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## Stomatopods and decapods from Isla del Coco, Pacific Costa Rica

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**Abstract:** A summary of the available information on stomatopod and decapod diversity of Isla del Coco and records of recently collected species during the CIMAR-MarViva expedition (January 2007) as well as the presence of yet unpublished specimens deposited in the Museo de Zoología, Universidad de Costa Rica, is reported. The material of the CIMAR-MarViva expedition comprised 23 species, including nine species new for the island. Revision of the collection of the Museo de Zoología, including two unpublished records, revealed the presence of additional 12 decapod species not previously reported for the island. Overall, a total of 135 species (6 stomatopods and 129 decapods) has been reported so far for the island, which harbors 29.5% of all decapod species known to occur along the Pacific mainland of Costa Rica, and 16.3% of all decapods reported for the Panamic Province. The most diverse families (including  $\geq 10$  spp.) at Isla del Coco are Xanthidae (14 spp.), Majidae and Alpheidae (each 11 spp.), and Porcellanidae (10 spp.). There is a strong affinity of the stomatopod and decapod fauna of both Isla del Coco and Islas Galápagos. Rev. Biol. Trop. 56 (Suppl. 2): 79-97. Epub 2008 August 29.

**Key words:** biodiversity, decapod crustaceans, Islas Galápagos, eastern tropical Pacific, zoogeography.

Decapod crustaceans are prominent members of most marine, estuarine, freshwater and terrestrial ecosystems. Thus, not surprisingly, the presence of these crustaceans is fairly well documented for Isla del Coco and surrounding waters. Despite the fact that a considerable number of scientific expeditions stopped – on their way to Galápagos Island – at Isla del Coco (see Hertlein 1963, Hogue & Miller 1981; Wehrtmann & Cortés 2008, Cortés 2008), the published results of only a few of these expeditions have contributed substantially to our knowledge regarding these crustaceans: Faxon (1895) analyzed the decapods obtained during the explorations of the U.S. Fish Commission Steamer “Albatross” in 1891; Rathbun (1902) reported on *Brachyura* and *Macrura* collected around Isla del Coco during the Stanford Galápagos Expedition,

1898-1899; Boone (1930) commented on the decapod and stomatopod species collected during the cruises of the yachts “Eagle” and “Ara”, 1921-1928; and Haig (1960) described the porcellanids based on collections made by the Allan Hancock Expeditions, 1933-38, including material from Isla del Coco. More recently, Camp & Huck (1990) provided some additional records of stomatopods from Isla del Coco, and Zimmerman & Martin (1999) published on the brachyuran crabs (*Leucosiidae*, *Calappidae*, and *Parthenopidae*) of the island, including the description of two new species (*Osachila kaiserae* and *Thyrolambrus verucibrachium*). Wicksten & Vargas (2001) and Thoma *et al.* (2005) described a new species of *Thor* (Decapoda: Brachyura: Hippolytidae) and *Parapinnixa* (Decapoda: Brachyura: Pinnotheridae), respectively, from Isla del Coco.

While all of the previously mentioned studies refer to marine stomatopods and decapods, as far as we know there are only two publications specifically dealing with freshwater decapods: Villalobos (1959) and Abele & Kim (1984) reported the presence of four freshwater decapods from Isla del Coco, including the endemic *Macrobrachium cocoense*.

Here we summarize the available information concerning the diversity of stomatopods and decapods reported so far from Isla del Coco, and include records of additional species collected during the CIMAR–MarViva expedition to the island (2007). Moreover, we include new and yet unpublished records of species collected from Isla del Coco, deposited in the Museo de Zoología, Escuela de Biología, Universidad de Costa Rica. According to this inventory, a total of 133 species, 6 stomatopods and 127 decapods, are currently known to occur on and around Isla del Coco.

#### MATERIALS AND METHODS

The CIMAR–MarViva Expedition on board the vessel “Proteus” lasted from 10 – 22 January 2007. The collection around Isla del Coco was carried out between 13 and 16 January 2007. The material was obtained during a monitoring program of the coral reefs surrounding the island. The specimens were collected (1) by SCUBA in depths ranging from 15 – 21 m; (2) from rocky debris of coralline origin by SCUBA, which was subsequently washed and separated on board of the vessel, and (3) dredge trawling in depths from 50 – 60 m. Specimens were preserved in 70% ethanol and subsequently deposited in the Museo de Zoología, Escuela de Biología, Universidad de Costa Rica (UCR), in San José.

The other source of information was the collections of the Museo de Zoología of the UCR. Additionally, we included two more species based on unpublished material from Mary K. Wicksten (Texas A&M University, College Station, U.S.A.). We also examined the holding for stomatopods and decapods from Isla del Coco, and the present contribution includes all

those species, which were collected at the island, including those not previously published from this area.

