

Checklist of the Benthic Gammaridea and Caprellidea (Crustacea: Peracarida: Amphipoda) from the Gulf of Mexico Continental Shelf and Slope

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ABSTRACT. The published records of amphipod Crustacea from the Gulf of Mexico continental shelf and slope were reviewed and compiled in a checklist to help the study of this taxonomic group in this large marine ecosystem (LME). Species from both the continental shelf and the upper slope are reported for the diverse habitats that occur in the LME. Unpublished records of amphipod specimens deposited in national collections, validated databases, and reports in the LME have been included. A total of 101 benthic species is recorded in the Gulf of Mexico and is grouped into 55 genera, 26 families and two suborders. The synonymy of the recorded amphipod species of this LME has been included to account for nomenclatural changes in the recent literature. Identifying the components of the amphipod diversity and its occurrence in the different habitats of the Gulf of Mexico provides a useful baseline for both management and conservation.

KEY WORDS : Amphipoda, distribution, diversity, LME, marine habitats.

INTRODUCTION

The order Amphipoda encompasses one of the most diverse peracaridean groups with almost 7000 species (BELLAN-SANTINI, 1999), the gammarid suborder being the most widespread and diverse of the amphipods (BARNARD & KARAMAN, 1991). The other three suborders are highly specialized and restricted in their distribution. The amphipods, together with the polychaetes, constitute 77 % of the total abundance of the macrobenthic community of the coastal ocean (PROBERT & GROVE, 1998). Gammaridean amphipods have been recognized among the six most diverse groups of the macrobenthic assemblages in the northwestern sector of the region (PEQUEGNAT et al., 1990). The amphipods represent a key food resource for cephalopods (PEREZ & HAIMOVICI, 1995) and for fish and macrocrustacea in the coastal habitats (BRIGHT, 1970; ESCOBAR & SOTO, 1997). Amphipods are important components in the regeneration of nitrogen in the sediment-water interface (GARDNER et al., 1993) and are sensitive to environmental changes being therefore considered excellent bioindicators (LEAR & O'MALLEY, 1983; THOMAS, 1993a; MONTAGNA & HARPER, 1996).

The existing documentation on amphipods recorded in the Gulf of Mexico is focussed on the taxonomy of species of the littoral zone (ORTIZ, 1979; ORTIZ & LALANA 1993) and the coastal ocean (PEQUEGNAT et al., 1990; RABALAIS et al., 1999). Reviews of the group include MYERS (1981) for Aorids, ORTIZ (1991) for Bateids, LECROY (1995, 2000) for Colomastigids, and LOWRY & STODDARD (1997) for Aristids, Lysianassooids, Scopelocheirids amongst oth-

ers. The purpose of this work is to compile information on recorded species, genera and families of the suborders Gammaridea and Caprellidea of different marine benthic habitats in the Gulf of Mexico and to provide a baseline of the existing marine amphipod diversity.

METHODS

The records of species herein presented on benthic gammarid and caprellid amphipods were compiled from published references from the Gulf of Mexico continental shelf and slope. New records and some unpublished references, thesis and reports, have been included as well for those specimens available in formal national collections and the validated records of institutional databases.

The classification criteria of BOWMAN & ABELE (1982) was used for the levels of Phylum to superorder, the specific name of the amphipods and their synonymy was validated with the classification of BARNARD & KARAMAN (1991) and in the case of taxa that have not been recorded in the latter reference combined with existing Gulf of Mexico amphipod classification schemes. Every superorder, family, genus and species is presented in an alphabetical rather than phyletic order and follows the taxonomic scheme of BARNARD & KARAMAN (1991), in the case of Lysianassoidea, the classification scheme by LOWRY & STODDARD (1997) was followed.

Every recorded species includes the ecological account of the habitat, the association with other species, the depth range, the geographical distribution within the Gulf of Mexico and references to the information sources. An analysis of the occurrence in habitats, depth zones and geographical sectors where the species have been recorded

was carried out to define the gaps in coverage. A comparison with checklists from other regions in the tropics allowed us to evaluate similarities in representation of families. The rate of discovery of amphipod species for the Gulf of Mexico was described.

SYSTEMATIC ACCOUNT

Crustacea Pennant, 1777

Peracarida Calman, 1904

Amphipoda Latreille, 1816

Caprellidea Leach, 1814

Caprellidae White, 1847

1. *Caprella equilibra* Say, 1818
Synonyms: *Caprella januari* Kröyer, 1842; *C. esmarkii* Boeck, 1861; *C. laticornis* Boeck, 1861; *C. aequilibra* Bates, 1862; *C. ultima* Bates, 1862; *C. obesa* Haswell, 1880; *C. mendax* Myers, 1903
Occurrence: in sandy bottoms at 87 m depth on the continental shelf in the western Gulf of Mexico (BORJA, 1998), and in seagrass beds, algal mats associated with sponges, hydroids, bryozoan and tunicates in Port Isabel and Port Aransas, Texas and offshore habitats to depths of 300 m (MCCAIN, 1968).

Pariambidae Laubitz, 1993

2. *Deutella californica* Mayer, 1890
The species inhabits soft bottoms at 17 m depth on the continental shelf in the western Gulf of Mexico (BORJA, 1998) and off Port Aransas, Texas (MCCAIN, 1968).
3. *Paracaprella pusilla* Mayer, 1890
The species inhabits muddy sediments at 21 m depth on the continental shelf in the western Gulf of Mexico (BORJA, 1998), and occurs in mangrove roots and seagrass beds associated with hydroids and tunicates in coastal waters of Port Isabel and Port Aransas, Texas (MCCAIN, 1968).

