Records of crustacean decapodid stages from the family Enoplometopidae (Crustacea: Decapoda) in the pelagic environment of the western Indian Ocean

О находках декаподида десятиногих раков из семейства Enoplometopidae (Crustacea: Decapoda) в желудках некоторых хищных рыб в пелагиали западной части Индийского океана

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KEY WORDS: Crustacea, Decapoda, Enoplometopus pictus, E. holthuisi, Alepisaurus ferox, Thunnus albacares, decapodid, morphology description, Reunion Island.

КЛЮЧЕВЫЕ СЛОВА: Crustacea, Decapoda, Enoplometopus pictus, E. holthuisi, Alepisaurus ferox, Thunnus albacares, декаподид, описание морфологии, Реюньон.

ABSTRACT. Juveniles of decapod crustaceans at the decapodid stage were recorded in the stomachs of top pelagic predators (Alepisaurus ferox, Thunnus alalunga, and T. albacares) caught in the oligotrophic gyre of the south-west Indian Ocean. Decapodids were found partially digested in stomachs. We were able to identify them and describe their morphological characters for the first time. These juveniles belong to the genus Enoplometopus (family Enoplometopidae de Saint Laurent, 1988, superfamily Enoplometopoidea de Saint Laurent, 1988, and infraorder Astacidea Latreille, 1802). 1. Enoplometopus pictus A. Milne-Edwards, 1862. Adults are only known from the holotype of species collected in Reunion Island. Our decapodids differ by their absence of armament on the outer margin of palms and fingers of chelae, as well as an absence of tubercles on the lateral surfaces of palms of the first pereiopods chelae. 2. E. holthuisi Gordon, 1968. It differs from other Enoplometopus species which possess two post-cervical spines with very thin cheliped. The length of the chela exceeds 50% of that of pereiopods; fingers length is slightly less than chela length. The chela width is 7.5 times its length. This species differs from E. gracilipes and E. voigtmani that have a similar chela shape: the absence of two spines at the dorsal rear edge of the 6th abdominal somite (present in E. gracilipes), and by distribution range (E. voigtmani). E. holthuisi records are known in Reunion Island while no occurrences of E. voigtmani were recorded in the study area. Presence of E. holthuisi in the waters of Mauritius Island is reported for the first time extending documented distribution of this species in the Indian Ocean.

How to cite this article: Burukovsky R.N., Romanov E.V. 2020. Records of crustacean decapodid stages from the family Enoplometopidae (Crustacea: Decapoda) in the pelagic environment of the western Indian Ocean // Arthropoda Selecta. Vol.29. No.4. P.443–451. doi: 10.15298/arthsel.29.4.06

РЕЗЮМЕ. Ювенильные особи десятиногих ракообразных на стадии декаподита были обнаружены при исследовании содержимого желудков крупных хищных рыб (Alepisaurus ferox, Thunnus alalunga и T. albacares), обитающих в пелагиали олиготрофных вод южно-субтропического круговорота Индийского океана, расположенного к востоку от острова Мадагаскар. Декаподиды были в той или иной степени повреждены пищеварительными ферментами. Несмотря на это, удалось идентифицировать два вида декаподид и впервые описать некоторые особенности их морфологии. Декаподиды относятся к омароподобным десятиногим ракам из рода Enoplometopus (семейство Enoplometopidae de Saint Laurent, 1988, надсемейство Enoplometopoidea de Saint Laurent, 1988, инфраотряд Astacidea Latreille, 1802). Первый — Enoplometopus pictus A. Milne-Edwards, 1862. Взрослые представители этого вида известны лишь по голотипу вида, найденному у острова Реюньон. Декаподиды отличаются от него отсутствием вооружения на ребрах пальцев и пальцев клешней, а также бугорков на боковых поверхностях клешней первых переопод. Второй вид — декаподид E. holthuisi Gordon, 1968. Он отличается от других видов из рода Enoplome-
topus, имеющих два постцервикальных шипа, строение клешни, если не более длинной, то значительно более узкой. Длина клешни составляет более половины длины всей конечности, длина ее пальцев несколько меньше половины длины клешни, а ее ширина — в 7,5 раза меньше длины. Он отличается от имеющих относительно длинные клешни E. gracilipes и E. voigtmanni отсутствием двух шипов на дорсальной стороне 6 сегмента абдомена (присутствуют у E. gracilipes), и областью распространения (E. voigtmanni). E. holthuisi известен находкой у о-ва Реюньон, тогда как имаго E. voigtmanni в этой части океана неизвестны. Нами впервые приводится находка E. holthuisi в водах острова Маврикий, расширяя документированное распространение этого вида в Индийском океане.