#### RESULTS

A total of 23 species were collected during the expedition CIMAR–MarViva. Of these, 14 species had been previously reported from Isla del Coco, and nine species represent new records for the island (Table 1). Revision of the collection of the Museo de Zoología revealed the presence of additional 10 decapod species not previously reported for the island (Table 1). Finally, two more species were added based upon unpublished material kindly provided by Mary Wicksten.

**Stomatopoda.** Six species from five families have been reported from Isla del Coco (Table 2), including the endemic *Neocoronida cocosiana* (Manning, 1972). During the CIMAR–MarViva expedition, two species (*Neogonodactylus zaca* and *Pseudosquilla adialta*) were collected. Both species were known to occur around the island (Table 2).

**Decapoda.** Summarizing the available literature, a total of 106 species of decapods are known to occur at Isla del Coco and surrounding waters (Table 3). During the CIMAR – MarViva expedition, 23 decapod species were obtained of which nine species represent new records for Isla del Coco: one species of Caridea, two species of Anomura and six species of Brachyura (Table 1). Revision of the collections of the Museo de Zoología revealed 10 additional decapod species not previously reported for the island. Thus, the updated decapod species list for Isla del Coco includes now a total of 129 species, including six endemic species. The most diverse families ( $\geq 5$  spp.) are: Xanthidae (14 spp.), Majidae (11 spp.), Porcellanidae (10 spp.), Alpheidae (11 spp.), Paguridae (7 spp.), Galatheididae and Palaemonidae (6 spp.), Diogenidae, Parthenopidae, Portunidae and Grapsidae (5 spp.).

TABLE 1  
*Stomatopod and decapod species collected during the CIMAR–MarViva expedition (2007)*

Family/Species	New record for Isla del Coco	Habitat	Catalogue number of MZUCR
<b>Stomatopoda</b>			
Family GONODACTYLIDAE <i>Neogonodactylus zaca</i> (Manning, 1972)		under and on coralline rocks	2489-08/2490-01/ 2481-08
Family PSEUDOSQUILLIDAE <i>Pseudosquilla adiaxalta</i> Manning, 1964		on coralline rocks	2481-02
<b>Caridea</b>			
Family PALAEMONIDAE <i>Brachycarpus biunguiculatus</i> (Lucas, 1899)		on coralline rocks	2488-04
Family ALPHEIDAE * <i>Alpheus bellimanus</i> Lockington, 1877	X	on coralline rocks	1736-01/ 1741-01/ 1835-01
** <i>Alpheus grahami</i> Abele, 1975	X	coral slabs, rocky crevices	M.K. Wicksten, com. pers.
<i>Synalpheus</i> sp.	X		2481-05
Family HIPPOLYTIDAE ** <i>Lysmata galapagensis</i> Schmitt, 1924	X	coral slabs, rocky crevices	M.K. Wicksten, com. pers.
<i>Thor cocoensis</i> Wicksten & Vargas, 2001		on coralline rocks	2488-06
<b>Anomura</b>			
Family DIOGENIDAE <i>Dardanus sinistripes</i> (Stimpson, 1859)	X	shells, debris	2486-01
Family PAGURIDAE <i>Iridopagurus occidentalis</i> (Faxon, 1893)		shells, debris	2483-01/ 2485-01
Family PORCELLANIDAE <i>Pachycheles biocellatus</i> (Lockington, 1868)		under rocks	2480-04
<i>Petrolisthes glasselli</i> Haig, 1957		under and on coralline rocks	2480-05/ 2488-03/ 2489-04
Family ALBUNEIDAE <i>Albunea lucacia</i> (de Saussure, 1853)	X	sand, debris	2487-04
<b>Brachyura</b>			
Family DROMIIDAE <i>Hypoconcha panamensis</i> Smith, 1869		shells, debris	2486-01
Family RANINIDAE <i>Ranilia fornicata</i> Faxon, 1893		<i>Lovenia</i> sp. (Echinodermata), debris	2484-01
Family MAJIDAE <i>Herbstia tumida</i> (Stimpson, 1871)		under and on coralline rocks	2480-02/ 2481-01
<i>Microphrys branchialis</i> Rathbun, 1892		sand, debris	2487-01
<i>Teleophrys cristulipes</i> Stimpson, 1860		under and on coralline rocks	2480-03/ 2482-02/ 2489-03

TABLE 1 (Continued)  
*Stomatopod and decapod species collected during the CIMAR–MarViva expedition (2007)*

