

Composition and Zoogeographical Affinities of the Stomatopod and Decapod Crustacean Fauna Collected During The Ceemex P4 Cruise in the Gulf of Tehuantepec, Mexico

by Michel E. HENDRICKX & Laura A. VÁZQUEZ-CUREÑO

Abstract

The CEEMEX-P4 cruise represented the first sampling expedition to the Gulf of Tehuantepec within the frame of a comprehensive project aimed at the study of demersal resources associated with major shrimp (Penaeidae) fishing grounds off the coast of western Mexico. The material was collected in March-April 1991, aboard the R/V "El Puma" (ICML, UNAM). A total of 29 stations were occupied and samples of invertebrates and fishes were obtained with three types of gear: an 80-foot shrimp trawl, a Mediterranean bottom trawl and a modified Agassiz dredge. Fifty-two species and subspecies of macro-crustaceans were collected; these included 6 species of stomatopods, and 46 species or subspecies of decapod crustaceans (10 Penaeoidea, 3 Caridea, 2 Palinura, 2 Anomura, and 29 Brachyura). As many as 16 species had never been reported previously in the literature for the Gulf of Tehuantepec. Figures available for stomatopods are close to those reported in literature for areas located off the coast of Sinaloa and Nayarit (SE of Gulf of California), in the Gulf of Tehuantepec, Mexico, and in the Gulf of Nicoya, Costa Rica. When compared to what is known of subtidal decapods, however, number of species is comparatively lower in the Gulf of Tehuantepec than in the SE Gulf of California where as many as 107 species, including only a few cryptic species, have been collected. As far as distribution is concerned, the following results were obtained: 1) all species, except one, have previously been recognized as members of the crustacean fauna of the tropical east Pacific; 2) all stomatopods present a distribution ranging from the Gulf of California, Mexico, to Peru, except for *Lysiosquilla panamica*; 3) most species of decapod are also known from the Gulf of California (or even from further north) to Peru (or even further south), but two species have never been found south of the Gulf of Panama; one does not seem to range south of Nicaragua; two are known south to Gorgona Island, Colombia; seven have never been reported further south than Ecuador; and two have their currently known southernmost limit in the Gulf of Tehuantepec.

Key-words: Stomatopod and decapod crustaceans; Gulf of Tehuantepec, Mexico; shelf fauna; distribution.

Résumé

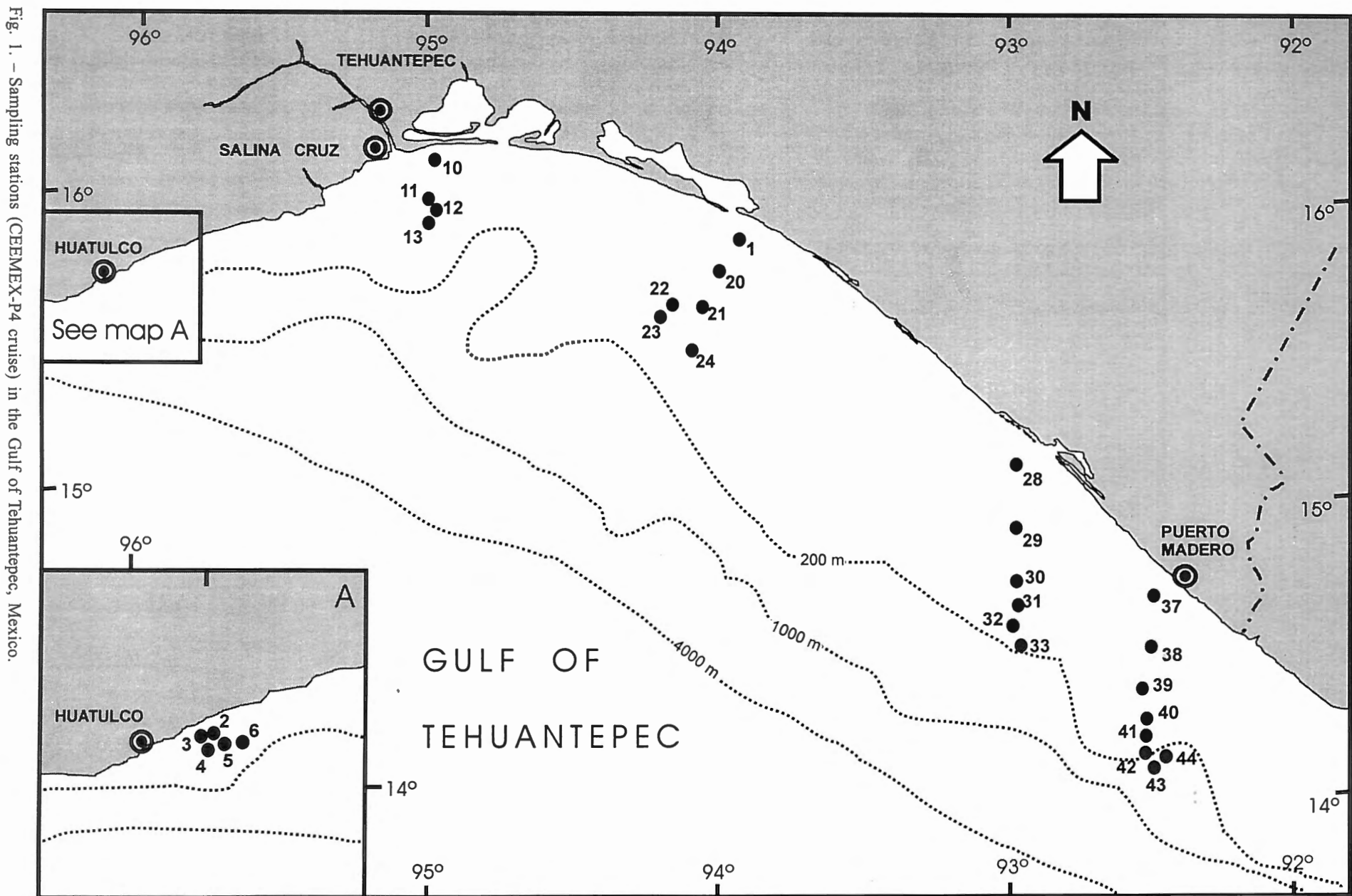
Réalisée en mars et avril de 1991, la croisière CEEMEX-P4 representa la première campagne d'échantillonnages réalisée dans le cadre d'un programme d'étude intégral de la faune marine du golfe de Tehuantepec. Le but de ce programme était