Introduction

Reef lobsters of the genus Enoplometopus are widely distributed in tropical waters of the world’s oceans, inhabiting shallow-water coral reef ecosystems. They are small species (maximal total length is less than 200 mm) with a brightly coloured carapace. They are often on display in marine aquaria [Baensch, Debelius, 1992]; their colourful pictures are commonly shown in diving and snorkelling periodic journals and general literature focused on tropical marine fauna [Debelius, 2001]. In natural environment, however, Enoplometopus species are secretive, solitary animals that are rarely encounters during underwater observations. The current state of knowledge of the biology and ecology of these species is extremely poor, distribution of several species is known from single records, therefore any new information collected is essential. Even taxonomic position of Enoplometopus within Decapoda was disputed up until the early 2000s. Only recently were these crustaceans finally placed in the family Enoplometopidae Saint Laurent, 1988 [Saint Laurent, 1988; Martin, Davis, 2001; Chan, 2010]. Very little is known about their reproduction and growth, including data on ontogenetic morphological changes. Several development stages were partially described for the single species Enoplometopus antillensis Lütken, 1865 [Abrunhosa et al., 2007; Martin et al., 2014], and some peculiarities of juveniles’ claw armament were described for E. crosnier [Chan, Ng, 2008].

Adult Enoplometopus species are benthic, their larvae are pelagic [Poupin, 2003; Martin et al., 2014] while biological and ecological preferences of post-larvae and juveniles and their settlement period are poorly known. Post-larvae of Enoplometopus are commonly reported (only identified at a generic level) from the stomachs of tropical pelagic and benthiopelagic predators both in the eastern Atlantic, western Indian Ocean, Central and Western Pacific [Dragovich, 1970; Potier et al., 2004, 2007a,b, 2014; Dambacher et al., 2010; Choy et al., 2013; Williams et al., 2014; Trystram et al., 2015].

Juveniles of Enoplometopus at the decapodiid stage [Martin et al., 2014] were commonly recorded during ongoing studies focused on the trophic ecology of top predators in the oligotrophic gyre of the south-west Indian Ocean within the Indian South Subtropical Gyre Province (ISSG) [Longhurst, 2007]. Here we present the identification and first morphological description of pelagic juveniles for two species from the genus Enoplometopus collected in the area. Then we will present and discuss the distribution of pelagic stages of Enoplometopus in the western Indian Ocean based on a wide range of data, using pelagic top predators such as tuna, billfish and associated species as biological samplers.

Material and methods

Data was collected independently around islands Reunion and Mauritius (southwestern Indian Ocean) during several research projects focused on the trophic ecology of top pelagic predators: tuna (Thunnus spp.), billfish (Xiphiidae and Istiophoridae), and lancetfish (Alepisaurus ferox). Predatory fish were caught during research and commercial cruises, with pelagic longline gears in offshore waters of the western Indian Ocean, and with handlines in proximity to fish aggregation devices (FADs) anchored off the northern coast of Mauritius Island at a distance 1 to 10 nautical miles from shore between 500 and 3000 m depth. Stomachs were collected either onboard, at the local processing plants or at landing sites (for handline fisheries). Stomachs were frozen at –18°C and stored in the freezer until further processing in the laboratory. Stomachs were treated following a standard protocol described in Potier et al. [2007a,b]. All recovered individuals of the genus Enoplometopus were recorded; several specimens collected in 2012–2016 were preserved for further detailed identification: those collected off Reunion Island are indicated below as RUN, and the ones collected off Mauritius as MRU. Archival data from the STOMAC database, developed at the Institute de Recherche pour le Développement (IRD), France [Potier et al., 2005; Potier, 2015, pers. comm.], were also used for the mapping of occurrences of Enoplometopus spp. in the stomachs of pelagic fish throughout the western Indian Ocean.