Family/Species	New record for Isla del Coco	Habitat	Catalogue number of MZUCR
Family PORTUNIDAE			
* <i>Callinectes arcuatus</i> Ordway, 1863	X	rock pools	2259-08
<i>Portunus brevipennis</i> (Faxon, 1895)		sand, debris	2487-02
Family XANTHIDAE			
* <i>Cycloxanthops vittatus</i> (Stimpson, 1860)	X	on coralline rocks	1632-01
* <i>Domecia hispida</i> Eydoux & Souleyet, 1842	X	on <i>Pocillopora</i>	1063-02/ 1933-05
* <i>Lophoxanthus lamellipes</i> (Stimpson, 1860)	X	under rocks; intertidal	2253-04
<i>Microcassiope xantusii</i> (Stimpson, 1871)	X	on coralline rocks	2481-04/ 2489-06
<i>Nanocassiope polita</i> (Rathbun, 1893)		on coralline rocks s	2489-01
<i>Paractaea sulcata</i> (Stimpson, 1860)	X	on coralline rocks	2481-03/ 2488-05
<i>Pilumnus gonzalensis</i> Rathbun, 1893	X(Golfo de California and southern Pacific Costa Rica, now including Isla del Coco)	under rocks	2480-01
<i>Platyactaea dovi</i> (Stimpson, 1871)	X	on coralline rocks	2481-01
* <i>Trapezia digitalis</i> Latreille, 1828	X	on <i>Pocillopora</i>	1933-01
* <i>Xanthodius sternberghii</i> Stimpson, 1859	X	under rocks; intertidal	2259-02/ 2261-01/ 2397-04
<i>Xanthodius stimpsoni</i> (Milne Edwards, 1879)	X	under intertidal rocks; on coralline rocks	2488-01 / 2253-03
Family GRAPSIDAE			
* <i>Geograpsus lividus</i> (Milne Edwards, 1837)	X	under rocks; intertidal	2397-01
* <i>Grapsus grapsus</i> (Linnaeus, 1758)	X	on rocks	624-01
* <i>Pachygrapsus transversus</i> (Gibbes, 1850)	X	on rocks; intertidal	2253-05/ 2259-07/ 2397-06/ 2401-03
Family PINNOTHERIDAE			
<i>Tetrias scabripes</i> Rathbun, 1918	X(Cerralvo Channel and other localities, south to Mita Point, Gulf of California, now including Isla del Coco)	shells, debris	2486-05

a) new records (and range extensions) for Isla del Coco, b) unpublished records based on material deposited (\*) in the Museo de Zoología, Universidad de Costa Rica (MZUCR), and c) two species added by M.K. Wicksten (\*\*)

TABLE 2  
Stomatopod species reported for Isla del Coco

Family/Species	World distribution <sup>1</sup>	Distribution on oceanic islands <sup>2</sup>	Endemic to island	Distribution in Costa Rica <sup>3</sup>	References <sup>4</sup>
Family GONODACTYLLIDAE					
<i>*Neogonodactylus zacaе</i> (Manning, 1972)	ETP	G,R		PCR,IC	58,60,72,76
Family PSEUDOSQUILLIDAE					
<i>*Pseudosquillisma adialstalta</i> Manning, 1964	ETP	CL,G		PCR,IC	58,50,60,76
Family CORONIDIDAE					
<i>Coronida schmitti</i> Manning, 1976	ETP	G		IC	46, 76
<i>Neocoronida cocosiana</i> (Manning, 1972)	ETP		X	IC	76
Family TETRASQUILLIDAE					
<i>Tetrasquilla mccullochae</i> (Schmitt, 1940)	Ct	-		PCR,IC	27,58,59, 61, 62, 72
Family SQUILLIDAE					
<i>Crenatosquilla oculinova</i> (Glassell, 1942)	ETP	-		PCR,IC	58,50,62,76

\* = species collected during the CIMAR– MarViva expedition (2007)

<sup>1</sup> Ct: Circumtropical; ETP: eastern tropical Pacific

<sup>2</sup> CL: Clipperton Island; G: Islas Galápagos; R: Isla Revillagigedo

<sup>3</sup> IC: Isla del Coco, PCR: Pacific of Costa Rica

<sup>4</sup> References are indicated by numbers according to the references list.

TABLE 3  
Updated list of decapod species reported from Isla del Coco

Family/Species	World distribution	Distribution on oceanic islands <sup>2</sup>	Endemic to Isla del Coco	Distribution in Costa Rica <sup>3</sup>	References <sup>4</sup>
Family PENAEIDAE					
<i>Pelagopenaeus balboae</i> (Faxon, 1893)	Car,EA,ETP,WP	-		IC type locality	17,18,67
Family SICYONIIDAE					
<i>Sicyonia affinis</i> Faxon, 1893	ETP	M		PCR,IC	37,39,42,77
<i>Sicyonia disedwardsi</i> (Burkenroad, 1934)	ETP	-		PCR,IC	37,42,77
Family SOLENOCERIDAE					
<i>Hymenopenaeus doris</i> (Faxon, 1893)	ETP	-		IC, PCR	17,18,67,77,85
<i>Hymenopenaeus nereus</i> (Faxon, 1893)	ETP	G		PCR,IC	17,18,77,85
Family OPLOPHORIDAE					
<i>Meningodora mollis</i> Smith, 1882	ETP,IP,NEP,WA	G		IC	47,77

TABLE 3 (Continued)  
 Updated list of decapod species reported from Isla del Coco