Gammaridea Latreille, 1816

Ampeliscidae Costa, 1857

4. *Ampelisca abdita* Mills, 1964
The species inhabits soft bottoms of the continental shelf off Terminos lagoon in the southwestern Gulf of Mexico (MOLINA, 1998) and off Tamiahua lagoon in the western sector at a depth range of 16 to 40 m (BORJA, 1998).
5. *Ampelisca agassizi* (Judd, 1896)
Synonym: *Byblis agassizi* Judd, 1896
The species inhabits soft sediments on the continental shelf in the western Gulf of Mexico at depths of 16 to 175 m (BORJA, 1998; MOLINA, 1998).
6. *Ampelisca bicarinata* Goeke & Heard, 1983
This species occurs in sandy sediments and has a wide distribution in the Gulf of Mexico with records in the northern Gulf extending from southeastern Florida to Texas in a depth range of 9 to 54 m (GOEKE & HEARD, 1983), and in the southwestern Gulf of Mexico at a similar depth range (MOLINA, 1998).
7. *Ampelisca brevisimulata* Barnard, 1954

The species inhabits soft sediments in the continental shelf of the western Gulf of Mexico at depths of 16 to 36 m (MOLINA, 1998).

8. *Ampelisca cristata* Holmes, 1908
Occurrence: in the continental shelf at a depth range of 20 to 40 m in the eastern Gulf of Mexico from Port Charlotte, Florida to the Campeche Bank (ORTIZ, 1979).
9. *Ampelisca holmesi* Pearse, 1908
Occurrence: in sandy sediments and seagrass beds from the northeastern and central Gulf of Mexico from Key West, Florida to the Mississippi Delta at depths of 1 to 54 m (SHOEMAKER, 1933; GOEKE & GATHOF, 1983).
10. *Ampelisca lobata* Holmes, 1908
Occurrence: in the continental shelf on the northeastern Gulf of Mexico off Florida between Sarasota and Naples at a depth range of 20 to 40 m (ORTIZ, 1979).
11. *Ampelisca parapacifica* Goeke & Heard, 1984
Occurrence: in carbonated sandy and silty sediments of the northeast and southeastern Gulf of Mexico at a depth range of 24 to 189 m (GOEKE & HEARD, 1984). Additional records include muddy sediments off Tamaulipas and Veracruz in the western Gulf of Mexico in the inner shelf between 16 and 43 m depth (MOLINA, 1998).
12. *Ampelisca schellenbergi* Shoemaker, 1933
Occurrence: from Key Largo and the Dry Tortugas to the Bank of Campeche in shallow waters of 1 to 10 m depth (SHOEMAKER, 1933).
13. *Ampelisca spinipes* Boeck, 1861
The species is restricted to shallow waters of Key Largo, Florida (SHOEMAKER, 1933).
14. *Ampelisca vadorum* Mills, 1963
The species has been recorded in sandy sediments off the Papaloapan river in the western Gulf of Mexico at 27 m depth (MOLINA, 1998).
15. *Ampelisca venetiensis* Shoemaker, 1916
Occurrence: in sandy and muddy sediments of the continental shelf in the western Gulf of Mexico at a depth range of 17 to 202 m (BORJA, 1998).
16. *Ampelisca verrilli* Mills, 1967
Occurrence: in muddy sediments, in the western Gulf of Mexico at a depth of 34 m (BORJA, 1998).

Ampithoidae Stebbing, 1899

17. *Ampithoe ramondi* Audouin, 1826
Occurrence: associated with algal mats in reefs of southern Florida in the eastern Gulf of Mexico (THOMAS, 1993b) and the Bank of Campeche in the southern Gulf sector (ORTIZ, 1979).

Anamixidae Stebbing, 1897

18. *Anamixis covatura* Thomas, 1997
The species is found in coral rubble and associated with tunicates in the coral reefs of Key West in the eastern Gulf of Mexico and in the Bank of Campeche in the southern Gulf (THOMAS, 1997).
19. *Anamixis hanseni* Stebbing, 1897
Occurrence: in the Florida shelf off Cape Romano in the eastern Gulf of Mexico (ORTIZ, 1979).
20. *Anamixis vanga* Thomas, 1997
The species is found in coral rubble and associated with tunicates in coral reefs of the Florida Keys in the eastern Gulf of Mexico at a depth range of 2 to 20 m (THOMAS, 1997).

Aristiidae Lowry & Stoddart, 1997

21. *Aristias captiva* Lowry & Stoddart, 1997
Occurrence: associated with fans, bryozoans and sponges in the northeastern Gulf of Mexico at a depth range of 55 to 73 m (LOWRY & STODDART, 1997).
22. *Boca campi* Lowry & Stoddart, 1997
Occurrence: in sandy and muddy sediments, associated with bryozoan, calcareous algae and shell debris in the northeastern Gulf of Mexico at a depth range of 55 to 73 m (LOWRY & STODDART, 1997).
23. *Boca elvae* Lowry & Stoddart, 1997
Occurrence: in soft sediments in the northeast of Dry Tortugas in the eastern Gulf of Mexico at 180 m depth (LOWRY & STODDART, 1997).
24. *Boca megachela* Lowry & Stoddart, 1997
Occurrence: in coralline algae and seagrass beds, associated with sponges and fans, in the northeastern Gulf of Mexico at a depth range of 18 to 73 m (LOWRY & STODDART, 1997).

Bateidae Stebbing, 1906

25. *Batea bousfieldi* (Ortiz, 1991)
Synonym: *Carinobatea bousfieldi* Ortiz, 1991
This species occurs in the central west shelf of Florida in the northeastern Gulf of Mexico at a depth range of 37 to 73 m (ORTIZ, 1991).
26. *Batea campi* (Ortiz, 1991)
Synonym: *Carinobatea campi* Ortiz, 1991
Occurrence: in the central shelf of Florida in the northeastern Gulf of Mexico at a depth range of 1 to 36 m (ORTIZ, 1991).
27. *Batea carinata* (Shoemaker, 1926)
Synonym: *Carinobatea carinata* Shoemaker, 1926
Occurrence: in the central west shelf of Florida in the northeastern Gulf of Mexico at a depth range of 55 to 73 m (ORTIZ, 1991).
28. *Batea catharinensis* Müller, 1865
Synonym: *Batea secunda* Holmes, 1903
Occurrence: in soft sediments and seagrass beds of the continental shelf of the northern Gulf of Mexico at a depth range of 1 to 45 m (ORTIZ, 1991).
29. *Batea cuspidata* (Shoemaker, 1926)
Synonym: *Carinobatea cuspidata* Shoemaker, 1926
Occurrence: off Florida in the northeastern Gulf of Mexico at a depth range of 3 to 49 m (SHOEMAKER, 1933; ORTIZ, 1991).