Results

A total of six individuals from the genus Enoplometopus were preserved from the stomachs and identified to species. All of them were affected by digestion but their overall state made species-specific identification possible.
Systematic account

Order Decapoda Latreille, 1802
Infraorder Astacidea Latreille, 1802,
Superfamily Enoplometopoidea Saint Laurent, 1988
Family Enoplometopidae Saint Laurent, 1988

Enoplometopus pictus A. Milne-Edwards, 1862¹

MATERIAL. Off Reunion Island. RUN-1: Vessel F/V “Parvati”; 11.07.2016, 20°24’53S, 54°16’41E, stomach of Alepisaurus ferox; Geoffrey Bertrand leg; decapodid (carapace length (CL) 6.1

¹ Detailed synonymy and taxonomic description are presented in Poupin [2003].

Records of Enoplometopidae decapodid stages in the pelagic environment

Fig. 1. Decapod of Enoplometopus pictus A. Milne-Edwards, 1862, specimen RUN-1: a — carapace, dorsal view; b — chela, lateral view; c — telson, dorsal view; d — abdomen, lateral view; e — rostrum and front of the carapace, lateral view.

Run. 1. Декапод Enoplometopus pictus A. Milne-Edwards, 1862, экземпляр RUN-1: a — карапакс, вид сверху; b — клешня, вид сбоку; c — тельсон, вид сверху; d — абдомен, вид сверху; e — рострум и фронтальный край карапакса, вид сбоку.

mm total length (TL) 22.6 mm. RUN-2: Vessel F/V “Marius 3”. 5.12.2012, 19°36’49S, 54°05’26E; stomach of Thunnus alalunga; Loïc Le Foulgoec leg; decapodid (CL 7.2 mm, TL 18.6 mm). RUN-3: Vessel F/V “Laksmi”, 27.12.2012, 19°40’04S, 53°39’20E; stomach of Thunnus alalunga; Alan Sharp leg; decapodid (CL 6.0 mm, TL 19.8 mm). Off Mauritius Island. MRU-1: 8.11.2014, 20°12’S, 57°16’E. Stomach of Thunnus alalunga. Zahirah Dhurmeea leg. Decapodid with CL 6.3 mm, TL 26.2 mm. MRU-3: 8.11.2014, 20°12’S, 57°16’E. Stomach of Thunnus alalunga. Zahirah Dhurmeea leg. Decapodid (CL 6.0 mm, TL 20.0 mm).

DESCRIPTION. Rostrum extends beyond scaphocerite’s distal margin. Rostrum length from tip to posterior orbit margin (5.6 mm) almost equal to carapace length from posterior orbit margin to carapace rear margin measured along dorsal side (6.1 mm). Distodorsal rostrum part, anterior to dorso-lateral teeth flattened and broadens posteriorly. Dorso-lateral rostrum teeth directing outward, positioned
anterior edges of carpus and merus which are armed with slightly undulated (Fig. 1b).

Two pairs of intermediate spines are present in the area of the rostrum transition into carapace (Fig. 1a). First pair of intermediate spines is situated between the eyes, and second one right behind. Carapace carries pair of supra-ocular spines (positioned above posterior pair of intermediate spines) and three pairs of lateral spines. Distance between lateral spines decreases rearward. Five median spines situated along median line of carapace’s dorsal side. First median spine positioned over posterior pair of intermediate spines while last median spine is located at about 30% of carapace length from its posterior margin. Low keel extends toward carapace’s posterior margin behind last intermediate spine.

Carapace surface smooth. Lower part of orbital carapace margin terminated as tiny antennal tooth (Fig. 1c). Branchiostegal spine present. Thin, poorly visible grooves (apparently derives of cervical and post-cervical grooves) extend from small notch in hepatic part of the branchiostegite, but does not span over carapace’s dorsal side. Therefore, cervical groove is absent.

Abdomen smooth, without sculpture. Pleuron of first somite hidden completely below wide pleuron of second somite (Fig. 1d). Anterior margin of pleuron of second somite smooth, skewed backward with pointed ventral margin directed down-rearwards. Pleurons of other somites also pointed but directed downward. Posterior margin of sixth somite armed with two teeth. Telson length is more than 1.6 times its width in widest part (at a proximal one-third of its length). Telson is armoured laterally with two paired spines. The first pair, the smaller one, is positioned slightly beyond the telson midline, with the second and the larger one positioned sub-distally.