Family/Species	World distribution	Distribution on oceanic islands <sup>2</sup>	Endemic to Isla del Coco	Distribution in Costa Rica <sup>3</sup>	References <sup>4</sup>
Family NEMATOCARCINIDAE					
<i>Nematocarcinus agassizzi</i> Faxon 1893	ETP	G,M		IC	18,83,85
<i>Nematocarcinus ensifer</i> (Smith, 1882)	EA,ETP,WA	G		IC	18,83
Family ATYIDAE					
<i>Archaeatya chacei</i> Villalobos, 1959	ETP	-		PCR,IC	2
Family PALAEMONIDAE					
<i>Brachycarpus biunguiculatus</i> (Lucas, 1849)	Ct	G,GO, M,R		PCR,IC	49,77
<i>Harpiliopsis depressa</i> (Stimpson, 1860)	ETP,IP,RS	G, M,R		PCR,IC	77,84
<i>Macrobrachium americanum</i> Bate, 1868	ETP	G		PCR,IC	2,49,77
<i>Macrobrachium cocoensis</i> Abele & Kim, 1984	ETP		X	IC	2
<i>Macrobrachium hancocki</i> Holthuis,1952	ETP	G,GO		PCR,IC	2,49,83
<i>Palaemon ritteri</i> Holmes, 1895	ETP,NEP	G		PCR,IC	49,77,84
Family ALPHEIDAE					
** <i>Alpheus bellimanus</i> Lockington, 1877	ETP	CL,G		PCR	52,84
<i>Alpheus canalis</i> Kim & Abele, 1988	ETP	G,GO		PCR,IC	52,77,84
<i>Alpheus galapagensis</i> Sivertsen, 1933	ETP	G		PCR,IC	52,77,84, 85
*** <i>Alpheus grahami</i> Abele, 1975	ETP	M		IC	M.K. Wicksten, pers. comm.
<i>Alpheus hebes</i> Kim & Abele, 1988	ETP	G,GO,R		PCR,IC	52,77,84
<i>Alpheus longiquus</i> Kim & Abele, 1988	ETP	G,R		PCR,IC	52,77,84
<i>Alpheus lottini</i> Guérin-Méneville, 1829	PE,ETP,IP	CL,G,M,R		PCR,IC	52,77
<i>Alpheus pacificus</i> Dana, 1852	ETP,OI,IP,RS	CL,G,R		PCR,IC	52,77,84
<i>Alpheus saxidomus</i> Holthuis, 1980	ETP	G,GO		IC,PCR type locality	19,51,77,84

TABLE 3 (Continued)  
 Updated list of decapod species reported from Isla del Coco

Family/Species	World distribution	Distribution on oceanic islands <sup>2</sup>	Endemic to Isla del Coco	Distribution in Costa Rica <sup>3</sup>	References <sup>4</sup>
<i>Alpheus villus</i> Kim & Abele, 1988	ETP	-		IC	52,77,84
<i>Automate dolichognatha</i> De Man, 1888	ETP,RS,WA,WP	G,R		IC	82,85
Family HIPPOLYTIDAE					
*** <i>Lysmata galapagensis</i> Schmitt, 1924	ETP	G		IC	M.K. Wicksten pers. comm.
<i>Thor amboinensis</i> (De Man, 1888)	ETP,IP,WA	G		IC	77
<i>Thor cocoensis</i> Wicksten & Vargas, 2001	ETP	G		IC type locality	86
Family PROCESSIDAE					
<i>Processa peruviana</i> Wicksten, 1983	ETP	G		PCR,IC	77,80,83
Family PANDALIDAE					
<i>Heterocarpus hostilis</i> Faxon 1893	ETP	-		IC	17,18,39,85
Family CRANGONIDAE					
<i>Pontophilus gracilis occidentales</i> Faxon, 1893	ETP	-		IC	65
Family UPOGEBIIDAE					
<i>Pomatogebia cocosa</i> (Williams, 1986)	ETP	-	X	IC type locality	40,55,77,87
Family POLYCHELIDAE					
<i>Stereomastis nana</i> (Smith, 1884)	C	-		IC	18,83
Family PALINURIDAE					
<i>Panulirus gracilis</i> Streets, 1871	ETP	-		PCR,IC	39,40,86,77
<i>Panulirus penicillatus</i> Olivier, 1791	ETP,IP	CL,G,M		PCR,IC	39,40,86,77
Family COENOBITIDAE					
<i>Coenobita compressus</i> Milne Edwards, 1837	ETP	G,R		PCR,IC	4,8,9,10,73,78
Family DIOGENIDAE					
<i>Allodardanus rugosus</i> Haig & Provenzano, 1965	ETP	-	X	IC type locality	34,78
<i>Calcinus explorator</i> Boone, 1930	ETP	G		IC	8,73,78
<i>Cancellus tanneri</i> Faxon, 1893	ETP	G	X	IC type locality	17,78



TABLE 3 (Continued)  
 Updated list of decapod species reported from Isla del Coco