l'étude des ressources démersales associées aux principales zones de pêches de crevettes Penaeidae de la côte ouest du Mexique. Les pêches furent réalisées par le R/V "El Puma" (ICML, UNAM) dans 29 stations. Les échantillons d'invertébrés et de poissons furent obtenus à l'aide de trois types d'engins de pêche: un chalut à crevettes de 80 pieds, un chalut type "Méditerranée" et une drague de fond type "Agassiz". Cinquante-deux espèces et sous-espèces de macro-crustacés furent capturées, comprenant 6 espèces de stomatopodes ainsi que 46 espèces ou sous-espèces de crustacés décapodes (10 Penaeoidea, 3 Caridea, 2 Palinura, 2 Anomura, et 29 Brachyura). En tout, 16 espèces n'avaient jamais été citées antérieurement dans la littérature pour la région du golfe de Tehuantepec. Le nombre d'espèces de stomatopodes obtenues est comparable à celui cité pour la région qui correspond aux côtes de Sinaloa et de Nayarit (SE du golfe de Californie), pour le golfe de Tehuantepec, Mexique, et pour le golfe de Nicoya, Costa Rica. Au contraire, en ce qui concerne les décapodes de la plate-forme, le nombre d'espèces est comparativement inférieur dans le golfe de Tehuantepec que dans la région du SE du golfe de Californie, où 107 espèces sont connues, y-comprises quelques espèces cryptiques. En ce qui concerne la distribution géographique des espèces récoltées, on note que: 1) toutes les espèces, sauf une, font partie de la faune de crustacés de la région du Pacifique est tropical; 2) tous les stomatopodes présentent une distribution qui s'étend depuis le golfe de Californie, Mexique, jusqu'au Pérou, sauf dans le cas de *Lysiosquilla panamica*; 3) la plupart des espèces de décapodes son aussi connues depuis le golfe de Californie (et parfois plus au nord) jusqu'au Pérou (et parfois plus au sud), mais deux espèces n'ont jamais été récoltées au sud du golfe du Panama; une espèce ne semble pas s'étendre plus au sud que le Nicaragua, deux sont citées au sud de l'île Gorgona, Colombie, sept d'entre-elles n'ont jamais été rapportées au sud de l'Equateur, et deux espèces ont leur limite sud de distribution dans le golfe de Tehuantepec.

Mots-clefs: Crustacés stomatopodes et décapodes; golfe de Tehuantepec, Mexique; faune de la plate-forme; distribution.

Introduction

Offshore fisheries along the Pacific coast of Mexico are based primarily on the exploitation of shrimps of the genera *Litopenaeus* and *Farfantepenaeus* fishing grounds in the southeastern Gulf of California, the Gulf of Tehuantepec, and, to a lesser extend, the northern Gulf of California



and off Magdalena Bay, Baja California (RODRIGUEZ DE LA CRUZ, 1981a, 1981b; HENDRICKX, 1985). Each of these areas has been subject to various studies, mostly aimed at obtaining faunistic checklists that could serve as the basic tool for further fisheries or ecological studies. However, only part of the results obtained during these studies have been made available through scientific publications.

Until this date, there is no comprehensive study available for any group of marine invertebrates from the Gulf of Tehuantepec. The only information on subtidal macrocrustaceans is that published as results of a 1979 survey organized by the "Secretaria de Marina", Mexico, which reported on 32 species of stomatopod and decapod crustaceans collected during a single cruise (SOSA-HERNANDEZ et al., 1980). A large amount of additional, unpublished information, however, exists for the area (HERNÁNDEZ-AGUILERA, pers. com.) and has been used in part (list of species) to compare the biodiversity of decapod crustaceans with that from the Gulf of California, located at a much higher latitude along the west coast of Mexico (HENDRICKX & HERNÁNDEZ-AGUILERA, 1992). Figures indicated that the number of species of decapod crustaceans in the Gulf of Tehuantepec is much lower than in the Gulf of California.

The CEEMEX cruises were part of an extensive project sponsored by the European Economic Community (EEC), and originally designed by the Instituto de Ciencias del Mar, Barcelona, España, and the Universidad Autónoma de Sinaloa, México. The main objective was to establish a scientific basis for restructuring of shelf fisheries along the Pacific coast of Mexico (southeastern Gulf of California and Gulf of Tehuantepec) (ANONYMOUS, 1993). In this context, the CEEMEX-P4 cruise represented the first sampling expedition to the Gulf of Tehuantepec. The purpose of this paper is to provide baseline data on the stomatopod and decapod crustaceans that were captured during this cruise, and to compare the composition of Gulf decapods and stomatopods with that of the eastern tropical Region.

Material and Methods

The material on which the present study is based was collected in March-April 1991 in the Gulf of Tehuantepec, southwestern Mexico (Fig. 1), during the CEEMEX-P4 cruise aboard the R/V "El Puma" of the Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México. A total of 29 stations were visited (Fig. 1). Samples of invertebrates and fishes were obtained using three types of gear (see ANONYMOUS, 1993). Trawling operations were made either with a common 80-foot shrimp trawl similar to the one used by shrimpers in the area or with a Mediterranean bottom trawl similar to the one used in the Mediterranean fisheries. Dredging was made with a modified Agassiz dredge (ca. 2.5 m width). Trawl duration was variable, according to sampling

conditions (type of gear and bottom); most trawls, however, were ca. 30 minutes long.

Information presented herein is related only to the list of species of stomatopod and decapod crustaceans collected during the cruise and to their distribution within the eastern tropical Pacific. The data related to species association, abundance and potential for fishery will be treated elsewhere.

The species accounts are summarized in a table including scientific name, with author and year of description, date and site of sampling, depth, and material examined (including sex and size range). Abbreviations used in this paper are as follows: St., sampling station; T.L., total length; C.W., carapace width; C.L., carapace length; M, male; F, female, FF, ovigerous female. Specimens of collected species are deposited in the Invertebrates Reference Collection of the "Laboratorio de Invertebrados Bentónicos", Estación Mazatlán UNAM. Selected duplicates are also deposited in the Reference Collection of the Instituto de Ciencias del Mar, Barcelona, Spain, and in the invertebrates collections of the Facultad de Ciencias del Mar, Universidad Autónoma de Sinaloa, Mazatlán, Mexico (see Table 1).