Length of first pair of pereiopods almost equal to body length (19.0 and 22.6 mm respectively). Length of chela (9.8 mm) about two times shorter than the entire cheliped; length of fingers (4.0 mm) about 0.5 of chela length. Chela width is 0.25 of its length. Inner margin of the fixed finger is compressed into a ‘blade-like’ margin extended toward the distal fingertip, and curved inwardly. Movable finger without blade-like margin. Interior margins of both fingers not serrated but pressed into a ‘blade-like’ margin extended toward the distal 0.25 of its length. Inner margin of the fixed finger is corrected down-rearwards. Pleurons of other somites also pointed along dorsal carapace surface. Shallow but well visible cervical and post-cervical grooves differ from the rostrum transition from rostrum into carapace. Intermediate spines situated over posterior orbit margin (Fig. 2a). Supraorbital spines located below intermediate ones. Three pairs of lateral spines present on the carapace: posterior lateral spine above hepatic region of cephalothorax. Seven median spines situated along dorsal carapace surface. The first median spine is above intermediate spines while the fifth one is right before the cervical groove. Two posterior median spines are post-cervical.

Carapace surface smooth. Lower orbital edge of carapace terminated by pointed antennal projection. Well-developed branchiostegal tooth also present. Rounded branchiostegal keel extends from branchiostegal tooth to posterior part of branchiostegite but not reaching its posterior margin. Shallow but well visible cervical and post-cervical grooves start from the rear area of the branchiostegite. Both grooves apparently do not extend over the carapace dorsal side. It was impossible to verify this point due to the damaged state of decapodid carapace.

Abdomen smooth, without any sculpture. Pleuron of first somite hidden completely below wide pleuron of second somite (Fig. 2b). Anterior lower pleuron margin of second somite bears small denticles skewed down-rearwards.

**Remarks.** Holthuis [1983] divided all species from Holthuis' [1983] approach for the convenience of description of the telson shape and proportions also changing during growth and development. This subgenus consists of five species: E. (E.) pictus A. Milne-Edwards, 1862, E. (E.) occidentalis Randall, 1840, E. (E.) chacei Kensley, Child, 1986, E. (E.) debelius Holthuis, 1983, and E. (E.) daumi Holthuis, 1983 [A. Milne-Edwards, 1862; Holthuis, 1983; Kensley, Child, 1986; Chan, Ng, 2008].

Four of them (E. occidentalis, E. chacei, E. debelius & E. daumi) are characterised by a weakly developed cervical groove and one more or less reduced post-cervical spine. Three distolateral spines (inner pair longest) are also present on the telson in addition to a lateral spine [Holthuis, 1983; Kensley, Child, 1986; Poupin, 2003; Chan, Ng, 2008].

The present specimens are lacking a cervical groove and post-cervical spine, and a telson armed with one lateral and one distolateral spine. All these indicators allow us to identify our decapodids as E. pictus A. Milne-Edwards, 1862.

**Materials.** Holthuis, 1983 [A. Milne-Edwards, 1862; Holthuis, 1983]. This subgenus consists of five species: E. (E.) pictus A. Milne-Edwards, 1862, E. (E.) occidentalis Randall, 1840, E. (E.) chacei Kensley, Child, 1986, E. (E.) debelius Holthuis, 1983, and E. (E.) daumi Holthuis, 1983 [A. Milne-Edwards, 1862; Holthuis, 1983; Kensley, Child, 1986; Chan, Ng, 2008].

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**Adult E. pictus** is known from the single specimen (holotype) stored in the Muséum National d’Histoire Naturelle (MNHN, Paris) collected in Reunion Island [A. Milne-Edwards, 1862]. Our specimens differ from the holotype by the absence of armament on the outer margin of palms and fingers of chelae, as well as the absence of tubercles on lateral surfaces of palms of the first pereiopods chelae. Apparently, these characters are subjected to ontogenetic variability. Although the telson in the present specimens is longer than wide, according to A. Milne-Edwards’ [1862] drawing, the telson’ maximal width is almost equal to its length in adults. We therefore suppose that the telson shape and proportions also changing during growth and development.

**Enoplometopus holthiisi** Gordon, 1968²

**Material.** Off Mauritius Island. MRU-5: 5.06.2014, 20°06’S, 57°27’E; stomach of Thunnus alalunga; Zahirah Dhar-mea leg; decapodid (CL 8.0 mm, TL 30.0 mm).