Colomastigidae Chevreux, 1899

30. *Colomastix bousfieldi* LeCroy, 1995
Occurrence: in coral reefs, algal mats, seagrass beds and mangrove roots, associated with sponges, tunicates in the northern Gulf of Mexico and the eastern Bank of Campeche at a depth range of 1 to 172 m (LECROY, 1995).
31. *Colomastix camura* LeCroy, 1995
Occurrence: in coral reef patches, associated with sponges, in the northern Gulf of Mexico at a depth range of 18 to 73 m (LECROY, 1995).
32. *Colomastix cornuticauda* LeCroy, 1995
Occurrence: associated with the sponges *Agelas dispar* Duchassaing and Michelotti, 1864 and *Aplysina fistularis* (Pallas, 1766) in the Florida Middle Ground in the eastern Gulf of Mexico at a depth range of 24 to 35 m (LECROY, 1995).

33. *Colomastix denticornis* LeCroy, 1995
Occurrence: associated with the sponges *Agelas dispar* Duchassaing & Michelotti, 1864 and *Aplysina fistularis* (Pallas, 1766) in the Florida Middle Ground in the eastern Gulf of Mexico at a depth range of 55 to 73 m (LECROY, 1995).
34. *Colomastix falcirama* LeCroy, 1995
Occurrence: in coral reef, associated with sponges and the coral species *Madracis decactis* (Lyman, 1859) in the Florida Middle Ground, Big Pine Key and Dry Tortugas in the eastern Gulf of Mexico at a depth range of 1 to 98 m (LECROY, 1995).
35. *Colomastix gibbosa* LeCroy, 1995
Occurrence: in coral reef, associated with the sponge *Geodia gibberosa* Lamarck, 1815 and the coral species *Madracis decactis* (Lyman, 1859) in the central West Florida Bank, the Florida Middle Ground and Dry Tortugas in the eastern Gulf of Mexico at 73 m depth (LECROY, 1995).
36. *Colomastix halichondriae* Bousfield, 1973
Synonym: *Colomastix pusilla* Pearse, 1932
Occurrence: associated with sponges, corals and bivalves in Texas in the northwestern Gulf of Mexico, the Florida Middle Ground, central West Florida Shelf and Dry Tortugas in the eastern Gulf sector at a depth range of 1 to 73 m (LECROY, 1995).
37. *Colomastix heardi* LeCroy, 1995
Occurrence: associated with sponges and corals in the Florida Middle Ground, the Florida Keys, central West Florida Shelf, in the eastern Gulf of Mexico and south in the eastern Bank of Campeche at a depth range of 10 to 73 m (LECROY, 1995).
38. *Colomastix ircinia* LeCroy, 1995
Occurrence: in coral reefs, associated with sponges of the genus *Ircinia* and the coral species *Madracis decactis* (Lyman, 1859) in Florida Middle Ground and Dry Tortugas in the eastern Gulf of Mexico at a depth range of 25 to 36 m (LECROY, 1995).
39. *Colomastix janiceae* Heard & Perlmutter, 1977
Synonym: *Colomastix pusilla* Pearse, 1912
The species is associated with a large variety of species of sponges and corals in Dry Tortugas, the Florida Keys, the central West Florida shelf and the Florida Middle Ground in the eastern Gulf of Mexico, off Texas in the northwestern Gulf sector and in the Bank of Campeche in the southern sector at a depth range of 1 to 87 m (LECROY, 1995).
40. *Colomastix tridentata* LeCroy, 1995
Occurrence: associated with sponge and coral species of the Florida Middle Ground, the central West Florida shelf, Dry Tortugas and the Florida Keys in the eastern Gulf of Mexico, off Texas in the northwestern sector and in the Bank of Campeche at a depth range of 1 to 73 m (LECROY, 1995).

Corophiidae-Ischyroceridae *sensu* Barnard & Karaman, 1991

41. *Acuminodeutopus naglei* (Bousfield, 1973)
Synonym: *Rudilemboides naglei* Bousfield, 1973
Occurrence: in soft sediments with shell debris in the northeastern Gulf of Mexico at a depth range of 1 to 55 m (MYERS, 1981).
42. *Bemlos macromanus* Shoemaker, 1925
Occurrence: in the Florida shelf off Cape Romano in the northeastern Gulf of Mexico (ORTIZ, 1979).
43. *Bemlos ovalipes* (MYERS, 1979)
Synonym: *Lembos ovalipes* Myers, 1979
Occurrence: in the central West Florida shelf in the northeastern Gulf of Mexico at a depth range of 18 to 37 m (MYERS, 1981).