Results

As results of the sampling, a total of 52 species were collected: six species of stomatopods (five species of the genus *Squilla* and *Lysiosquilla panamica*), and forty-six species or subspecies of decapod crustaceans (ten Penaeoidea, three Caridea, two Palinura, two Anomura, and twenty-nine Brachyura) (Table 1). All species, except one, were previously known for the eastern tropical Region. Several species, however, had not been previously reported in the literature for the Gulf of Tehuantepec, although most were supposed to occur in this area according to their distribution range in the eastern tropical Pacific. These species include one stomatopod, three penaeoid shrimps, two caridean shrimps, one lobster, one Anomura, and eight Brachyura.

The stomatopod *Lysiosquilla panamica*, is known from off the coast of Guerrero (17°42'48"N-101°42'36"W), Mexico, to La Libertad, Ecuador, from 3-90 m depth (HENDRICKX & SALGADO-BARRAGAN, 1991). The present record, however, represents only the sixth sampling locality reported for this species for the entire eastern tropical Pacific Region, the second for the Pacific coast of Mexico and the first in the Gulf of Tehuantepec (SALGADO-BARRAGAN & ILLESCAS-MONTERROSO, 1987; HENDRICKX & SALGADO-BARRAGAN, 1991). *Metapenaeopsis beebeyi* occurs from the Gulf of California, Mexico, to the Gulf of Panama (5.5 to 91 m); *Sicyonia picta*, from Mexico to Northern Peru. In both cases, however, there are no published records available between the entrance of the Gulf of California and Guatemala; present record is consequently the first

Table 1. – List of species collected during the CEEMEX P4 cruise. Data include: sampling station; date; trawling depth; number, sex and size of examined specimens. Selected specimens were deposited in reference collections of the Instituto de Ciencias del Mar Barcelona Spain (A) and of the Escuela de Ciencias del Mar, Universidad Autónoma de Sinaloa, Mazatlán, México (B).

SPECIES	ST.	DATE	MATERIAL EXAMINED	DEPTH	
Stomatopoda					
Squillidae					
1. <i>Squilla biformis</i> BIGELOW, 1891	(A)	St. 2	4/IV/91	19 M (T.L. 55-73 mm) and 27 F (T.L. 54-74 mm)	26 m
		St. 13	4/IV/91	26 M (T.L. 56-77 mm) and 40 F (T.L. 52-82 mm)	118-125 m
		St. 22	3/IV/91	1 M (T.L. 80 mm) and 2 F (T.L. 67-68 mm)	80-86 m
		St. 23	3/IV/91	5 M (T.L. 68-83 mm) and 3 F (T.L. 67-82 mm)	124-132 m
		St. 24	3/IV/91	1 M (T.L. 74 mm)	180 m
		St. 32	2/IV/91	40 F (T.L. 68-116 mm) and 34 F (T.L. 73-117 mm)	130-133 m
		St. 33	2/IV/91	14 M (T.L. 85-122 mm) and 16 F (T.L. 73-114 mm)	180-181 m
		St. 41	1/IV/91	19 M (T.L. 80-126 mm) and 34 F (T.L. 73-118 mm)	125 m
		St. 42	1/IV/91	87 M (T.L. 74-125 mm) and 88 F (T.L. 75-112 mm)	121-126 m
		St. 43	1/IV/91	99 M (T.L. 66-107 mm), 116 F (T.L. 67-108 mm)	249-252 m
		St. 44	1/IV/91	12 M (T.L. 64-76 mm) and 9 F (T.L. 62-73 mm)	346-360 m
2. <i>Squilla hancocki</i> SCHMITT, 1940		St. 39	1/IV/91	1F (T.L. 72 mm)	64-68 m
3. <i>Squilla mantoidea</i> BIGELOW, 1893	(A)	St. 10	30/III/91	4 F (T.L. 156-200 mm)	23-24 m
		St. 19	3/IV/91	1 M (T.L. 134 mm) and 2 F (T.L. 112-145 mm)	31-34 m
		St. 37	1/IV/91	4 M (T.L. 116-150 mm) and 4 F (T.L. 92-195 mm)	23 m
		St. 38	1/IV/91	1 M (T.L. 175 mm)	45 m
4. <i>Squilla panamensis</i> BIGELOW, 1891		St. 12	31/III/91	17 M (T.L. 80-100 m) and 16 F (T.L. 60-102 mm)	52-54 m
5. <i>Squilla parva</i> BIGELOW, 1891	(A)	ST. 4	4/IV/91	3 M (T.L. 28-54 mm) and 12 F (T.L. 25-30 mm)	82-93 m
		St. 22	3/IV/91	15 M (T.L. 23-31 mm) and 27 F (T.L. 23-31 mm)	80-86 m
		St. 23	3/IV/91	8 M (T.L. 25-31 mm) and 37 F (T.L. 24-32 mm)	124-132 m
		St. 28	2/IV/91	20 M (T.L. 45-57 mm) and 17 F (T.L. 40-57 mm)	27-28 m
		St. 37	1/IV/91	6 M (T.L. 52-63 mm) and 14 F (T.L. 48-62 mm)	23 m
6. <i>Lysiosquilla panamica</i> MANNING, 1971		St. 2	4/IV/91	1 M (T.L. 99 mm)	26 m
Decapoda					
Penaeidae					
7. <i>Farfantepenaeus californiensis</i> (HOLMES, 1900)	(A,B)	St. 11	30/III/91	1 M (T.L. 105 mm)	42 m
		St. 12	31/III/91	26 M (T.L. 71-83 mm) and 24 F (T.L. 70-104 mm)	52-54 m
		St. 19	31/III/91	1 M (T.L. 159 mm)	31-34 m
		St. 29	2/IV/91	3 M (T.L. 107-115 mm)	45-47 m
		St. 38	1/IV/91	3 M (T.L. 112-129 mm) and 4 F (T.L. 123-132 mm)	45 m
		St. 39	1/IV/91	6 M (T.L. 87-94 mm)	64-68 m
8. <i>Litopenaeus vannamei</i> (BOONE, 1931)	(A,B)	St. 10	30/III/91	8 M (T.L. 125-144 mm) and 9 F (T.L. 126-154 mm)	23-24 m
		St. 19	31/III/91	1 F (T.L. 105 mm)	31-34 m
		St. 37	1/IV/91	4 M (T.L. 106-165 mm) and 11 F (T.L. 77-202 mm)	23 m
9. <i>Rimapenaeus pacificus</i> (BURKENROAD, 1934)	(A)	St. 19	31/III/91	1 F (T.L. 64 mm)	31-34 m
		St. 28	2/IV/91	6 M (T.L. 34-44 mm) and 37 F (T.L. 53-67 mm)	27-28 m
		St. 37	1/IV/91	4 M (T.L. 38-40 mm) and 17 F (T.L. 44-64 mm)	23 m
10. <i>Trachysalambria brevisuturae</i> (BURKENROAD, 1934)	(A)	St. 19	31/III/91	10 F (T.L. 51-64 mm)	31-34 m
		St. 28	2/IV/91	1 F (T.L. 39 mm)	28 m
		St. 37	1/IV/91	2 M (T.L. 360-41 mm) and 8 F (T.L. 34-59 mm)	23 m
		St. 38	1/IV/91	6 F (T.L. 56-64 mm)	45 m
11. <i>Metapenaeopsis beebei</i> (BURKENROAD, 1938)		St. 38	1/IV/91	3 F (T.L. 51.0-62.5 mm)	45 m
Sicyoniidae					
12. <i>Sicyonia picta</i> FAXON, 1893		St. 39	1/IV/91	1 F (T.L. 39.0 mm)	64-68 m
13. <i>Sicyonia disdorsalis</i> (BURKENROAD, 1934)		St. 11	30/III/91	3 M (T.L. 46-52 mm)	42 m
		St. 28	2/IV/91	2 M (T.L. 39-45 mm) and 87 F (T.L. 39-61 mm)	27-28 m
		St. 37	1/IV/91	20 M (T.L. 38-50 mm) and 140 F (T.L. 33-62 mm)	23 m
14. <i>Sicyonia aliaffinis</i> (BURKENROAD, 1934)	(B)	St. 19	31/III/91	2 F (T.L. 59-63 mm)	31-34 m
		St. 28	2/IV/91	4 F (T.L. 55-64 mm)	27-28 m
		St. 29	2/IV/91	1 F (T.L. 60 mm)	45-47 m
		St. 37	1/IV/91	5 M (T.L. 46-55 mm) and 4 F (T.L. 55-63 mm)	23 m
		St. 38	1/IV/91	6 M (T.L. 43-60 mm) and 4 F (T.L. 56-60 mm)	45 m
Solenoceridae					
15. <i>Solenocera florea</i> BURKENROAD, 1938		St. 12	31/III/91	31 M (T.L. 34-54 mm), 61 F (T.L. 33-57 mm)	52-54 m
		St. 28	2/IV/91	29 F (T.L. 21-52 mm)	27-28 m
16. <i>Solenocera mutator</i> BURKENROAD, 1938	(B)	St. 5	4/IV/91	47 M (T.L. 38-56 mm) and 32 F (T.L. 42-59 mm)	89-102 m
		St. 13	4/IV/91	44 M (T.L. 31-49 mm) and 65 F (T.L. 30-58 mm)	118-125 m
		St. 21	4/IV/91	21 M (T.L. 37-51 mm) and 34 F (T.L. 37-65 mm)	64-67 m
		St. 22	3/IV/91	40 M (T.L. 39-55 mm) and 45 F (T.L. 41-59 mm)	80-86 m
		St. 23	3/IV/91	39 M (T.L. 41-55 mm) and 52 F (T.L. 42-53 mm)	124-132 m
		St. 24	3/IV/91	1 M (T.L. 45 mm)	180 m
		St. 31	2/IV/91	9 M (T.L. 43-53 mm) and 26 F (T.L. 41-56 mm)	80-83 m
		St. 40	1/IV/91	27 M (T.L. 43-56 mm) and 46 F (T.L. 42-58 mm)	96-98 m
		St. 41	1/IV/91	1 M (T.L. 53 mm)	125 m

