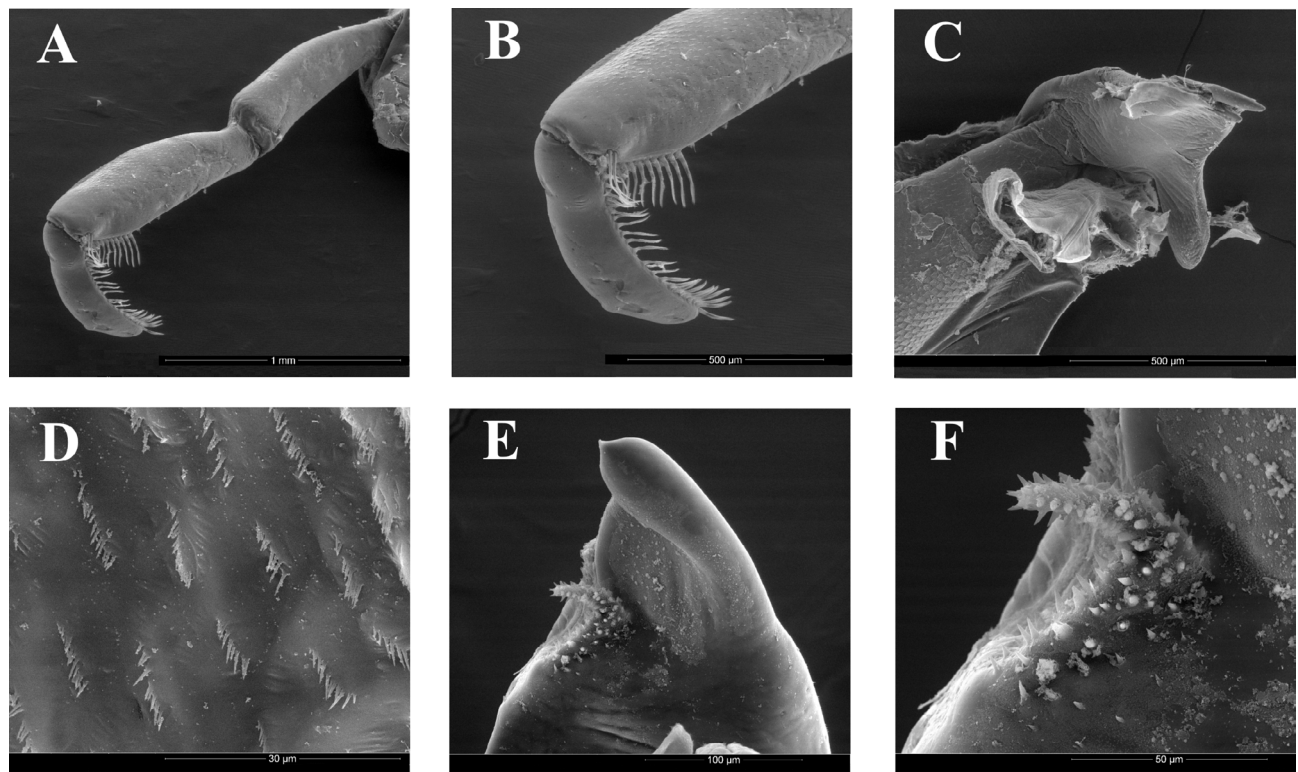


Figure 3. *Rocinela murilloi* Brusca and Iverson, 1985, female, 33.6 mm (ICML-EMU-9973), mandible. A, mandibular palp; B, same, detail of distal two articles; C, mandible, general view; D, detail of molar process; E, detail of incisor; F, detail of lacina mobilis (see text for explanations).