- 44a. *Bemlos spinicarpus inermis* (Myers, 1979)
Synonym: *Lemlos spinicarpus inermis* Myers, 1979
Occurrence: in the central West Florida shelf in the northeastern Gulf of Mexico at a depth range of 6 to 73 m (MYERS, 1981).
- 44b. *Bemlos spinicarpus spinicarpus* (Pearse, 1912)
Synonym: *Lembos spinicarpus spinicarpus* Pearse, 1912
Occurrence: in coral reefs of Key West in the eastern Gulf of Mexico (MYERS, 1981; THOMAS, 1993b).
45. *Bemlos tempus* (Myers, 1979)
Synonym: *Lembos tempus* Myers, 1979
Occurrence: in sandy bottoms of the central West Florida shelf in the northeastern Gulf of Mexico at a depth range of 37 to 73 m (MYERS, 1981).
46. *Bemlos tigrinus* (Myers, 1979)
Synonym: *Lembos tigrinus* Myers, 1979
Occurrence: in sandy sediments of the central West Florida shelf in the northeastern Gulf of Mexico at a depth range of 18 to 73 m (MYERS, 1981).
47. *Bemlos unicornis* (Bynum & Fox, 1977)
Synonym: *Lembos unicornis* Bynum & Fox, 1977
Occurrence: throughout the Florida shelf in the northeastern Gulf of Mexico at a depth range of 1 to 20 m (MYERS, 1981; THOMAS, 1993b).
- 48a. *Bemlos unifasciatus reductus* (Myers, 1979)
Synonym: *Lembos unifasciatus reductus* Myers, 1979
Occurrence: in soft sediments of the central West Florida shelf in the eastern Gulf of Mexico (MYERS, 1981; THOMAS, 1993b) and off Veracruz and Terminos Lagoon in the southwestern sector at a depth range of 18 to 73 m (MOLINA, 1998).
- 48b. *Bemlos unifasciatus unifasciatus* (Myers, 1977)
Synonym: *Lembos unifasciatus unifasciatus* Myers, 1977
Occurrence: in the shallow reefs in southwestern Florida (MYERS, 1981; THOMAS, 1993b).
49. *Chevalia aviculae* Walker, 1904
Occurrence: in coral reefs, associated with sponges, of Florida (THOMAS, 1993b) and in the Bank of Campeche at a depth range of 25 to 40 m (ORTIZ, 1979).
50. *Eriethonius brasiliensis* (Dana, 1853)
Synonym: *Pyctilus brasiliensis* Dana, 1853
This tube building species occurs in coral reefs among macroalgae and associated with sponges in the northeastern Gulf of Mexico at a depth range of 10 to 300 m (BARNARD & BARNARD, 1990; THOMAS, 1993b).
51. *Eriethonius rubricornis* (Stimpson, 1853)
Synonym: *Pyctilus rubricornis* Stimpson, 1853
Occurrence: in coral reefs among macroalgae in the northeastern Gulf of Mexico shelf at a depth range of 10 to 235 m (ORTIZ, 1979).
52. *Gammaropsis atlantica* Stebbing, 1888
Occurrence: in coral reefs in the northwestern Florida in the eastern Gulf of Mexico (THOMAS, 1993b) and in the carbonated sediments from the Bank of Campeche in the southern Gulf sector at a depth range of 20 to 40 m (ORTIZ, 1979).
53. *Globosolembos smithi* (Holmes, 1905)
Synonym: *Autonoe smithi* Holmes, 1905
Occurrence: in sandy sediments and shell debris in the Western Florida shelf in the eastern Gulf of Mexico and the Bank of Campeche in the southern sector at 73 m depth (MYERS, 1981; BARNARD & KARAMAN, 1991; ORTIZ, 1993b).
54. *Lembos websteri* Bate, 1857
Occurrence: between Sarasota and Cape Romano in the Florida shelf in the eastern Gulf of Mexico at a depth range of 20 to 40 m (ORTIZ, 1979).
55. *Liocuna caeca* Myers, 1981
Occurrence: in sandy sediments and shell debris of the central West Florida shelf in the northeastern Gulf of Mexico at a depth range of 39 to 73 m (MYERS, 1981).
56. *Microdeutopus myersi* Bynum & Fox, 1977
Occurrence: in sandy sediments of the central West Florida shelf in the northeastern Gulf of Mexico and extends its range south to the Florida Keys within a depth range of 1 to 73 m (MYERS, 1981).
57. *Photis longicaudata* (Bate & Westwood, 1863)
Synonym: *Eiscladus longicaudata* Bate & Westwood, 1863
Occurrence: in carbonate sediments in the Florida shelf in the eastern Gulf of Mexico (SHOEMAKER, 1945) and in soft sediments off the Tuxpan river in the western Gulf of Mexico at a depth range of 32 to 40 m (MOLINA, 1998).
58. *Photis macromanus* McKinney, Kalke & Holland, 1978
Occurrence: in sandy sediments of the western Gulf of Mexico shelf at a depth range of 18 to 24 m (MCKINNEY et al., 1978).
59. *Photis pugnator* Shoemaker, 1945
Occurrence: from the central West Florida shelf in the eastern Gulf of Mexico to the Bank of Campeche in the southern sector at a depth range of 15 to 42 m (ORTIZ, 1979).
60. *Rildardanus laminosa* (Pearse, 1912)
Synonym: *Unciola laminosa* Pearse, 1912
Occurrence: in the central West Florida shelf in the eastern Gulf of Mexico at a depth range of 6 to 55 m (MYERS, 1981).
61. *Unciola spicata* Shoemaker, 1945
The species has been recorded in the West Florida shelf in the northeastern Gulf of Mexico (ORTIZ, 1979).
62. *Unciola serrata* Shoemaker, 1945
Occurrence: in soft bottoms of the continental shelf from Florida to Alabama in the northeastern Gulf of Mexico (MYERS, 1981) and in the western and southwestern Gulf of Mexico off Tamiahua and Terminos lagoons at a depth range of 1 to 200 m (BORJA, 1998; MOLINA, 1998).

Cyphocarididae Lowry & Stoddart, 1997

63. *Cyphocaris tunicola* Lowry & Stoddart, 1997
Occurrence: in coral reefs associated with colonies of sea squirts in the northeastern Gulf of Mexico at a depth range of 200 to 500 m (LOWRY & STODDART, 1997).

Endevouridae Lowry & Stoddart, 1997

64. *Ensayara entrichoma* Gable & Lazo-Wasem, 1990
Occurrence: in the eastern Gulf of Mexico at 73 m depth (LOWRY & STODDART, 1997).

Gammaridae Leach, 1814

65. *Gammarus mucronatus* Say, 1818
This common species of the coastal ocean occurs in sandy sediments of the continental shelf in the western Gulf of Mexico at a depth range of 2 to 40 m (BORJA, 1998; LECROY, 2000).
66. *Gammarus palustris* Bousfield, 1969
Occurrence: in the littoral fringe and in coral reefs, in soft bottoms associated with sponges and shell rubble in the western Gulf of Mexico (CARRERA & VARGAS, 1997; LECROY, 2000).