SPECIES	ST.	DATE	MATERIAL EXAMINED	DEPTH
Caridea				
Alpheidae				
17. <i>Alpheus bellimanus</i> LOCKINGTON, 1877	St. 10	30/III/91	1 F damaged (T.L. ca. 22.5 mm)	23-24 m
18. <i>Alpheus normanni</i> KINGSLEY, 1878	St. 10	30/III/91	1 FF (T.L. 23.0 mm)	23-24 m
Hippolytidae				
19. <i>Lysmata</i> aff. <i>porteri</i> (RATHBUN, 1907)	St. 37	1/IV/91	1 specimen	23 m
Palinura				
Scyllaridae				
20. <i>Evivacus princeps</i> SMITH, 1869	(A) St. 10	30/III/91	3 M (T.L. 16.0-18.4 cm)	23-24 m
	St. 11	30/III/91	1 M (T.L. 13.2 cm)	42 m
	St. 19	31/III/91	1 M (T.L. 15.3 cm) and 1 F (T.L. 14.7 cm)	34 m
	St. 37	1/IV/91	1 M (T.L. 9.8 cm)	23 m
Palinuridae				
21. <i>Panulirus gracilis</i> STREETS, 1871	St. 10	30/III/91	2 FF (T.L. 29.3-32.3 cm)	23-24 m
Anomura				
Diogenidae				
22. <i>Dardanus sinistripes</i> (STIMPSON, 1859)	(B) St. 2	4/IV/91	5 M (C.L. 8.7-12.4 mm), 4 F (C.L. 9.5-13.6 mm.) and 1 FF (C.L. 10.6 mm)	26 m
	St. 10	30/III/91	3 M (C.L. 13.8-42.3 mm)	23-24 m
	St. 12	31/III/91	1 F (C.L. 15.0 mm)	52-54 m
	St. 21	4/IV/91	3 M (C.L. 6.4-14.2 mm) and 2 F (C.L. 7.4-8.8 mm)	64-67 m
	St. 28	2/IV/91	(C.L. 8.0-27.6 mm), 3 F (8.3-11.3 mm) and 3 FF (C.L. 9.5-10.2 mm)	27-28 m
	St. 30	2/IV/91	12 M (C.L. 5.3-21.7 mm), 11 F (C.L. 7.0-20.8 mm) and 2 FF (C.L. 8.5-18.7 mm)	61-65 m
	St. 37	1/IV/91	17 M (C.L. 8.5-30.5 mm), 2 F (C.L. 7.8-7.8 mm) and 2 FF (C.L. 11.0-11.7 mm)	23 m
Galatheidae				
23. <i>Pleuroncodes planipes</i> STIMPSON, 1860	(B) St. 4	4/IV/91	4 M (C.L. 9.5-24.2 mm) and 4 F (C.L. 23.7-31.6 mm)	82-93 m
	St. 5	4/IV/91	16 M (C.L. 20.4-26.3 mm)	89-102 m
	St. 13	4/IV/91	2 M (C.L. 23.9-24.3 mm) and 1 F (C.L. 23.8 mm)	118-125 m
	St. 23	3/IV/91	11 M (C.L. 22.5-32.3 mm) and 8 F (C.L. 26.4-31.1 mm)	124-132 m
	St. 32	2/IV/91	17 M (C.L. 21.4-31.1 mm) and 4 F (C.L. 24.3-26.7 mm)	130-133 m
	St. 33	2/IV/91	34 M (C.L. 26.6-43.0 mm) and 13 F (C.L. 25.5-35.4 mm)	180-181 m
	St. 40	1/IV/91	117 M (C.L. 18.4-25.7 mm) and 95 F (l.c. 20.1-25.4 mm)	96-98 m
	St. 41	1/IV/91	167 M (C.L. 21.0-42.9 mm) and 146 F (C.L. 19.5-33.1 mm)	125 m
	St. 42	1/IV/91	13 M (C.L. 36.2-42.8 mm) and 35 F (C.L. 25.5-37.8 mm)	121-126 m
Brachyura				
Dromiidae				
24. <i>Cryptodromiopsis larraburei</i> (RATHBUN, 1910)	St. 30	2/IV/91	2 M (C.W. 23.5-25.1 mm) and 2 F (C.W. 5.3 mm)	61-65 m
	St. 39	1/IV/91	3 M (C.W. 24.5-30.3 mm) and 4 F (18.8-28.6 mm)	64-68 m
25. <i>Hypoconcha panamensis</i> SMITH, 1869	(A) St. 37	1/IV/91	1 FF (C.W. 11.9 mm)	23 m
Dorippidae				
26. <i>Eithusa lata</i> RATHBUN, 1893	St. 2	4/IV/91	1 M (C.W. 16.0 mm) and 1 F (C.W. 12.0 mm)	26 m
Calappidae				
27. <i>Calappa convexa</i> de SAUSSURE, 1853	(B) St. 10	30/III/91	1 M (C.W. 12.3 mm)	23-24 m
	St. 38	1/IV/91	1 F (C.W. 129.3 mm)	45 m
28. <i>Cycloes bairdii</i> STIMPSON, 1860	St. 38	1/IV/91	1 M (C.W. 2 mm)	45 m
29. <i>Hepatus kossmanni</i> NEUMANN, 1878	St. 2	4/IV/91	1 M (C.W. 45.6 mm) and 1 F (C.W. 41.7 mm)	26 m
	St. 10	30/III/91	3 M (C.W. 30.8 -104.7 mm)	23-24 m
	St. 12	31/III/91	6 M (C.W. 41.8-76.3 mm) and 2 F (C.W. 45.2-46.7 mm)	52-54 m
	St. 19	31/III/91	1 F (C.W. 32.9 mm)	31-34 m
	St. 28	2/IV/91	18 M (C.W. 30.2-61.1 mm) and 10 F (C.W. 34.5-66.6 mm)	27-28 m
	St. 37	1/IV/91	11 M (C.W. 34.7-65.4 mm) and 31 F (C.W. 33.5-50.1 mm)	23 m
	St. 38	1/IV/91	1 M (C.W. 39.8 mm)	45 m
	St. 39	1/IV/91	1 F (C.W. 39.7 mm)	64-68 m
30. <i>Platymera gaudichaudii</i> H. MILNE-EDWARDS, 1837	(A,B) St. 4	4/IV/91	13 M (C.W. 12.1-45.6 mm) and 7 F (C.W. 28.9-57.6 mm)	82-93 m
	St. 5	4/IV/91	2 F (C.W. 28.2-30.7 mm)	89-102 m
	St. 12	31/III/91	6 M (C.W. 73.5-78.6 mm)	52-54 m
	St. 21	4/IV/91	1 F (C.W. 43.2 mm; aprox. With broken spines)	64-67 m
	St. 32	2/IV/91	1 M (C.W. 71.1 mm)	133 m
	St. 39	1/IV/91	3 M (C.W. 67.8-72.2 mm) and 4 F (C.W. 43.0-56.8 mm)	64-68 m
	St. 40	1/IV/91	6 M (C.W. 59.3-70.0 mm) and 4 F (C.W. 48.5-53.0 mm)	96-98 m
	St. 41	1/IV/91	1 M (C.W. 54.3 mm) and 2 F (C.W. 50.5-58.0 mm)	125 m