Family/Species	World distribution	Distribution on oceanic islands <sup>2</sup>	Endemic to Isla del Coco	Distribution in Costa Rica <sup>3</sup>	References <sup>4</sup>
<i>*Dardanus sinistripes</i> (Stimpson, 1859)	ETP	G		PCR	62,73,78
<i>Paguristes fecundus</i> Faxon, 1893	ETP	M		IC type locality	17,78
Family LITHODIDAE					
<i>Neolithodes diomedae</i> (Benedict, 1894)	ETP,NEP, SEP	-		IC	18,56,78
<i>Paralomis longipes</i> Faxon, 1893	SEP	-		IC	31,47,66,78, 83
Family PAGURIDAE					
<i>Catapagurus diomedae</i> Faxon, 1893	ETP	-		IC	18,47,78
<i>Enallopaguropsis janetae</i> McLaughlin, 1982	ETP		X	IC type locality	47,64,78
<i>Iridopagurus occidentalis</i> Faxon, 1893	ETP	-		IC	17,18,20,53,78
<i>Manucomplanus longimanus</i> (Faxon, 1893)	ETP	-		IC	17,54,78
<i>Pagurus virgulatus</i> Haig & Harvey	ETP	-		PCR,IC	33,78
<i>Phimochirus californiensis</i> (Benedict, 1892 )	ETP	G		PCR,IC	35,63,78
<i>Rhodochirus hirtimanus</i> (Faxon, 1893)	ETP	G		IC	18,63,78
Family PARAPAGURIDAE					
<i>Probeebei mirabilis</i> Boone, 1926	ETP	-		IC	6,78,83
Family GALATHEIDAE					
<i>Munida perlata</i> Benedict, 1902	ETP	G		PCR,IC	18,45,66,78, 83
<i>Munida refulgens</i> Faxon, 1893	ETP	M		PCR,IC	5,18,45,78,83
<i>Munidopsis aspera</i> (Henderson, 1885)	PE	-		IC	18,78,83
<i>Munidopsis nitida</i> (A. Milne Edwards, 1880)	ETP,NEP	-		IC	3b,18,78,83
<i>Munidopsis diomedae</i> (Faxon, 1893)	PE	-		IC	18,78,83
<i>Munidopsis vicina</i> Faxon, 1893	ETP	-		IC	18,48,83

TABLE 3 (Continued)  
 Updated list of decapod species reported from Isla del Coco

Family/Species	World distribution	Distribution on oceanic islands <sup>2</sup>	Endemic to Isla del Coco	Distribution in Costa Rica <sup>3</sup>	References <sup>4</sup>
Family PORCELLANIDAE					
<i>Pachycheles biocellatus</i> (Lockington, 1878)	ETP	CL,G,M,R		PCR,IC	26,29,78,81
<i>Pachycheles velerae</i> Haig, 1960	ETP,SEP	G		IC	29,36,78
<i>Petrolisthes cocoensis</i> Haig, 1960	ETP	-	X	IC type locality	65
<i>Petrolisthes edwardsii</i> (de Saussure, 1853)	ETP	G,R		PCR,IC	26,29,30,78,81
<i>Petrolisthes glasselli</i> Haig, 1957	ETP	CL,G,GO,M,R		PCR,IC	27,29,30,78
<i>Petrolisthes haigae</i> Chace, 1962	ETP	CL,G,M,R		PCR,IC	13,26,78
<i>Petrolisthes ortmanni</i> Nobili, 1901	ETP	-		PCR,IC	3a,29,78
<i>Petrolisthes tonsorius</i> Haig, 1960	ETP	G,M,R		PCR,IC	29,30,78
<i>Porcellana cancrisocialis</i> Glassell, 1936	ETP	-		PCR,IC	27,29,30,78
<i>Porcellana paguriconviva</i> Glassell, 1936	ETP	-		PCR,IC	27,29,30,78
Family ALBUNEIDAE					
* <i>Albunea lucacia</i> (de Saussure, 1853)	ETP	-		PCR	78
Family HIPPIDAE					
<i>Hippa pacifica</i> (Dana, 1852)	ETP	CL,G,GO		PCR,IC	7,16,32,78
BRACHYURA					
Family DROMIIDAE					
<i>Hipoconcha panamensis</i> Smith, 1869	ETP	G,R		PCR	24,71,80
Familia DYNOMENIDAE					
<i>Dynomene ursula</i> Stimpson, 1860	ETP	CL,G,M,R		PCR,IC	24,66
Family RANINIDAE					
<i>Ranilia fornicata</i> Faxon, 1893	ETP	G,R		IC	17,18,43,71
Family DORIPPIDAE					
<i>Ethusa lata</i> Rathbun, 1893	ETP	G		PCR,IC	24, 38,62,71,80
<i>Ethusina smithiana</i> Faxon, 1893	ETP	M		IC	18,41,71,83

TABLE 3 (Continued)  
 Updated list of decapod species reported from Isla del Coco