**Description.** Distal part of the rostrum absent (broken). Intact proximal part of rostrum does not extend beyond distal eye margin. Ventral rostral keel that is characteristic for E. pictus absent.

Single pair of intermediate spines present in area of transition from rostrum into carapace. Intermediate spines situated over posterior orbit margin (Fig. 2a). Supraorbital spines located below intermediate ones. Three pairs of lateral spines present on the carapace: posterior lateral spine above hepatic region of cephalothorax. Seven median spines situated along dorsal carapace surface. The first median spine is above intermediate spines while the fifth one is right before the cervical groove. Two posterior median spines are post-cervical.

Carapace surface smooth. Lower orbital edge of carapace terminated by pointed antennal projection. Well-developed branchiostegal tooth also present. Rounded branchiostegal keel extends from branchiostegal tooth to posterior part of branchiostegite but not reaching its posterior margin. Shallow but well visible cervical and post-cervical grooves start from the rear area of the branchiostegite. Both grooves apparently do not extend over the carapace dorsal side. It was impossible to verify this point due to the damaged state of decapodid carapace.

Abdomen smooth, without any sculpture. Pleuron of first somite hidden completely below wide pleuron of second somite (Fig. 2b). Anterior lower pleuron margin of second somite bears small denticles skewed down-rearwards.

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² Detailed synonymy and taxonomic description are presented in Poupin [2003].
Records of Enoplometopidae decapodid stages in the pelagic environment

Fig. 2. Decapodid of *Enoplometopus holthuisi* Gordon, 1968, specimen MRU-5: a — carapace, lateral view; b — abdomen, lateral view; c — pereiopod I; d — telson, dorsal view; e — pleurons of somites II and III.

Рис. 2. Декаподит *Enoplometopus holthuisi* Gordon, 1968, экземпляр MRU-5: a — карапакс, вид сбоку; b — абдомен, вид сбоку; c — перейопода I; d — тельсон, вид сверху; e — плевроны сомитов II и III.

Length of first pair of pereiopods almost equal to body length (25.0 and 30.1 mm respectively). Chela long (14.7 mm), exceeding half of pereiopod length. Length of fingers (6.3 mm) slightly less than 0.5 of chela length. Chela width (2.0 mm) is 7.5 times its length. Palm edges bear teeth (Fig. 2c). Carpus distal edge armed with three teeth. Edges of merus armed by ten teeth along interior edge, and by five teeth along each exterior and upper edge.

Pleurons pointed, slightly curving posteriorly. Pleurons of third, fourth, and fifth somites slightly curved backwards, also bearing small denticles over anterior lower margin. Pleuron of sixth somite not pointed. Its posterior edge armed with two teeth. Telson spade-shaped (Fig. 2d). Its maximal width 1.3 times as long as its length. Telson armed with four lateral spines, two of them situated in anterior third of telson and other two situated subdistally. Distal pair of spines notable larger than others.
REMARKS. All Enoplometopus species that possess single pair of intermediate spines, two post-cervical spines and two lateral spines in the middle of the carapace were attributed by Holthuis [1983] to the subgenus Hoplometopus Holthuis, 1983. It includes seven species: E. (H.) antillensis Lütken, 1865, E. (H.) callistis Intès et Le Louf, 1970, E. (H.) holthuisi Gordon, 1986, E. (H.) voigtmanni Türkay 1989, E. (H.) crosnieri Chan et Yu, 1998, E. (H.) macrodonpus Chan et Ng, 2008, and E. (H.) gracilipes (Saint Laurent, 1988) [Türkay, 1989; Poupin, 2003; Chan, Ng, 2008].

E. (H.) antillensis, E. (H.) callistis, E. (H.) macrodonpus, and E. (H.) crosnieri are characterised by a single post-cervical spine and a wide, relatively short chela. Its length to maximum width ratio varied from 2.4 in E. (H.) callistis to about 3.0 in other species (extrapolated by RNB from drawn images or photos of the mentioned species presented in Intès, Le Louf [1970]; Seelz & Rodriguez [1991]; Chan & Yu [1998]; Poupin [2003]; Chan & Ng [2008]).