SPECIES	ST.	DATE	MATERIAL EXAMINED	DEPTH
31. <i>Osachila lata</i> FAXON, 1893. Leucosiidae	(A) St. 39	1/IV/91	1 M (C.W. 41.4 mm)	64-68 m
32. <i>Persephona townsendi</i> (RATHBUN, 1893)	St. 28	2/IV/91	9 M (C.W. 21.1-30.0 mm), 6 F (C.W. 15.7-31.7 mm) and 1 FF (C.W. 29.8 mm)	27-28 m
33. <i>Persephona edwardsii</i> BELL, 1855 Inachidae	(A) St. 37	1/IV/91	6 M (C.W. 21.8-28.5 mm) and 6 F (C.W. 21.9-27.2 mm)	23 m
34. <i>Podochela casoae</i> HENDRICKX, 1987	St. 28		1 M (C.W. 7.8 mm)	27-28 m
35. <i>Stenorhynchus debilis</i> (SMITH, 1871) Pisidae	St.38	1/IV/91	1 M (C.W. 9.0 mm)	45 m
36. <i>Herbstia cf. tumida</i> (STIMPSON, 1871) Parthenopidae	St. 10	30/III/91	1 FF (C.W. 9.2 mm)	23-24 m
37. <i>Parthenope (Parthenope) hyponca</i> (STIMPSON, 1871) Portunidae	St. 37	1/IV/91	1 M (C.W. 32.6 mm) and 1 F (C.W. 32.6 mm)	23 m
	St. 39	1/IV/91	1 M (C.W. 26.0 mm)	64-68 m
38. <i>Arenaeus mexicanus</i> (GERSTAECKER, 1857)	(A) St. 28	2/IV/91	1 F (C.W. 57.8 mm)	27-28 m
39. <i>Callinectes arcuatus</i> ORDWAY, 1863	(A) St. 37	1/IV/91	1 F (C.W. 75.8 mm)	23 m
40. <i>Callinectes bellicosus</i> (STIMPSON, 1859)	St. 37	1/IV/91	1 F (C.W. 125.8 mm)	23 m
41. <i>Cronius ruber</i> (LAMARCK, 1818)	St. 38	1/IV/91	1 M (C.W. 27.6 mm)	45 m
42. <i>Euphyllax dovii</i> STIMPSON, 1860	(A,B) St. 2	4/IV/91	3 F (C.W. 43.8-49.5 mm) and 1 FF (C.W. 44.5 mm)	26 m
	St. 10	30/III/91	1 F (C.W. 53.3 mm)	23-24 m
	St. 11	30/III/91	7 F (C.W. 41.6-54.6 mm)	42 m
	St. 12	31/III/91	5 F (C.W. 50.5-59.0 mm)	52-54 m
	St. 19	31/III/91	10 F (C.W. 42.9-46.7 mm), 1 FF (C.W. 55.3 mm)	31-34 m
	St. 28	2/IV/91	1 M (C.W. 53.2 mm) and 1 F (C.W. 54.4 mm)	27-28 m
	St. 37	1/IV/91	2 F (C.W. 51.3-52.7 mm) and 1 FF (C.W. 45.2 mm)	23 m
	St. 38	1/IV/91	1 F (C.W. 43.2 mm)	45 m
43. <i>Euphyllax robustus</i> A. MILNE EDWARDS, 1874	St. 11	30/III/91	6 M (C.W. 59.4-83.1 mm), 9 F (C.W. 50.4-70.2 mm) and 1 FF (C.W. 95.9 mm)	42 m
	St. 12	31/III/91	1 M (C.W. 48.8 mm) and 1 F (C.W. 51.3 mm)	52-54 m
	St. 19	31/III/91	1 M (C.W. 105 mm)	31-34 m
44. <i>Portunus asper</i> (A. MILNE-EDWARDS, 1861)	(A) St. 10	30/III/91	21 M (C.W. 61.0-93.9 mm), 21 F (C.W. 60.1-75.3 mm) and 14 FF (C.W. 63.2-77.6 mm)	23-24 m
	St. 19	31/III/91	7 F (C.W. 42.1-80.0 mm) and 1 FF (C.W. 62.4 mm)	31-34 m
	St. 28	2/IV/91	42 F (C.W. 36.4-84.9 mm) and 14 FF (C.W. 54.6-94.5 mm)	27-28 m
	St. 37	1/IV/91	35 F (C.W. 33.3-76.4 mm) and 19 FF (C.W. 41.0-70.9 mm)	23 m
	St. 38	1/IV/91	3 F (C.W. 65.5-80.1 mm) and 1 FF (C.W. 82.5 mm)	45 m
45. <i>Portunus xantusii xantusii</i> (STIMPSON, 1860)	(A,B) St. 2	4/IV/91	9 F (C.W. 24.6-33.0 mm) and 5 FF (C.W. 35.1-37.3 mm)	26 m
	St. 4	4/IV/91	3 F (C.W. 21.6-32.7 mm) and 1 FF (C.W. 24.4 mm)	82-93 m
	St. 12	31/III/91	18 M (C.W. 21.4-37.6 mm) and 11 F (C.W. 21.1-33.4 mm)	52-54 m
	St. 30	2/IV/91	6 M (C.W. 33.8-41.2 mm) and 3 F (C.W. 31.7-38.3 mm)	61-65 m
	St. 39	1/IV/91	32 M (C.W. 19.8-41.4 mm) and 21 F (C.W. 28.2-37.2 mm)	64-68 m
	St. 40	1/IV/91	1 F (C.W. 25.1 mm)	96-98 m
46. <i>Portunus xantusii affinis</i> (FAXON, 1893)	(B) St. 39	1/IV/91	62 F (24.0-41.2 mm) and 33 FF (C.W. 32.1-40.2 mm)	64-68 m
47. <i>Portunus xantusii</i> (STIMPSON, 1860)	St. 2	4/IV/91	27 M (C.W. 25.6-43.0 mm) and 9 F (C.W. 22.4-40.0 mm)	26 m
	St. 21	4/IV/91	5 M (C.W. 20.1-34.7 mm) and 2 F (29.2-32.7 mm)	64-67 m
	St. 40	1/IV/91	4 M (C.W. 27.1-39.0 mm) and 2 F (C.W. 36.2-37.7 mm)	96-98 m
48. <i>Portunus tuberculatus</i> (STIMPSON, 1860) Xanthidae	St. 10	30/III/91	1 F (C.W.80.6 mm)	23-24 m
49. <i>Edwardsium lobipes</i> (RATHBUN, 1898)	(A) St. 2	4/IV/91	1 FF (C.W. 20.5 mm)	26 m
	St. 30	2/IV/91	3 F (C.W. 6.1-19.2 mm)	61-65 m
	St. 39	1/IV/91	2 M (C.W. 26.2-27.3 mm) and 1 F (C.W. 25.0 mm)	64-68 m
50. <i>Heteractea lunata</i> (MILNE-EDWARDS & LUCAS, 1843)	(A) St. 10	30/III/91	5 F (C.W. 7.6-20.7 mm) and 1 FF (C.W. 13.3 mm)	23-24 m
51. <i>Microcassiope xantusii</i> (STIMPSON, 1871)	St. 10	30/III/91	1 M (C.W. 6.7 mm) and 1 FF (C.W. 8.6 mm)	23-24 m
52. <i>Quadrrella nitida</i> SMITH, 1869	St. 10	30/III/91	2 FF (C.W. 7.8-8.3 mm)	23-24 m