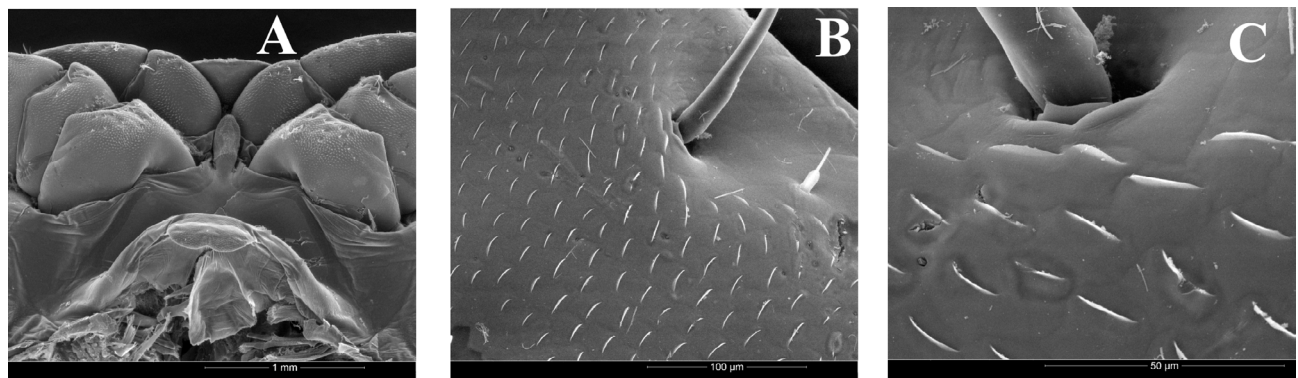


Figure 4. *Rocinela murilloi* Brusca and Iverson, 1985. A, female, 33.4 mm; B, C, female, 33.6 mm (ICML-EMU-9973). A, ventral view of the frontal part; B, scales on second article of pereopod III; C, same, magnified.

long; eyes large, dark, widely separated; antenna 1 short, antenna 2 extending to pereonite III; pereonite I the longest; coxae of pereonites V–VII extending posteriorly; pleotelson with a pair of submedian pits (Fig. 1). The original description (Brusca and Iverson, 1985) also included illustrations of the pereopods I, IV and VII, the maxilliped, the pleopods 1–5, and a dorsal view of the female holotype. Brusca and France (1992) completed the illustration series by adding drawings of the frontal margin of the carapace (ventral

view), the mandible, the maxillule, the maxilla, the pereopod III, and the uropod (all from the holotype). SEM photographs of selected appendages and of the frontal portion of the carapace of *R. murilloi* (Figs. 2–4) are provided here for the first time. The shape and ornamentation of pereopods I–III of the material examined (Fig. 2A, D, G) perfectly match the illustrations and descriptions provided by Brusca and Iverson (1985) and Brusca and France (1992), with the inferior margin of the propodus featuring a

distally expanded, broadly-rounded lobe, with 5-5-5 (pereopods I-II-III) stout, recurved spines (Fig. 2B, E, H). In the pereopod I, the carpus has one stout spine (Fig. 2C), and the merus features 2 distal spines (Fig. 2C) and 1 subbasal, shorter spine. Pereopod II (not described previously) (Fig. 2D–F) is similar to pereopod I but with two stout spines on the carpus (Fig. 2F). The merus of pereopod III (Fig. 2G, I) has 3 long, distal stout spines, decreasing in length towards the proximal margin, and one shorter, proximal spine.

The mandible of the examined material (Fig. 3A–F) also closely matches the description and illustrations provided by Brusca and France (1992), with a 3-articulated palp (Fig. 3A, B), the second article about twice as long as first, and with a distal row of about 10 serrate spines and 2 distal, single setae (Fig. 3B); the strongly projecting linguiform molar process (Fig. 3C) also matches the description, and is covered by regularly spaced rows of minute spines (Fig. 3D); the claw-like incisor is spoon-like, ending in a rather sharp tip (Fig. 3E), and the lobe between the molar process and the incisor (the lamina mobilis of Brusca and France, 1992) seems to be an isolated process surrounded by a field of numerous, sharp spinules (Fig. 3F).

Brusca and France (1992) also provided an illustration and a SEM photograph of the ventral view of the frontal part of *R. murilloi* carapace, with a narrow, arrowhead shape frontal lamina that perfectly matches the material examined (Fig. 4A).

The surface of the pereopods I–III articles is covered by minute scales (Fig. 4B, C), not illustrated previously.

DISCUSSION

Rocinela murilloi is a widely distributed deep-water aegid, ranging from California to Chile (Brusca and France, 1992; Hendrickx, 2008). It was reported for this geographical range by Espinosa-Pérez and Hendrickx (2001) but inadvertently omitted by the same authors for polar and temperate waters of the East Pacific (Espinosa-Pérez and Hendrickx, 2006).