Haustoriidae Stebbing, 1906

67. *Parahaustorius attenuatus* Bousfield, 1965
Occurrence: in coral reefs, associated with sponges, in the western Gulf of Mexico (CARRERA & VARGAS, 1997).
68. *Pseudohaustorius carolinensis* Bousfield, 1973
The species has been recorded in the Bank of Campeche in the southern Gulf of Mexico at depths of 15 to 40 m (ORTIZ, 1979).

Leucothoidae Dana, 1852

69. *Leucothoe spinicarpa* (Abildgaard, 1789)
Synonym: *Gammarus spinicarpa* Abildgaard, 1789
Occurrence: in coral reefs, associated with sponges and tunicates, in the Florida Keys in the eastern Gulf of Mexico (SHOEMAKER, 1933; THOMAS, 1993b; CARRERA & VARGAS, 1997) and in soft sediments of the western Gulf of Mexico at a depth range of 25 to 30 m (MOLINA, 1998).

Liljeborgiidae Stebbing, 1899

70. *Liljeborgia dellavallei* Stebbing, 1906
Occurrence: in the central West Florida shelf (ORTIZ, 1979).
71. *Listriella carinata* McKinney, 1979
Occurrence: in soft sediments of the Texas shelf in the northwestern Gulf of Mexico (MCKINNEY, 1979) and in the southwestern Gulf of Mexico at depths of 10 to 28 m (MOLINA, 1998).

Lysianassidae DANA, 1849 s.s. (sensu Lowry & Stoddart, 1997)

72. *Aruga holmesi* Barnard, 1965
Occurrence: in soft sediments of the northeastern Gulf of Mexico at a depth range of 7 to 73 m (LOWRY & STODDART, 1997).
73. *Concarnes concavus* (Shoemaker, 1933)
Synonym: *Socarnes concavus* Shoemaker, 1933
Occurrence: in the eastern Gulf of Mexico at depths from 1 to 80 m (THOMAS, 1993b; LOWRY & STODDART, 1997).
74. *Dissiminassa homosassa* Lowry & Stoddart, 1997
The species is found in shell debris, algae, alcyonarians, corals and seagrass beds and sandy sediments of the northeastern Gulf of Mexico at a depth range of 18 to 73 m (LOWRY & STODDART, 1997).

Lysianassidae Dana, 1849 *sensu lato*

75. *Eurythenes gryllus* (Lichtenstein, 1822)
Synonym: *Gammarus gryllus* Lichtenstein, 1822
This scavenger species has been reported from the north central slope of the Gulf of Mexico (LOWRY & STODDART, 1997).
76. *Eurythenes obesus* (Chevreux, 1905)
Synonym: *Gammarus obesus* Chevreux, 1905
This scavenger species has been reported from the north central slope of the Gulf of Mexico (LOWRY & STODDART, 1997).
77. *Lysianopsis alba* Holmes, 1903
This species has been reported from Key West and Key Largo in the eastern Gulf of Mexico in a depth range of 1 to 40 m (SHOEMAKER, 1933; LOWRY & STODDART, 1997).
78. *Lysianopsis ozona* Lowry & Stoddart, 1997
Occurrence: in seagrass beds, algae and bottoms with shell debris, associated with sponges, alcyonarian and corals in the northeastern Gulf of Mexico at a depth range of 18 to 29 m (LOWRY & STODDART, 1997).

79. *Orchomenella perdido* Lowry & Stoddart, 1997
Occurrence: in shell debris, algae and sandy sediments, associated with sponges in the northeastern Gulf of Mexico at a depth range of 1 to 37 m (LOWRY & STODDART, 1997).
80. *Orchomenella thomasi* Lowry & Stoddart, 1997
Occurrence: in sandy bottoms with shell debris, calcareous algae and dead bryozoans in the northeastern Gulf of Mexico at a depth range of 10 to 73 m (LOWRY & STODDART, 1997).
81. *Rimakoroga floridiana* Lowry & Stoddart, 1997
Occurrence: in bottoms with shell debris, algae and dead alcyonaria in the eastern Gulf of Mexico at a depth range of 55 to 73 m (LOWRY & STODDART, 1997).
82. *Shoemakerella cubensis* (Stebbing, 1897)
Synonym: *Lysianax cubensis* Stebbing, 1897
Occurrence: in sandy sediments from Dry Tortugas in the eastern Gulf of Mexico to the Mississippi Delta in the central northern Gulf (THOMAS, 1993b; LOWRY & STODDART, 1997), and in the western Gulf of Mexico at a depth range of 2 to 69 m (MOLINA, 1998).
83. *Tryphosella apalachicola* Lowry & Stoddart, 1997
Occurrence: in shell debris and sandy sediments associated with sponges and bryozoans in the northeastern Gulf of Mexico at 55 m depth (LOWRY & STODDART, 1997).