for this strip of the eastern tropical Pacific coast and for the Gulf of Tehuantepec (PEREZ-FARFANTE, 1988; HENDRICKX, 1990, 1995a). Known from California, USA, and throughout the Gulf of California, Mexico, to Lobos de Tierra Island, Peru (WICKSTEN & HENDRICKX, 1992), *Solenocera mutator* was commonly captured during this survey. Still, there seems to be no previously published record available for the Gulf of Tehuantepec. *Alpheus bellimanus*, ranges from Monterey, California, to Chile (including Socorro and Clarion Islands, Mexico) (WICKSTEN & HENDRICKX, 1992). Although it is known from Tangola-Tangola Bay (WICKSTEN, 1983), just north of the sampling area, present record is the first for the Gulf of Tehuantepec. A similar situation occurs with *Alpheus normanni*, known from the Gulf of California, Mexico, to Secas Islands, Panama and the Galapagos Islands (WICKSTEN & HENDRICKX, 1992). This species had never been reported previously for the coastal area comprised between the Gulf of California and Costa Rica. The specimen of *Lysmata* obtained during the survey is close to *L. aff. porteri*, known from off the coast of Chile and Juan Fernández Islands (WICKSTEN, 1990), but does not seem to belong to that species. Additional material was obtained during sampling operations in the SE Gulf of California and will be studied apart. A very conspicuous species, the shield fan lobster *Evivacus princeps*, is known from the Gulf of California, Mexico, to Tumbes, Peru (HENDRICKX, 1995b) but had never been cited for the Gulf of Tehuantepec in literature; in fact, there seems to be a complete lack of published records from Tenacatita, Jalisco, Mexico, to Barra de Santiago, El Salvador (HOLTHUIS, 1985). *Pleuroncodes planipes* is a galatheid with both a pelagic and a benthic phase (SCHMITT, 1921; HENDRICKX, 1985, 1995c). Its southernmost limit is unprecised. The second species of the genus occurring off the Pacific coast of America, *P. monodon*, was recently reported as far north as the Gulf of Tehuantepec (BIANCHI, 1991). This would make the range of both species overlap over several degrees of latitude. Our material was compared with specimens from northern populations of *Pleuroncodes* (i.e. Gulf of California) but not with specimens from the Humboldt-Peru currents area. Previous to this study, there seems to be no record of *P. planipes* for the Gulf of Tehuantepec in literature.