Hendrickx (2008) reported a total of 11 specimens from seven localities in the southern Gulf of California. The material examined in the present study amounts to two additional specimens from the southern Gulf of California (2 localities), 56 specimens from SW Mexico

(4 localities), and 12 specimens from off the west coast of the Baja California Peninsula (6 localities) (Fig. 5). With a total of 81 specimens found in 19 localities, *R. murilloi* appears to be a widespread and relatively common species of fish parasite in deep-water off western Mexico. When considering new and previous records for this species (Tab. 1), there is a clear lack of data for very wide areas in the eastern Pacific (Fig. 5), particularly between SW Mexico ($17^{\circ}45'16''\text{N}$) and Costa Rica (*ca.* $09^{\circ}36.7'\text{N}$), between Costa Rica and northern Peru ($7^{\circ}07'\text{S}$), and between northern Peru and Chile (only two records in *ca.* $18^{\circ}40'\text{S}$ and $33^{\circ}39'\text{S}$).

The material reported by Hendrickx (2008) for the southern Gulf of California was collected at depths of 890 to 1274 m, with an epibenthic dissolved oxygen range of 0.20 to 0.76 ml/l, and a bottom temperature range of 3.6 to 5.3 °C. Overall depth range of the additional material examined herein is 700 to 1235 m, thus slightly shallower than previously known (768 to 1866 m; Brusca and France 1992). The new material reported herein was collected in a lower dissolved oxygen concentrations range (*i.e.*, 0.11–0.65 ml/l) and a slightly different temperature range (*i.e.*,

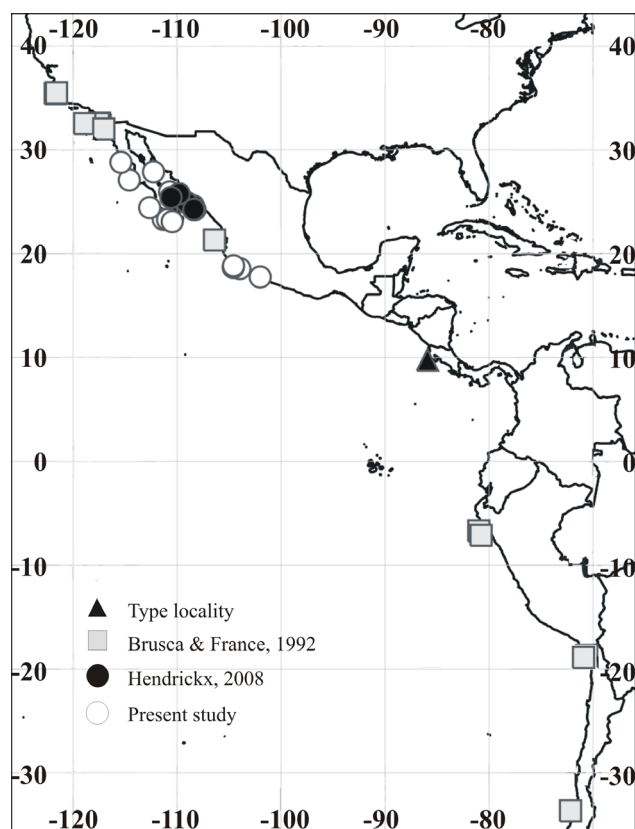


Figure 5. Sampling localities in the eastern Pacific where *Rocinela murilloi* Brusca and Iverson, 1985 has been collected.

Table 1. Previous and present records of *Rocinela murilloi* Brusca and Iverson, 1985 in the eastern Pacific. N, number of specimens; LACM-AHF, Los Angeles County Museum of Natural History, ex-Allan Hancock Foundation, California; AMS, The Australian Museum, Sydney; SIO, Scripps Institution of Oceanography, California; USNM, United States National Museum, Washington D.C. Some closely set records overlap.