Melitidae *sensu* Jarret & Bousfield, 1996

84. *Ceradocus sheardi* Shoemaker, 1948
Occurrence: in sandy bottoms and hard banks of Dry Tortugas in the eastern Gulf of Mexico and in the Bank of Campeche in the southern Gulf sector at depths of 2 to 80 m (ORTIZ, 1979; THOMAS, 1993b; LECROY, 2000).
85. *Elasmopus pocillimanus* (Bates, 1862)
Synonym: *Maera pocillimanus* Bate, 1862
Occurrence: in coral reefs, associated with coral and coral rubble, in seagrass beds and among algae of the southern Florida at a depth of 30 m (ORTIZ, 1979; THOMAS, 1993b; LECROY 2000).
86. *Elasmopus rapax* Costa, 1853
Occurrence: in hard bottoms, mangrove roots and associated with sponges, algae and coral in the central West Florida shelf, the eastern Gulf of Mexico and on the Campeche Bank (ORTIZ, 1979; LECROY, 2000).
87. *Eriopisa incisa* McKinney, Kalke & Holland, 1978
Occurrence: in silty sediments of the northwestern Gulf of Mexico at a depth range of 98 to 134 m (MCKINNEY et al., 1978).
88. *Jerbarnia americana* Watling, 1981
Occurrence: throughout the northeastern Gulf of Mexico (ORTIZ & LALANA, 1993).
89. *Maera hamigera* Haswell, 1879
Occurrence: from the central West Florida shelf in the eastern Gulf of Mexico to the Bank of Campeche in the southern sector at a depth range of 15 to 40 m (ORTIZ, 1979).
90. *Netamelita barnardi* McKinney, Kalke & Holland, 1978
Occurrence: in sandy sediments, coral reefs and algae mats in the northwestern Gulf of Mexico (MCKINNEY et al., 1978), off Florida (THOMAS, 1993b), and in the southwestern Gulf of Mexico at a depth range of 15 to 40 m (MOLINA, 1998).
91. *Netamelita brocha* Thomas & Barnard, 1991
Occurrence: in soft bottoms and associated with coralline algal mats, northeast of the Florida Keys at a depth range of 15 to 76 m (THOMAS & BARNARD, 1991; THOMAS, 1993b; LECROY, 2000).

Melphidippidae Stebbing, 1899

92. *Hornellia (Metaceradocus) atlanticus* Thomas & Barnard, 1986
Occurrence: in the Florida Keys in the eastern Gulf of Mexico to southern Texas in the northwestern sector (THOMAS & BARNARD, 1986).

Oedicerotidae Liljeborg, 1865

93. *Monoculodes nyei* Shoemaker, 1933
Occurrence: from Key West in the eastern Gulf of Mexico to southern Texas in the northwestern sector (SHOEMAKER, 1933; THOMAS, 1993b).

Phoxocephalidae Sars, 1895

94. *Eobrolgus spinosus* (Holmes, 1905)
Synonym: *Paraphoxus spinosus* Holmes, 1905
Occurrence: in soft sediments from the continental shelf off Tamiahua lagoon in the western Gulf of Mexico (BORJA, 1998).
95. *Metharpinia floridana* (Shoemaker, 1933)
Synonym: *Pontharpinia floridana* Shoemaker, 1933
Occurrence: in sandy sediments and carbonated banks from Florida in the eastern Gulf of Mexico to Texas in the northwestern Gulf sector (SHOEMAKER, 1933; BARNARD & BARNARD, 1990; THOMAS, 1993b) and the Bank of Campeche (MOLINA, unpubl.) in the southern Gulf sector at a depth range of 10 to 60 m.

Platyischnopidae Barnard & Drummond, 1979

96. *Eudevenopus honduranus* Thomas & Barnard, 1983
Occurrence: in coral hard bottoms of the Florida shelf and Keys at depths of 1 to 40 m (BARNARD & BARNARD, 1990; THOMAS, 1993b).

Scopelocheiridae Lowry & Stoddart, 1997

97. *Aroui americana* Lowry & Stoddart, 1997
This scavenger species occurs in sandy bottoms of the northeastern Gulf of Mexico at a depth range of 95 to 100 m. It has been often found in stomach contents of fish (LOWRY & STODDART, 1997).

Sebidae Walker, 1908

98. *Seba aloe* Karaman, 1971
This species occurs in the continental shelf off Cape Romano in the eastern Gulf of Mexico (ORTIZ, 1979).

Stenothoidae Dana, 1855

99. *Parametopella texensis* McKinney, Kalke & Holland, 1978
Occurrence: in the northwestern Gulf of Mexico at a depth range of 10 to 20 m (MCKINNEY et al., 1978).

Synopiidae Dana, 1855

100. *Synopia ultramarina* Dana, 1853
Occurrence: in soft sediments of the shallow habitats of Key Largo in the eastern Gulf of Mexico (SHOEMAKER, 1933).

Uristidae Lowry & Stoddart, 1997

101. *Stephonyx biscayensis* (Chevreux, 1908)
Synonym: *Euonyx biscayensis* Chevreux, 1908
The species has been recorded in the northeastern Gulf of Mexico at 494 m depth (LOWRY & STODDART, 1997).

DISCUSSION

This study recognized a total of 101 species of amphipods from the Gulf of Mexico that belong to 55 genera, 26 families and two suborders. The suborder Gammaridea is highly diverse with a total of 97 species that represent 96% of the total species richness recorded in this LME. The most diversified gammarid families in this LME are, in species richness decreasing order, Corophiidae-Ischyroceridae (12 genera, 24 species), Ampeliscidae (1 genus, 13 species), Lysianassidae (9 genera, 12 species), Colomastigidae (1 genus, 11 species) and Melitidae (6 genera, 8 species). In contrast, the suborder Caprellidea is poorly represented and each recorded family in the Gulf of Mexico is represented by one at most two species.

The amphipods have been sampled and recorded in diverse shallow habitats (Table 1), predominantly associated to sessile faunal components in coral reefs (sponges, tunicates, alcyonaria and bryozoa) and to vegetation (calcareous algae, algal mats, seagrass beds, and mangrove roots). The soft sediments are next in species richness (19.13% of records) as are the sandy bottoms (10.43% of records) and bottoms with shell debris (9.57% of records). Only few species occur associated to banks of bivalves (*Colomastix halichondriae*), beds of tunicates (*Leucothoe spinicarpa*), and hydroids (*Caprella equilibra*, *Paracaprella pusilla*). The large richness of habitats in the Gulf of Mexico promises further species to be recorded in the next years.