Among Brachyura, the present survey allows us to report the first capture of *Osachila lata* in the area therefore extending its known range south to the Gulf of Tehuantepec. *Persephona townsendi* is known from the Gulf of California, Mexico, south to Cape San Francisco, Ecuador (HENDRICKX, 1995d). Considered one of the most common species of Leucosiidae in the Gulf of California it has not been cited previously for the Gulf of Tehuantepec. The only record available between the SE Gulf of California and the Gulf of Panama is at Tangola-Tangola Bay (RATHBUN, 1937), just north of the Gulf of Tehuantepec. Among Majoidea crabs, *Podocheila casoae*, described for the Gulf of California, has its southernmost distribution limit extended to the Gulf of Tehuantepec.

Another species, *Stenorhynchus debilis* is probably the most commonly reported subtidal species of majid of the eastern tropical Pacific, and the absence of previously published records for the Gulf of Tehuantepec is rather surprising. Of all species of Portunidae obtained during this survey, two very conspicuous species had not been recorded previously in the Gulf of Tehuantepec: *Arenaeus mexicanus* and *Euphyllax dovii*, although both are known from more northern and southern localities. All specimens of *Euphyllax dovii* reported herein were supposedly captured on bottom, during trawling operations, but this species is also known as a member of the pelagic realm, from Santa Monica, California, USA, to 9°23'N - 119°W (JERDE, 1970; HENDRICKX, 1995d). According to records in literature, this would represent the first capture in bottom trawl between Manzanillo, Mexico, and Costa Rica. GRACIA *et al.* (1986) observed a massive concentration of dead specimens of *E. dovii* on sandy beaches, just north of Salina Cruz, and of living specimens swimming close to wave breakers along the shore. In addition to this, there is an unpublished record of this species for the Gulf of Tehuantepec by VILLALOBOS-HIRIART & HERNÁNDEZ-AGUILERA (1984). The exact distribution limits of subspecies of *Portunus xantusii* are not well established due to taxonomic difficulties in separating one subspecies from another. Positive records, however, indicate that the subspecies *xantusii* is found from Concepcion Bay to San Lucas Cape, on the west coast of the Gulf of California, and from off Huatabampo to Teacapan on the east coast (GARTH & STEPHENSON, 1966; HENDRICKX, 1995d). The present record for the nominal subspecies, *P. x. xantusii*, would therefore be the first for the Gulf of Tehuantepec, where another subspecies, *P. x. minimus*, has been previously reported by SOSA-HERNANDEZ *et al.* (1980). In addition to this, specimens of *Portunus xantusii affinis* and of *Portunus xantusii* (undetermined subspecies) were also captured. The later are intermediate forms that could not be identified confidently to subspecies. The existence of intermediate forms was already recognized by STEPHENSON (1965) and discussed briefly by GARTH & STEPHENSON (1966) in their monograph on Portunidae of the west coast of America. *Portunus tuberculatus*, known from the Gulf of California to the Bay of Panama and some oceanic islands, has been cited previously for Puerto Huatulco, just north of the Gulf of Tehuantepec, by GARTH & STEPHENSON (1966). The four species of Xanthidae captured during the survey were already known from the area. *Heteractea lunata* and *Quadrella nitida*, reported from intertidal and shallow water (CRANE, 1937), are here reported at 23-24 m.

Discussion

It is noteworthy that the number of species and subspecies of macro-crustaceans collected during this cruise (52: 6 stomatopods and 46 decapods) is the highest ever reported from the Gulf of Tehuantepec subtidal habitats. Moreover, it is also one of the highest figure available in literature

for a single subtidal survey in the entire eastern tropical Pacific (Table 2). It is difficult to evaluate how representative these figures are for the Gulf of Tehuantepec, precisely because comparative data are lacking altogether. The only published data are by SOSA-HERNANDEZ *et al.* (1980) who reported 4 species of Stomatopoda and 28 species of Decapoda (Table 2). Species cited by these authors and not captured during the present survey are: *Litopenaeus stylirostris*, *Farfantepenaeus brevisrostris*, *Rimapenaeus fuscina*, and *Xiphopenaeus riveti*, all very conspicuous species of penaeid shrimps; *Porcellana cancri-socialis*, a common species of commensal porcelain crab that could easily have escaped from the net; the small size box-crab *Calappa saussurei*, and the swimming-crab *Portunus xantusii minimus*. All together, this would bring to 6 species of Stomatopoda and 52 species and subspecies of Decapoda the total of subtidal macro-crustaceans reported for the area.