Locality	Position	Depth (m)	N	Catalogue	Reference
Off Point Guiones, Costa Rica, "Velero IV"	9°45'N 85°55'24"W	1866	9	LACM-AHF 202-05	Brusca and Iverson, 1985
California, San Diego Trough, R/V "Agassiz", 1-2 Jun 1971	32°21.8'N 117°24.0'W to 32°30.7'N 117°32.8'W	1235	2	AMS, P37849	Brusca and France, 1992
California, San Diego Trough, R/V "Agassiz", 1-2 Jun 1971	32°21.8'N 117°24.0'W to 32°30.7'N 117°32.8'W	1235	3	LACM, no number	Brusca and France, 1992
Peru, between Lobos de Tierra and Lobos de Afuera, St. SNPI-24, 22 Jan 1974	6°42'S 80°59'W	800	1	AHF, 100-03	Brusca and France, 1992
Peru, near Lobos de Afuera, Sta. SNP I-13, 20 Jan 1974	7°07'S 80°46'W	1200	1	AHF, 94-09	Brusca and France, 1992
U.S.A., California, offshore Point Sur, Sta. SLS-24, Nov 1984		1000	2	SIO, no number	Brusca and France, 1992
California, Piedras Blancas Point, R/V "Agassiz", 31 Mar 1974	35°24.4'N 121°42.8'W to 35°30.6'N 121°52.7'W	1170–1189	24	SIO, C3860	Brusca and France, 1992
California, Piedras Blancas Point, R/V "Agassiz", 1 Apr 1974	35°29.3'N 121°35.8'W to 35°34.5'N 121°042'W	906	19	SIO, C3777	Brusca and France, 1992
California, San Diego Trough, R/V "Oconostata", 7 Nov 1969	32°35'N 117°28'W to 32°40'N 117°32'W	1111–1194	4	SIO, C3804	Brusca and France, 1992
California, San Diego Trough, R/V "Agassiz", 26 Oct 1970	32°26.1'N 117°30.7'W to 32°22.5'N 117°28.8'W	1244–1259	5	SIO, C3828	Brusca and France, 1992
California, San Diego Trough, R/V "Agassiz", 18-19 Jan 1971	32°24.7'N 117°27.75'W to 32°29.2'N 117°30.2'W	1204–1226	3	SIO, C3799	Brusca and France, 1992
California, San Diego Trough, R/V "Agassiz", 1-2 Jun 1971	32°21.8'N 117°24.0'W to 32°30.7'N 117°32.8'W	1235	48	SIO, C3855	Brusca and France, 1992
California, San Diego Trough, R/V "Agassiz", 22 Jun 1971	32°24.8'N 117°28.3'W to 32°25.0'N 117°28.5'W	1260	1	SIO, C3757	Brusca and France, 1992
California, San Diego Trough, R/V "Agassiz", 22 Jun 1971	32°31'N 117°30'W	1 234	4	SIO, C3798	Brusca and France, 1992
California, San Diego Trough, R/V "Agassiz", 14 July 1971	32°25'N 117°26.8'W to 32°26'N 117°28.1'W	1208–1244	4	SIO, C3831	Brusca and France, 1992
California, San Diego Trough, R/V "Agassiz", 14 Sep 1971	32°26'N 117°29'W to 32°31'N 117°32'W	1241–1260	3	SIO, C3796	Brusca and France, 1992
California, San Diego Trough, R/V "Agassiz", 1 Nov 1971	32°24.4'N 117°29.5'W to 32°31'N 117°33.4'W	1222–1260	2	SIO, C3797	Brusca and France, 1992
California, San Diego Trough, R/V "Oconostata", 9 Feb 1972	32°26.2'N 117°31.6'W to 32°30.4'N 117°34.3'W	1189	1	SIO, C3784	Brusca and France, 1992
California, San Diego Trough, R/V "Agassiz", 27 Mar 1974	32°31.7'N 117°34.1'W to 32°25.7'N 117°28.4'W	1225	1	SIO, C3782	Brusca and France, 1992
California, off San Diego, 18-19 Jan 1971	32°24.7'N 117°27.75'W to 32°29.2'N 117°30.2'W	1219–1259	1	SIO, C3844	Brusca and France, 1992
California, East Cortes Basin, R/V "Agassiz", 6 May 1975	32°32'N 118°53.1'W to 32°32.7'N 118°53.6'W	1298	14	SIO, C1676	Brusca and France, 1992
Mexico, Baja California Norte, 26.2 km S of Pta. Descanso, 7 Dec 1966	32°0.6'N 117°2.9'W	827	1	SIO, C3921	Brusca and France, 1992
Costa Rica, south of Pt. Guiones, R/V "Agassiz", 20 Apr 1973	09°32.5'N 85°43.0'W to 09°36.7'N 85°40.5'W	1154–1157	1	SIO, C1 706	Brusca and France, 1992
Chile, off Arica, R/V "Thomas Washington", 7 May 1972	18°40.5'S 70°36.0'W to 18°32.2'S 70°29.8'W	768–968	1	SIO, C2916	Brusca and France, 1992
Chile, off Arica, R/V "Thomas Washington", 7 May 1972	18°42'S 70°37'W	1097–1152	30	SIO, C2908	Brusca and France, 1992
Mexico, San Blas, "Albatross", Sta. 3425	21°19'N 106°24'W	1201	1	USNM, 20723	Brusca and France, 1992
Chile, Anton Bruun cruise 18A, Sta. 699, 10 Aug 1966.	33°39'8N 72°10'W	1170–1480	3	USNM, no number	Brusca and France, 1992
R/V "El Puma", TALUD III, St. 14A, 19 Aug 1991	24°38.8'N 108°26.9'W	1016–1020	1	ICML-EMU-8016	Hendrickx, 2008
R/V "El Puma", TALUD IV, St. 19, 25 Aug 2000	24°15.3'N 108°24.1'W	1196–1200	1	ICML-EMU-8017	Hendrickx, 2008
R/V "El Puma", TALUD IV, St. 26, 26 Aug 2000	24°56.4'N 109°5.6'W	1200–1274	1	ICML-EMU-8018	Hendrickx, 2008
R/V "El Puma", TALUD IV, St. 33, 27 Aug 2000	25°45.9'N 109°48.1'W	1060–1090	1	ICML-EMU-8019	Hendrickx, 2008