TABLE 1
Occurrence of Gulf of Mexico amphipods by habitat

| Habitat | No. of records | % |
|------------------------------------|----------------|-------|
| Sandy bottoms | 12 | 10.43 |
| Soft sediments | 22 | 19.13 |
| Carbonate bottoms and coral rubble | 10 | 8.70 |
| Shell debris | 11 | 9.57 |
| Associated with vegetation | 21 | 18.26 |
| algae & algal mats | 16 | |
| mangrove roots | 3 | |
| seagrass beds | 9 | |
| Associated with fauna | 39 | 33.91 |
| alcyonarians | 5 | |
| bivalves | 1 | |
| briozoans | 5 | |
| corals | 27 | |
| hydroids | 2 | |
| sponge | 24 | |
| tunicates | 7 | |
| Total number of records | 214 | 100 |

Amphipods have been recorded on the continental shelf and slope (Table 2). The largest number of records has been made on the continental shelf (75% of the records) and the littoral fringe (20% of records, less than 10m depth). Species richness is almost twice as large on the inner shelf (54%, 10 to 50m depth) as records existing for the middle shelf (45, 51 to 100m depth). The outer conti-

mental shelf (101 to 200m depth) and the continental margin and upper slope (201 to 500m depth) have a low number of records (5%). Species from the continental slope and rise and the abyssal plain have not been recorded yet concluding that these depth zones remain gaps in our knowledge of amphipods in the region.

TABLE 2
Occurrence of Gulf of Mexico amphipods by depth zone

| Depth zone | Depth range (m) | No. of records | % |
|----------------------------------|-----------------|----------------|-----|
| Littoral | | 24 | 20 |
| Continental shelf | 1 to 50 | 71 | 75 |
| | 51 to 100 | 45 | |
| | 101 to 200 | 9 | |
| Continental margin & upper slope | 201 to 500 | 6 | 5 |
| Total number of records | | 245 | 100 |

Amphipods have been recorded throughout the coastal Gulf of Mexico (Table 3). The northern and eastern sectors of the Gulf of Mexico have been studied intensively and accounted for 73% of the total number of amphipod records herein provided, in contrast to 27% of records corresponding to the southern and western sectors. The south-eastern and south-western sectors are the least explored with only 11 species.

TABLE 3
Occurrence of amphipods by geographic sector in the Gulf of Mexico

| Sector | No. of records | % |
|---------------------|----------------|-------|
| North | 15 | 11.90 |
| northeastern | 28 | 22.22 |
| northwestern | 11 | 8.73 |
| South | 12 | 9.52 |
| southeastern | 3 | 2.38 |
| southwestern | 8 | 6.35 |
| West | 16 | 12.70 |
| East | 33 | 26.19 |
| Total No of records | 126 | 100 |

To conclude: the amphipods that inhabit the deep-sea central region remain unknown, and the southern regions have poorly been investigated. A large number species remains to be sampled in a sustained effort to have a better idea of the amphipod diversity in the Gulf of Mexico. The discovery rate in the Gulf of Mexico started in the late 18th century and remained low, with 22 species discovered in the 19th century. The discovery rate increased fivefold in the 20th century. The number of recorded Caprellidea species is low and has remained low since the 19th century with no new records. Future exploratory efforts will lead

to more records and discovery of new species in the region as can be derived from Fig. 1. The number of records obtained raised drastically from the 1960's on, when large exploration programs were initiated in the northern Gulf.

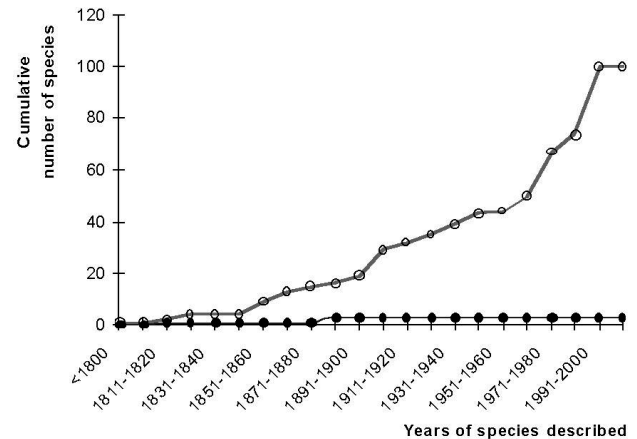


Fig. 1. – Discovery rate of the amphipod species (Caprellidea solid circles, and Gammaridea, open circles) described for the continental shelf and the continental slope of the Gulf of Mexico.

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REFERENCES

- BARNARD, J.L. & C.M. BARNARD (1990). *Geographic Index to marine Gammaridea (Amphipoda)*. National Museum of Natural History. 139 pp.
- BARNARD, J.L. & G.S. KARAMAN (1991). The families and genera of marine Gammaridean Amphipoda (except marine Gammaroids). *Records of the Australian Museum*, Supplement 13, Parts I and II. 866 pp.
- BELLAN-SANTINI, D. (1999). Ordre des Amphipodes (Amphipoda Latreille, 1816). Chapter 6. p: 93-176. In: PIERRE, P. Grassé (ed.), *Traite de Zoologie. Anatomie, systématique et biologie*. Tome VII. Fascicule IIIA. Crustacés Pécararides. Mémoires de l'Institut Océanographique, Monaco, No. 19. 450 pp.
- BORJA, E.M. (1998). *Anfipodos de la Plataforma Continental del Golfo de México*. Tesis de Licenciatura. Facultad de Ciencias, UNAM, México. 67 pp.
- BOWMAN, T.E. & L.G. ABELE (1982). Classification of the recent crustacea. Pp. 1-24. In: L.G. ABELE, ed., *Systematic, the fossil record and biogeography. The Biology of Crustacea*. Academic Press, New York, Vol. I, 319 pp.
- BRIGTH, T. (1970). Food of deep-sea bottom fishes. In: PEQUEGNAT, E.W. and F.A. CHACE Jr., eds., *Contribution of the Biology of the Gulf of Mexico*. Texas A&M University Oceanographic Studies, Vol. I. : 245-252.
- CARRERA P.L. & H.J. VARGAS (1997). Comunidad críptica de esponjas del arrecife de Isla de en Medio, Veracruz, México. *Revista de Biología Tropical*, 45 (1): 311-321.
- ESCOBAR, B.E. & L.A. SOTO (1997). Continental shelf benthic biomass in the western Gulf of Mexico. *Continental Shelf Research*, 17: 585-604.