How do these values compared with other areas within the eastern tropical Pacific (see Table 2)? During their survey of the Gulf of Nicoya, Costa Rica, which included 3 cruises during different periods of the year, MAURER *et al.* (1984) collected 54 species of macrocrustaceans (6 Stomatopoda and 45 Decapoda). Of these, as many as 13 were identified only to genus, which makes comparison difficult; thus, only 2 stomatopods and 14 decapods species reported by MAURER *et al.* (1984) have also been

collected during this survey. Considering the entire Gulf of California, a much larger area, 308 species of decapod crustaceans are said to be associated preferentially with the continental shelf (HENDRICKX, 1992). The latter figure, however, includes species living within the sediments (infauna) as well as species typically associated with rocky or mixed bottom (rubbles and sand, shell and coral rubbles, etc.) subtidal habitats, which are characteristic of the Gulf of California west coast. These habitats were not systematically sampled during the present survey (see below) or by SOSA-HERNANDEZ *et al.* (1980). Data available from a much more restricted area, the continental shelf of the SE Gulf of California, where bottom structure is similar to what is found in the Gulf of Tehuantepec, are still much higher. Indeed, the soft bottom decapod crustaceans community associated with the continental platform off the coast of southern Sinaloa (25-115 m) comprises as many as 107 species, including only a few cryptic species (HENDRICKX, 1995d). It should be emphasized, though, that a smaller mesh aperture (1") was used during part of the southern Sinaloa survey (see HENDRICKX, 1986) and this could probably account for part of the difference in number of species collected. Previous figures available for stomatopods are much closer to those obtained during the CEEMEX-P4 cruise: six species were trawled during the SIPCO cruises off the coast of Sinaloa (HENDRICKX, 1984), and four species were reported by DITTEL (1991) for the Gulf of Nicoya, Costa Rica.

Table 2. – Comparative data available within the eastern tropical Pacific for recent subtidal surveys of stomatopods and decapod crustaceans.

Geographic area	Species group	Sampling devices	Number of species	Sources
Gulf of Tehuantepec, Mexico	Stomatopods	Trawling	4	Sosa Hernández <i>et al.</i> , 1980.
Gulf of Nicoya, Costa Rica	Stomatopods	Trawling (9.1 m head rope; 3.6 cm stretched mesh).	5	Maurer <i>et al.</i> , 1984.
SE Gulf of California, Mexico	Stomatopods	Trawling	6	Hendrickx, 1984.
Gulf of California, Mexico	Stomatopods	Trawling (35 to 80 feet; 1 to 2.5" mesh aperture).	11 ⁽¹⁾	Hendrickx and Salgado-Barragan, 1989.
Gulf of Nicoya, Costa Rica	Stomatopods	Trawling	4	Dittel, 1991.
Western Mexico (Nayarit, Michoacan and Guerrero)	Stomatopods	Trawling (35 to 80 feet; 1" mesh aperture)	8	Illescas-Monterroso <i>et al.</i> , 1991.
Gulf of Tehuantepec, Mexico	Decapods	Trawling	28	Sosa Hernández <i>et al.</i> , 1980.
Gulf of Nicoya, Costa Rica	Decapods	Trawling (9.1 m head rope; 3.6 cm stretched mesh)	45 ⁽²⁾	Maurer <i>et al.</i> , 1984.
Gulf of California, Mexico	Decapods	Trawling (80 feet; 1" mesh aperture) and grabs.	308	Hendrickx, 1992.
SE Gulf of California, Mexico	Decapods	Trawling (80 feet; 1" mesh aperture) and grabs.	107	Hendrickx, 1995d.
Gulf of Tehuantepec, Mexico	Stomatopods	Trawling	6	Present survey.
	Decapods	Trawling	45	Present survey

⁽¹⁾ Large, common species accessible to trawl.

⁽²⁾ *Hemigrapsus* spp. and *Plagusia immaculata* not included.

ILLESCAS-MONTERROSO *et al.* (1991) reported eight species from western Mexico (Table 2). In addition to data presented in this survey and by SOSA-HERNANDEZ *et al.* (1980), there is only one other report of stomatopods for the Gulf of Tehuantepec by LUKE (1977), who cited one capture of *Squilla aculeata aculeata*. This brings to seven the number of known species for the area.

The capture of several species of decapod not typically associated with soft bottom, subtidal communities (i.e. *Panulirus gracilis*, *Herbstia cf. tumida*, *Heteractaea lunata*, *Microcassiope xantusii* and *Quadrella nitida*) needs some explanation too. All were caught at a single station (station 10), together with specimens of *Alpheus bellimanus* and *A. normanni*, two species of subtidal Alpheidae usually associated with rocky or mixed bottoms. Data indicate that trawling activities at this station were suspended after only 7 minutes duration, when sampling gear reached an inappropriate bottom structure, presumably a submerged, undetected rocky formation.

Inshore and offshore stomatopod and decapod crustaceans represent an important component of the benthic communities in the eastern tropical Pacific. Recently published data concerning the biodiversity of these groups along the coast of Mexico (see HENDRICKX, 1993a, 1993b), Costa Rica (MORÁN & DITTEL, 1993), Colombia (LEMAITRE & ALVAREZ-LEÓN, 1992) or wider sections of the east Pacific (WICKSTEN, 1989; WICKSTEN & HENDRICKX, 1992; LEMAITRE & RAMOS, 1992; HENDRICKX, 1995d) are indicative of the importance of these groups. A comparative analysis of species collected during this survey with data provided in all these publications, indicates that: 1) all species, except one, have previously been recognized as members of the crustacean tropical fauna of the east Pacific; 2) all stomatopods present a distribution ranging from the Gulf of California, Mexico, to Peru, except for *Lysiosquilla panamica* which is not known north of Guerrero, Mexico, and south of Ecuador; 3) most species of decapods also extend from the Gulf of California (or even from further north; e.g. *Farfantepenaeus californiensis*) to Peru (or even further south; e.g. *Alpheus bellimanus*), except *Alpheus normanni* and *Quadrella nitida* (not found south of the Gulf of Panama), *Pleuroncodes planipes* (to Nicaragua; see text), *Cycloes bardii*, *Hepatus kosmanni*, *Persephona towsendi*, *P. edwardsii*, *Herbstia tumida*, *Portunus xantusii* and *Microcassiope xantusii* (to Ecuador), *Podochela casoae* and *Callinectes bellicosus* (southern distribution limit is in the Gulf of Tehuantepec), *Portunus tuberculatus* and *Edwardsium lobipes* (to Gorgona Island, Colombia). Note that records on oceanic islands are not taken into account.

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Michel E. HENDRICKX & Laura A. VÁZQUEZ-CUREÑO
Laboratorio de Invertebrados Bentónicos,
Instituto de Ciencias del Mar y Limnología,
Estación Mazatlán, UNAM.
P.O. Box 811 Mazatlán - 82000, Sinaloa - México.