Proceeding from indicators presented above, the decapod described here from the subgenus Hoplometopus belongs either to E. (H.) holthuisi Gordon, 1986, E. (H.) voigtmanni Türkay, 1989, or E. (H.) gracilipes (Saint Laurent, 1988): all of them are characterised by 2 post-cervical spines and a narrow chela. The ratio of chela width to its length for these species ranges from 5.1 to 6.1 [Holthuis, 1983; Poupin, 2003; Chan, Ng, 2008]. Other species from the subgenus show much lower ratio, however, decapod described here demonstrate a considerably higher ratio (7.5). Finally the telson shape in all three candidate species is quasi rectangular with slightly rounded distal angles while our specimen has an elongated and rounded telson after a distal pair of lateral spines. Its length to width ratio is 1.3. Apparently, the telson shape is provisional and cannot be used for species identification.

All three candidate species are very close morphologically and are distinguished solely by the coloration of live individuals. Preserved, colourless, E. (H.) holthuisi and E. (H.) voigtmanni differ from E. (H.) gracilipes by a single character: the absence of spines at the dorsal rear edge of the sixth abdominal somite in the latter species [Poupin, 2003]. E. (H.) gracilipes does not correspond to our decapod which is armed with two spines on the sixth abdominal somite.

The distribution range of two remaining candidate species partially overlaps. E. (H.) voigtmanni is known in the Indian Ocean from Maldives, Sri Lanka, and Christmas Island; in the Western Pacific it was recorded off Papua New Guinea, Taiwan, Okinawa Island, Ryukyu Islands and apparently Tuamotu (French Polynesia) [Ng, Naruse, 2014]. E. (H.) holthuisi is also a typical Indo-West Pacific species showing, however, much wider distribution. It occurs off Reunion Island (Western Indian Ocean), in Indonesian Waters (Banda and Moluccas Islands), off the Philippines, Marshall (Eniwetok Atoll) and Hawaii Islands, in French Polynesia (Austral Islands: Rurutu), Society Islands: Tahiti; Tuamotu Islands [Poupin, 2003].

Based on considerations presented above, we believe that the decapod described here belongs most probably to E. (H.) holthuisi: our sample indicates the first record off Mauritius Island, situated in close proximity to Reunion Island where this species was recorded in the past.

Remarks on pelagic predators of Enoplometopus spp. and distribution of pelagic stages

Juveniles of Enoplometopus spp. were recorded in the stomach of three predatory species: albacore tuna, T. alalunga, yellowfin tuna, T. albacares, and longnose lancetfish, A. ferox. Most of them are from stomachs of albacore tuna (40 records), only five specimens were recovered from yellowfin tuna stomachs and four individuals are from lancetfish stomachs. The size of predators ranged from 68 to 147 cm, their mean size was equal to 103.±3.4 cm (±SD) for albacore tuna, 109.0±24.2 cm for yellowfin tuna, and 96.8±35.0 cm for lancetfish. All predators analyzed here are large-sized fish with relatively big mouth gapes, compared with the size of Enoplometopus spp. decapodids. Preying on such small-size macrozooplankton prey like Enoplometopus spp. decapodids apparently use ram-filter feeding [Golet et al., 2015, Romanov et al., 2020] while lancetfish most probably attack their prey individually, as they are ambush visual predators [Romanov, 2002].

Globally, pelagic stages of Enoplometopus spp. were found throughout the tropical zone of the World Ocean in the stomachs of various pelagic species: albacore tuna in Equatorial and Southwestern Pacific (Enoplometopus spp.) [Iversen, 1962; Williams et al., 2014], skipjack tuna, Eastern Tropical Atlantic (Enoplometopus antillensis) [Dragovich, 1970; Dragovich, Potthoff, 1972], longnose lancetfish, North Pacific Subtropical Gyre (Enoplometopus sp.) [Choy et al., 2013, suppl.]. All these studies reported reef lobsters as occasional rare preys that occur as single individuals in few stomachs. In contrast Enoplometopus spp. are relatively common crustacean prey for albacore tuna in the waters of Reunion Island [Romanov et al., 2020]. It was also recorded in the stomachs of several benthopelagic fish (Etelis caribunculus, Etelis coruscans, Eunegittus illustris, Pristipomoides argyrogrammicus, and Pristipomoides multidentis) caught over the outer shelf and slope areas in Reunion Island [Trystram et al., 2015].