Table 1. Cont.

Locality	Position	Depth (m)	N	Catalogue	Reference
R/V "El Puma", TALUD VI, St. 18, 15 Mar 2001	24°14.9'N 108°16.3'W	890–950	1	ICML-EMU-8020	Hendrickx, 2008
R/V "El Puma", TALUD VII St. 19, 7 Jun 2001	24°16.2'N 108°23.7'W	1160–1180	2	ICML-EMU-8021	Hendrickx, 2008
R/V "El Puma", TALUD VIII St. 16, 18 Apr 2005	25°24'N 110°37'W	1030	4	ICML-EMU-8022	Hendrickx, 2008
R/V "El Puma", TALUD VIII, St. 20, Apr 19, 2005	25°56'56"N 110°43'W	700–750	1	ICML-EMU-9971	Present study
R/V "El Puma", TALUD X, St. 9, Feb 10, 2007	27°52'51"N 112°15'53"W	1205–1215	1	ICML-EMU-9969	Present study
R/V "El Puma", TALUD XII, St. 13, Mar 30, 2008	17°45'16"N 102°0'29"W	1198	1	ICML-EMU-10630-A	Present study
R/V "El Puma", TALUD XII, St. 23, Abr 1, 2008	18°33'43"N 103°57'45"W	1058–1088	51	ICML-EMU-9973	Present study
R/V "El Puma", TALUD XII, St. 27, Abr 2, 2008	18°40'28"N 104°35'51"W	1040–1095	4	ICML-EMU-9972	Present study
R/V "El Puma", TALUD XII, St. 28, Apr 2, 2008	18°50'19"N 104°34'14"W	1101–1106	1	ICML-EMU-9970	Present study
R/V "El Puma", TALUD XV, St. 1, Aug 4, 2012	23°18'40"N 111°19'37"W	750–850	4	ICML-EMU-10630-B	Present study
R/V "El Puma", TALUD XV, St. 5C, Aug 5, 2012	23°16'42"N 110°54'55"W	980–1036	4	ICML-EMU-10632-A	Present study
R/V "El Puma", TALUD XV, St. 5E, Aug 5, 2012	23°05'22"N 110°27'54"W	948–954	1	ICML-EMU-10630-C	Present study
R/V "El Puma", TALUD XV, St. 8, Jul 30, 2012	24°54'48"N 112°38'06"W	1212–1235	1	ICML-EMU-10631-B	Present study
R/V "El Puma", TALUD XV, St. 24, Aug 1, 2012	27°5'42"N 114°35'30"W	772–786	1	ICML-EMU-10631-A	Present study
R/V "El Puma", TALUD XVI-B, St. 5, May 24, 2014	28°48'6"N 115°24'6"W	772–776	1	ICML-EMU-10632-B	Present study