Family/Species	World distribution	Distribution on oceanic islands <sup>2</sup>	Endemic to Isla del Coco	Distribution in Costa Rica <sup>3</sup>	References <sup>4</sup>
Family CALAPPIDAE					
<i>Calappa convexa</i> de Saussure, 1853	ETP	G		PCR,IC	24,43,71,80,89
<i>Calappa saussurei</i> Rathbun, 1898	ETP	-		PCR,IC	24,43,71,80,89
<i>Cryptosoma bairdii</i> (Stimpson, 1860)	ETP,WA	G,R		PCR,IC	43,71,80,89
<i>Osachila kaiserae</i> Zimmerman & Martin, 1999	ETP	-		PCR,IC	24,66,89
Family LEUCOSIIDAE					
<i>Ebalia clarionensis</i> Rathbun, 1935	ETP	CL		IC	89
Family MAJIDAE					
<i>Euprognatha bifida</i> Rathbun, 1893	ETP	R		PCR,IC	21,44
<i>Euprognatha granulata</i> Faxon, 1893	ETP	G		IC	17,18,21,50
<i>Herbstia tumida</i> (Stimpson, 1871)	ETP	R		PCR,IC	21,44,80
<i>Lissa tuberosa</i> Rathbun, 1898	ETP	M,R		IC	21,44
<i>Mithrax denticulatus</i> Bell, 1835	ETP,NEP	-		PCR,IC	14,21,44
<i>Mithrax spinipes</i> (Bell, 1835)	ETP	G		IC	21,44
<i>Podochela hemphilli</i> (Lockington, 1877)	EA,ETP,NEP	R		IC	21,44
<i>Sphenocarcinus agassizi</i> Rathbun, 1893	ETP	G		PCR,IC	21,44,80
<i>Stenocionops ovata</i> (Bell, 1835)	ETP	G		PCR,IC	44
<i>Stenorhynchus debilis</i> (Smith, 1871)	ETP,SEP	G,R		PCR,IC	21,44
<i>Teleophrys cristulipes</i> Stimpson, 1860	ETP	-		PCR,IC	21,44
Family AETHRIDAE					
<i>Aethra scutata</i> Smith, 1869	ETP	G,R		PCR,IC	89
Family PARTHENOPIDAE					
<i>Celatopesia hassleri</i> (Rathbun, 1925)	ETP	-		PCR,IC	18,21,44

TABLE 3 (Continued)  
 Updated list of decapod species reported from Isla del Coco

Family/Species	World distribution	Distribution on oceanic islands <sup>2</sup>	Endemic to Isla del Coco	Distribution in Costa Rica <sup>3</sup>	References <sup>4</sup>
<i>Parthenope exilipes</i> (Rathbun, 1893)	ETP	G,R		PCR,IC	21,22,44
<i>Solenolambrus arcuatus</i> Stimpson, 1871	ETP	G,R		PCR,IC	21,22,44,89
<i>Thyrolambrus verrucibrachium</i> Zimmerman & Martin, 1999	ETP	R		PCR,IC	21,44,69,89
<i>Thyrolambrus glasselli</i> Garth, 1958	ETP	R		PCR,IC	21,44
Family DALDORFIIDAE					
<i>Daldorfia garthi</i> Glassell, 1940	ETP	G		PCR,IC	21,22,44,89
Family PORTUNIDAE					
<i>Arenaeus mexicanus</i> (Gerstaecker, 1856)	ETP	-		PCR,IC	25,41
** <i>Callinectes arcuatus</i> Ordway, 1863	ETP,NEP	G		PCR	41,88
<i>Euphylax dovii</i> Stimpson, 1860	ETP	-		PCR,IC	25,41
<i>Portunus brevimanus</i> (Faxon, 1895)	ETP	R		IC	51
<i>Portunus xantussi affinis</i> (Faxon, 1893)	ETP	G,R		PCR,IC	51
Family XANTHIDAE					
** <i>Cycloxanthops vittatus</i> (Stimpson, 1860)	ETP	CL,G,R		PCR	22,70
** <i>Domecia hispida</i> Eydoux & Souleyet, 1842	ETP,IP,Med	CL,G,R		PCR	22,70
<i>Eriphia squamata</i> Stimpson, 1859	ETP,SEP	G		PCR,IC	14,70
<i>Liomera cinctimana</i> (White, 1847)	ETP,IP	CL,G,GO,M		PCR,IC	41
** <i>Lophoxanthus lamellipes</i> (Stimpson, 1860)	ETP	G,R		PCR	41
* <i>Microcassiope xantusii</i> (Stimpson, 1871)	ETP	CL,G,R			
* <i>Nanocassiope polita</i> (Rathbun, 1893)	ETP	G,R		IC	18,23,28,70
** <i>Ozius perlatus</i> Stimpson, 1860	ETP	G,M,R		PCR	41

TABLE 3 (Continued)  
 Updated list of decapod species reported from Isla del Coco