Data collected over recent decades, from 2001 to 2016 [Potier, 2015 pers. comm. and our data] shows that juveniles of Enoplometopus spp. occur throughout the south-western Indian Ocean: from Seychelles to Mauritius, from Reunion Island to Madagascar and Mozambique Channel (Fig. 3) [See also Potier et al., 2004, 2007a, b, 2014; Zudaire et al., 2015]. Reunion Island and La Pérouse seamount, situated ~90 miles north-west of Reunion, are major hotspots of these occurrences.

Besides the waters off Reunion Island, pelagic occurrences of Enoplometopus spp. are mostly situated in proximity to shelves (near Seychelles Bank and off Madagascar Coast), insular areas (Mauritius Island) and seamounts (e.g. in proximity to Travin Bank, 0°26’N, 56’00’E). Few individuals were found in the open ocean, generally downstream from land masses or seamounts. At the same time, extensive sampling efforts throughout the tropical western Indian Ocean shows a general absence of these crustaceans in the open-ocean pelagic environment (Fig. 3). Our data, based on biological samplers, shows that oligotrophic waters of ISSG around the southern Mascarene Islands
449 Records of Enoplometopidae decapodid stages in the pelagic environment

Fig. 3. The geographic positions of stomach sampling and occurrences of Enoplometopus species in the stomachs of pelagic predators collected in the western Indian Ocean (our data and Potier, 2015, pers. comm.). Cyan dots are Enoplometopus pictus, red oblique cross is E. holthuisi, yellow dots are Enoplometopus spp. (our data), brick red dots are Enoplometopus spp (Potier, 2015, pers. comm.) and white dots are pelagic predator’s stomachs without Enoplometopus species. Approximate position of the 200-mile Exclusive Economic Zones (EEZs) of coastal states represented by dotted line, the 200 m isobaths is dark line, and bathymetry from 1000 to 5000 m (in 1000 m steps) are shown in greyscale. Coastline and bathymetry data are from GEBCO [GEBCO, 2003, 2016]; EEZs are from FMI [2016].

(The Reunion and Mauritius) are characterised by relatively high occurrences of post-larvae stages of two reef lobster species (E. pictus and E. holthuisi) apparently indicating their elevated abundance in coastal areas.

Our results showed usefulness and overall efficiency of top predators as biological samples in the biogeographic and taxonomic studies. This paper confirmed the presence of E. pictus in the waters of Mauritius Island. Past record of E. pictus in Mauritius, reported by Ward [1942], lacked a description of the specimen, and therefore it was doubtful. E. holthuisi is reported from Mauritius Island for the first time. Our study extends documented distribution of both species in the Indian Ocean from single records from Reunion Island onto waters of Mauritius.

Acknowledgements
The authors want to thank all colleagues involved in specimen collections, in particular Zahirah Dhurmeea, Geofrey Bertrand, Loïc Le Foulgoc, Thomas Poirout and Alan Sharp. Special thanks to Michel Potier for providing information on occurrences of Enoplometopus spp. collected in predators’ stomachs and for data on entire stomach collection.
Data used in this study were collected during various research projects, in particular THETIS, PROSPER, RAFFORM, and EU data collection program DCF-DCMAP. PROSPER Project was funded by EU FEP and by Région Réunion through grant No 34462, GERMON Project “No759/ DMSOI/2013” was funded by the European Fisheries Funds EU FEP (Programme Opérationnel des Fonds Européens pour la Pêche) 2013-2015 and EU FEP 2007-2013, Volet Réunion, Axe 3, Mesure 3.6, l’Etat français (BOP 205)) and by Région Réunion. Project RAFFORM was funded by EU FEP and Region Réunion (grant No 38279). Samples collected by scientific observers were supported by the European Union Data Collection Framework (DCF-DCMAP). Collection of specimens in Mauritius was undertaken as part of the PhD dissertation of Zahraah Dhurmeea which was funded by the ‘Allo pour Thaï’ (APTT) programme of the Institut de Recherche pour le Développement (IRD). We would like to acknowledge comments and suggestions of an anonymous referee that improved the paper.

Compliance with ethical standards
Conflict of Interest: The authors declare that they have no conflict of interest.

Ethical approval: No ethical issues were raised during our research.

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451

Records of Enoplometopidae decapodid stages in the pelagic environment

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*Responsible editor V.A. Spiridonov*