3.44–5.75 °C). Salinity data at sampling localities, not available in Hendrickx (2008) report, were 34.42–34.60 ups. Additional information shows a strong variation in sediments composition and in % of organic carbon content (Tab. 2). This differs from the muddy environment previously reported by Hendrickx (2008). Sediment type at sampling localities, however, might not be directly related to the presence of the isopods, which are temporary external parasites of fishes.

Present information and previous records (Hendrickx, 2008) indicate that *R. murilloi* is highly tolerant to oxygen depletion and is a member of the deep-water fauna inhabiting below the lower boundary of the Oxygen Minimum Zone (OMZ) occurring off western Mexico (see Hendrickx and Serrano, 2010). This OMZ is particularly wide, deep, and with anoxic core-values off the west coast of Baja California (Papiol *et al.*, 2016) and off SW Mexico (Serrano, 2012). Although *R. murilloi* is presumably attached in a

permanent way to their hosts and might therefore move over long distance over the sea floor, environmental conditions prevailing close to the bottom below the OMZ core, in a similar depth range, are considered stable, particularly in what concerns dissolved oxygen concentration and water temperature (Hendrickx and Serrano, 2010; Serrano, 2012).

Species of *Rocinela* are blood-sucking temporary parasites of marine fishes. They can easily detach from their host, swim and reattach to a new host. However, very little is known about the fish-parasite relationship (Brusca and France, 1992). *Rocinela murilloi* and other species of the genus may abandoned their host once they are captured in bottom trawls or slegdes (see Brusca and France, 1992; Wing and Moles, 1995), thus making the identification of hosts very difficult. Cruz-Acevedo *et al.* (2018) reported 50 species of bathypelagic and bathydemersal deep-water fishes between 300 and 2100 m off western Baja California, the area where most specimens of *R. murilloi* were

Table 2. Environmental data associated with the capture of *Rocinela murilloi* Brusca and Iverson, 1985 (present study).

Cruise TALUD	St.	Depth (m)	Oxygen (ml l ⁻¹)	Bottom temp. (°C)	Salinity (ppm)	%C _{org}	% Clay	% Lime	% Sand
XII	13	1199–1100	0.36	3.96	34.55	1.74	ND	ND	ND
XII	23	1058–1088	0.22	4.39	34.54	ND	ND	ND	ND
XII	27	1040–1095	0.26	ND	34.53	1.96	ND	ND	ND
XII	28	1101–1106	0.27	4.11	34.53	2.13	ND	ND	ND
XV	1	750–850	0.11	5.75	34.54	3.93	13.37	67.94	18.69
XV	5C	980–1036	0.22	4.71	34.56	1.21	5.73	33.72	60.56
XV	5E	948–954	0.29	4.36	34.57	ND	ND	ND	ND
XV	8	1212–1235	0.65	3.44	34.6	3.54	8.48	61.92	29.59
XV	24	772–786	0.12	5.24	34.53	3.26	7.95	56.52	35.53
XVI-B	5	772–776	0.22	5.34	34.42	5.20	11.82	72.65	15.53

collected in the present survey. Of these, 27 species were captured in depths that match the depths at which the isopods were caught, thus leaving unclear possible associations. However, based on the list of species of fishes captured in the same samples (Cruz-Acevedo *et al.*, 2018), *R. murilloi* could be a parasite of *Bathypterois* Günther, 1878 (two species), *Dicrolene filamentosa* Garman, 1899, *Dibranchius spinosus* (Garman, 1899), *Paraliparis* Collett, 1879, *Sebastolobus* Gill, 1881, or *Lycenchelys* Gill, 1884 (three species).