Family/Species	World distribution	Distribution on oceanic islands <sup>2</sup>	Endemic to Isla del Coco	Distribution in Costa Rica <sup>3</sup>	References <sup>4</sup>
<i>*Platyactaea dovii</i> (Stimpson, 1871)	ETP	CL,G		PCR	30,41,66
<i>Quadrella nitida</i> Smith, 1869	ETP	G,M		PCR,IC	23,66,70
<i>**Trapezia digitalis</i> Latreille, 1828	ETP	CL,G,GO,R		PCR	12
<i>Trapezia ferruginea</i> Latreille, 1828	ETP, WP	CL,G,M,R		PCR,IC	12
<i>**Xanthodius sternberghii</i> Stimpson, 1859	ETP	-		PCR	14,66,70
<i>*Xanthodius stimpsoni</i> (Milne Edwards, 1879)	ETP	R		PCR	14,26
Family GECARCINIDAE					
<i>Gecarcinus (Johngarthia) planatus</i> Stimpson, 1898	ETP	CL,GO,R		IC	9,10,75, 79
Family GRAPSIDAE					
<i>Armases angustum</i> (Smith, 1870)	ETP	-		IC	1
<i>**Geograpsus lividus</i> (Milne Edwards, 1837)	Car,ETP,NEP, SEP, WA,WP	CL,G,R		PCR	14,68
<i>**Grapsus grapsus</i> (Linnaeus, 1758)	Car,EA,ETP,NEP,SEP, WA	CL,G,M,R		PCR	14,68
<i>**Pachygrapsus transversus</i> (Gibbes, 1850)	Ct	G,R		PCR	14,68
<i>Plagusia immaculata</i> Lamarck, 1818	IP,ETP	G		PCR,IC	41,68
Family PINNOTHERIDAE					
<i>Parapinnixa cortesi</i> Thoma, Heard & Vargas, 2005	ETP	-	X?	IC	74
<i>*Tetrias scabripes</i> Rathbun, 1918	ETP	-	-	-	41
Family OCYPODIDAE					
<i>Ocypode gaudichaudii</i> Milne Edwards & Lucas, 1843	ETP,SEP	G		PCR	41
<i>Uca panamensis</i> (Stimpson, 1859)	ETP	-		PCR,IC	15

TABLE 3 (Continued)  
*Updated list of decapod species reported from Isla del Coco*

Family/Species	World distribution	Distribution on oceanic islands <sup>2</sup>	Endemic to Isla del Coco	Distribution in Costa Rica <sup>3</sup>	References <sup>4</sup>
Family PALICIDAE					
<i>Palicus fragilis</i> Rathbun, 1893	ETP	G		IC	18,68

a) species collected during the CIMAR– MarViva expedition (2007) (\*), b) new records based on material deposited in the Museo de Zoología, Escuela de Biología, Universidad de Costa Rica, (\*\*), and c) two species added by M.K. Wicksten (\*\*\*)

<sup>1</sup> EA: eastern Atlantic; WA: western Atlantic; C: cosmopolitan; Car: Caribbean; Ct: Circumtropical; IP: Indo Pacific; Med: Mediterranean; RS: Red Sea; NEP: northeast Pacific; SEP: southeast Pacific; ETP: eastern tropical Pacific; WP: western Pacific

<sup>2</sup> CL: Clipperton Island; G: Islas Galápagos; GO: Islas Gorgonas; R: Isla Revillagigedo; M: Isla Malpelo

<sup>3</sup> IC: Isla del Coco, PCR: Pacific of Costa Rica

<sup>4</sup> References are indicated by numbers according to the references list.

**Range extension.** The brachyurans *Tetrias scabripes* Rathbun, 1918, and *Pilumnus gonzalensis* Rathbun, 1893, have been reported previously only from Cerralvo Channel and other localities, south to Mita Point, Golfo de California, and from the Golfo de California to the southern mainland of Costa Rica, respectively (Hendrickx 1995c). The known geographic distribution of both species includes now Isla del Coco.

## DISCUSSION

The revision of (a) the material collected by the CIMAR-MarViva expedition, (b) the collections of the Museo de Zoología, UCR, and (c) the published records revealed the presence of a total of 6 stomatopods and 129 decapods reported so far for Isla del Coco (Table 4). The number of decapod crustaceans reported for the island increased from 104 (Vargas & Wehrmann, 2008) to 129 (25 spp.; 24%). The total number of decapods is actually slightly higher due to the discovery of several species new for the island which currently are being analyzed (R. Vargas, unpubl. data). In contrast, no stomatopods species new for Isla del Coco were found.

Isla del Coco harbors 29.5% of all decapod species reported so far from the Pacific coast of Costa Rica (437 spp.: Vargas & Wehrmann, 2008), and 16.3% of decapod crustaceans reported for the Panamic Province (Boschi 2000). When compared to mainland Costa Rica, species diversity of stomatopods and decapods from Isla del Coco represents 20.0% (Stomatopoda) and 30.2% (Caridea) (Table 5). On the other hand, Isla del Coco shares a high percentage of species with the Pacific mainland of Costa Rica (Table 5): 80% for porcellanid crabs, and 46.6% for the brachyuran crabs.