- GARDNER, W.S., E.B. ESCOBAR, E.K. CRUZ & G.T. ROWE (1993). Ammonium excretion by benthic invertebrates and sediment-water nitrogen flux in the Gulf of Mexico near the Mississippi River outflow. *Estuaries*, 16 (4): 799-808.
- GOEKE, G. & J. GATHOF (1983). Amphipods of the Family Ampeliscidae (Gammaridea) I. *Ampelisca bicarinata*. A new species from the Gulf of Mexico. *Gulf Research Report*, 7(3): 217-223.
- GOEKE, G. & R. HEARD (1983). Amphipods of the Family Ampeliscidae (Gammaridea) II. Notes on the occurrence of *Ampelisca holmesi* in the northern Gulf of Mexico. *Gulf Research Report*, 7(3): 289-291.
- GOEKE, G. & R. HEARD (1984). Amphipods of the Family Ampeliscidae (Gammaridea) III. *Ampelisca parapacifica*. A new species of amphipod from the Western North Atlantic with the designation of a substitute name for *A. eschrichtii pacifica* Gurjanova, 1955. *Gulf Research Report*, 7(4): 331-337.
- LEAR, D.W. & M.L. O'MALLEY (1983). Effects of sewage sludge dumping on continental shelf benthos. In: *Wastes in the Ocean. Industrial and Sewage Wastes in the Ocean*. Vol. I: 293-311, John Wiley and Sons, New York.
- LECROY, S. (1995). Amphipod Crustacea III. Family Colomastigidae. *Memoirs Hourglass Cruises*, 9: 1-139.
- LECROY, S. (2000). An illustrated identification guide to the near shore marine and estuarine gammaridean Amphipoda of Florida. Vol. I. *US Environmental Protection Agency. Annual Report for DEP Contract No. WM724*.
- LOWRY, J.K. & H.E. STODDART (1997). Amphipoda Crustacea IV. Families Aristiidae, Cyphocarididae, Endeavouridae, Lysianassidae, Scopelochelidae, Uristidae. *Memoirs of the Hourglass Cruises*, 10 (1): 1-148.
- MCCAIN, J. (1968). The Caprellidae (Crustacea: Amphipoda) of the western north Atlantic. *Smithsonian Institution Press*, 278: 1-147.
- MCKINNEY, L.D. (1979). Liljeborgiid amphipods from the Gulf of Mexico and Caribbean Sea. *Bulletin of Marine Science*, 29: 140-154, 8 figs.
- MCKINNEY, L.D., R.D. KALKE & J.S. HOLLAND (1978). New species of amphipods from the western Gulf of Mexico. *Contribution in Marine Science*, 21: 134-159.
- MONTAGNA, P. & D.E. HARPER (1996). Benthic infaunal long-term response to offshore production platforms in the Gulf of Mexico. *Canadian Journal of Fisheries Aquatic Sciences*, 53 (11): 2567-2588.
- MYERS, A. (1981). Amphipod Crustacea I. Family Aoridae. *Memoirs of the Hourglass Cruises*, 5 (5): 1-75.
- ORTIZ, M. (1979). Contribución al estudio de los anfipodos (Gammaridea) del Mediterráneo Americano. *Revista de Investigaciones Marinas*, Serie 8 (45): 1-16.
- ORTIZ, M. (1991). Amphipoda Crustacea II. Family Bateidae. *Memoirs of the Hourglass Cruises*, 8 (1): 1-31.
- ORTIZ, M. & R. LALANA (1993). Additions to the checklist and bibliography of the amphipods (Crustacea: Amphipoda) of the American Mediterranean. *Revista de Investigaciones Marinas*, 14 (1): 16-37.
- PEQUEGNAT, W.E., B.J. GALLAWAY & L.H. PEQUEGNAT (1990). Aspects of the ecology of the deep-water fauna of the Gulf of Mexico. *American Zoologist*, 30: 45-64.
- PEREZ, J.A. & M. HAIMOVICI (1995). Descriptive ecology of two South American Eledonis (Cephalopoda: Octopodidae). *Bulletin of Marine Science*, 56 (3): 752-766.
- PROBERT, P.K. & S.L. GROVE (1998). Macrobenthic assemblages of the continental shelf and upper slope off the west coast of South Island, New Zealand. *Journal of the Royal Society of New Zealand*, 28 (2): 259-280.
- RABALAIS, N., R. CARNEY & E. ESCOBAR (1999). Overview of continental shelf benthic communities of the Gulf of Mexico. In: KUMPF, H., S. KAREN & K. SHERMAN, (eds.), *The Gulf of Mexico large marine ecosystem. Assessment, sustainability and management* : 171-195. Blackwell Science, USA.
- SHOEMAKER, C. (1933). Amphipoda from Florida and the West Indies. *American Museum Novitates*, 598: 1-24.
- SHOEMAKER, C. (1945). The amphipod genus *Photis* on the east coast of North America. *Charleston Museum Leaflet*, 22:1-27.
- THOMAS, J.D. (1993a). Biological monitoring and tropical biodiversity in marine environments: a critique with recommendations, and comments on the use of amphipods as bioindicators. *Journal of Natural History*, 27 (4): 795-806.
- THOMAS, J.D. (1993b). *Identification Manual for marine Amphipoda (Gammaridea): I Common coral reef and rocks, bottom amphipods of South Florida*. Final Report DEP contract number SP290. Smithsonian Institution Washington.
- THOMAS, J.D. (1997). Systematic, ecology and phylogeny of the Anamixidae (Crustacea: Amphipoda). *Records of the Australian Museum*, 49 (1): 35-98.
- THOMAS, J.D. & J.L. BARNARD (1986). Two species of *Hornellia* (subgenus *Metaceradocus*) from the Florida Keys and Belize (Amphipoda, Melphidippoidea). *Bulletin of Marine Science*, 38: 477-487.
- THOMAS, J.D. & J.L. BARNARD (1991). Two new species of *Netamelita* from the Caribbean Sea (Crustacea: Amphipoda: Gammaridea). *Proceedings of the Biological Society of Washington*, 104 (3): 583-592.

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