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REFERENCES

- Brusca, R.C. and France, F.C. 1992. The genus *Rocinela* (Crustacea: Isopoda: Aegidae) in the tropical eastern Pacific. *Zoological Journal of the Linnean Society*, London, 106: 231–275.
- Brusca, R.C. and Iverson, E.W. 1985. A guide to the marine isopod Crustacea of Pacific Costa Rica. *Revista de Biología Tropical*, 33: 1–77.
- Collett, R. 1879. Fiske fra Nordhavs-Expeditionens sidste Togt, Sommeren 1878. *Forhandlinger i Videnskabs-selskabet i Christiania*, 14: 1–106.
- Cruz-Acevedo, E.; Tolimieri, N. and Aguirre-Villaseñor, H. 2018. Deep-sea fish assemblages (300–2100 m) in the eastern Pacific off northern Mexico. *Marine Ecology Progress Series*, 592: 225–242.
- Espinosa Pérez, Ma. C. and Hendrickx, M.E. 2001. Checklist of isopods (Crustacea: Peracarida: Isopoda) from the eastern tropical Pacific. *Belgian Journal of Zoology*, 131: 41–54.
- Espinosa-Pérez, M.C. and Hendrickx, M.E. 2006. A comparative analysis of biodiversity and distribution of shallow water marine isopods (Crustacea: Isopoda) from polar and temperate waters in the East Pacific. *Belgian Journal of Zoology*, 136: 219–247.
- Garman, S. 1899. Reports on an exploration off the west coasts of Mexico, Central and South America, and off the Galapagos Islands, in charge of Alexander Agassiz, by the U.S. Fish Commission Steamer Albatross, during 1891, Lieut. Commander Z.L. Tanner, U.S.N., commanding. The fishes. *Memoirs of the Museum of Comparative Zoology at Harvard College*, 26: 1–431.
- Gill, T. N. 1881. A deep-sea rock-fish. *Annual Report of the Board of Regents of the Smithsonian Institution*, 14: 375.
- Gill, T. N. 1884. On the anacanthine fishes. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 36: 167–183.
- Günther, A. 1878. Preliminary notices of deep-sea fishes collected during the voyage of H.M.S. “Challenger” by Albert Günther F.R.S, keeper of the Zoological Department, British Museum. *Annals and Magazine of Natural History (Series 5)*, 2 (7/8/9) (art. 2/22/28): 17–23, 179–187, 248–251.
- Hendrickx, M.E. 2008. Rediscovery of *Rocinela murilloi* Brusca and Iverson, 1985 (Crustacea: Isopoda: Aegidae) in the Gulf of California, Mexico, and ecological data associated with its capture. *Crustaceana*, 81: 1259–1262.
- Hendrickx, M.E. and Serrano, D. 2010. Impacto de la zona de mínimo de oxígeno sobre los corredores pesqueros en el Pacífico mexicano. *Interciencia*, 35: 12–18.
- Leach, W.E. 1818. Cymothoadées. p. 338–358. In: (editor unknown), *Dictionnaire des Sciences Naturelles*, vol. 12. Paris, Strasbourg et Levrault.
- Papiol, V.; Hendrickx, M.E. and Serrano, D. 2016. Effects of latitudinal changes in the oxygen minimum zone of the northeast Pacific on the distribution of bathyal benthic decapod crustaceans. *Deep Sea Research Part II: Topical Studies in Oceanography*, 137: 113–130.
- Serrano, D. 2012. La zona de mínimo oxígeno en el Pacífico mexicano. p. 105–119. In: P. Zamorano, M.E. Hendrickx and M. Caso (eds), *Biodiversidad y comunidades del talud continental del Pacífico mexicano*. México D.F., Mexico, Secretaría del Medio Ambiente y Recursos Naturales (SEMARNAT), Instituto Nacional de Ecología (INE).
- Wing, B. L. and Moles, D. A. 1995. Behavior of *Rocinela angustata* (Isopoda, Aegidae), an ectoparasite of Alaskan marine fishes. *Journal of Aquatic Animal Health*, 7: 34–37.
- White, A. 1950. List of specimens of British animals in the collections of the British Museum. Part IV. Crustacea. London, British Museum (Natural History), 141p.