The most diverse decapod families are the same in both Isla del Coco and the Pacific mainland of Costa Rica (Vargas & Wehrmann, 2008): Xanthidae is the family with the highest number of species (Isla del Coco: 14 spp.;

TABLE 4  
*Species of stomatopods and decapods reported for Isla del Coco by order, family and genus*

Order	families	genera	species
Stomatopoda	5	6	6
Decapoda	41	93	129
TOTAL	46	99	135

TABLE 5  
*Stomatopod and decapod species reported from Isla del Coco (IC; including endemic species),  
 Pacific mainland of Costa Rica (PM), and Islas Galápagos (IG)*

Taxon	Isla del Coco				IG	PM
	total	endemic	shared with IG	shared with PM		
Stomatopoda	6	1	3	4	4	30
Caridea	26	1	21	12	58	86
Porcellanidae	10	1	6	8	12	41
Brachyura	58	1?	27	27	120	203

Number of shared species was computed from (Garth 1991), Harvey (1991), Wicksten (1991), and Hickman and Zimmerman (2000)

mainland: 45 spp.), followed by Majidae (11 and 43 spp.), Alpheidae (11 and 34 spp.), and Porcellanidae (10 and 44 spp.)

In comparison to Islas Galápagos, species numbers from Isla del Coco are substantially lower for caridean shrimps and brachyuran crabs (Table 5). Many of the caridean shrimps present at Islas Galápagos belong to the family Palaemonidae (Wicksten 1991), comprising relatively small and cryptic species, inhabiting rocky zones in shallow and low energy water. Many of these are known to occur in association with soft corals (e.g., *Pacifigorgia symbiotica* Williams & Breedy, 2004). In contrast, at Isla del Coco there are only a few shallow-water areas with rocky substrates, most of them characterized by high energy wave impact; and soft corals are less abundant, although soft coral diversity of deepwater areas around the islands have not been studied yet (O. Breedy, pers. comm.). These differences might explain the relatively low number of caridean species reported for Isla del Coco when compared to Islas Galápagos. Why brachyuran crabs are clearly more diverse at Islas Galápagos needs further attention, but this may be related to the greater extension and variability of habitats at Islas Galápagos. Here we report the presence of 17 crabs species new for the island, and we assume that future studies, employing different sampling techniques (including rock washing), will further increase the number of crab species and reduce the difference between both oceanic islands.

The diversity of stomatopod and decapod species from Isla del Coco shows strong affinities with that from Islas Galápagos, at least for those groups, for which information is available (Table 5). Most caridean shrimps species (81% or 21 spp.), and many Brachyura (46.6%) and Porcellanidae (60.0%) occur also on Islas Galápagos. The strong faunal affinity between both oceanic islands might be related to the fact that they are located in the same oceanic current system (Chavez & Brusca 1991, Kessler 2006); these currents transport planktonic early life stages throughout the eastern tropical Pacific, and Isla del Coco and Islas Galápagos represent the first possible settlement areas on their path to the coasts of Central and northern South America (Harvey 1991, Wicksten 1991, Cortés 1997).

In summary, Isla del Coco is characterized by a high diversity of stomatopods and decapods. We are convinced that the inventory of these species is far from completed. Dredging efforts in the vicinity of the island and in deeper waters using sampling techniques designed to collect cryptic species will probably result in a considerable increase of species numbers.

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## RESUMEN

La presente contribución resume la información disponible sobre la diversidad de los estomatópodos y decápodos de la Isla del Coco, e incluye informes de especies recolectadas recientemente durante la expedición CIMAR-MarViva (enero del 2007) como también la presencia de especímenes de la Isla del Coco en el Museo de Zoología, Universidad de Costa Rica, no publicados. El material de la expedición CIMAR-MarViva comprendió 23 especies, incluyendo nueve especies nuevas para la isla. La revisión de la colección del Museo más la inclusión de dos especies no informadas, reveló adicionalmente la presencia de 12 especies de decápodos. En conjunto, un total de 135 especies (6 estomatópodos y 129 decápodos) ha sido informado hasta el momento para la isla, la cual contiene 29.5% de todas las especies de decápodos conocidas para la costa del Pacífico de Costa Rica y el 16.3% de todas las especies de decápodos informadas para la Provincia Panámica. Las familias más diversas (incluyendo  $\leq 10$  spp.) en la Isla del Coco son Xanthidae (14 spp.), Majidae y Alpheidae (11 spp. cada una) y Porcellanidae (10 spp.). Hay una fuerte afinidad de la fauna de estomatópodos y decápodos entre la Isla del Coco e Islas Galápagos.

**Palabras clave:** biodiversidad, crustáceos decapados, Islas Galápagos, Pacífico Tropical Oriental, zoogeografía.

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