OSTRACODA OF ALACRAN REEF, CAMPECHE SHELF, MEXICO

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I. ABSTRACT

The ostracode fauna of the Alacran Reef, consisting of 105 species, exhibits a mixture of 1) reef genera (mostly Bairdiacea), 2) platform genera of the transition zone (calcareous platforms between the Caribbean and the Gulf of Mexico and Atlantic), 3) Caribbean, 4) Gulf of Mexico and 5) ubiquitous genera. Reef forms include: *Propontocypris*, *Paranesidea*, and ornate Bairdiidae. "Platform" genera include *Actinocythereis*, *Acuticythereis*, *Proteoconcha*, *Cytheretta*, and an abundance of *Loxoconcha (Loxocorniculum)*. Caribbean genera include *Gangamocytheridea* and *Quadracythere*. Gulf of Mexico genera include *Hulingsina*, *Peratocytheridea*, and *Loxoconcha*.

The reef slope and Campeche shelf typically harbour *Echinocythereis*, *Henryhowella*, *Cytheropteron*, *Pterygocythereis*, *Macrocyprina*, and *Paracytheridea*.

II. INTRODUCTION

The Alacran Reef is a shallow-water platform of approximately elliptical shape, with a long axis of 22 km in a NNW direction and a short axis of 12.5 km, situated about 150 km due north of Merida, Yucatan, Mexico (Text-fig. 1). It rises steeply from the Campeche Shelf, which is here about 56 m (170 ft.) deep (Kornicker and Boyd, 1962). In 1978, Dr. Kornicker, of the U.S. National Museum, sent me about 300 samples (washed residues) taken on and around the Alacran Reef. Some of this material was used for studies by graduate students of LSU, who identified species and tried to identify environments of sample-groups that were linked in cluster analysis. Unfortunatey, I do not have precise locations of all the samples (Text-fig. 1), and a number of them have been eliminated from this report. In the present study 43 samples have been used. They contained 105 ostracode species of which 77 could be identified with previously described species (63 in Table 1, 14 in explanation of Table 1). Two species are new but are not described here. The remaining species are listed as "sp." if they could be recognized as individual species (*e.g.*, *Paranesidea* sp.), the other are reported as "spp.," which include several species with scattered occurrences. Species that were found in only a single sample have not been tabulated (Table 1) but are listed in the explanation of Table 1.

The Alacaran Reef can be subdivided into a number of sub-environments from ENE to WSW: Windward Shelf; Windward Slope; Windward Reef-flat; Windward Trough; a broad expanse of topographic highs and lows that can be combined under the term "Cellular Reef deeps and highs" (Hoskin, 1968), and are here subdivided into "*Thalassia* patches, Patch Reefs, Cellular reef surface and Pinnacle Reefs" (Hoskin, 1966); Lagoon; Leeward Sand Flats; Leeward Slope; and Leeward Shelf. Foraminifera from seven samples from different environments were tabulated by Davis (1964). As these samples were not represented in the material received, no direct comparison can be made. Many of the species recorded here have been described in numerous publications, a list of which would unnecessarily lengthen the references. Therefore, I have indicated only those that are of direct importance to the present study. An alphabetical list of previously described species is attached as an Appendix.

III. ACKNOWLEDGMENTS

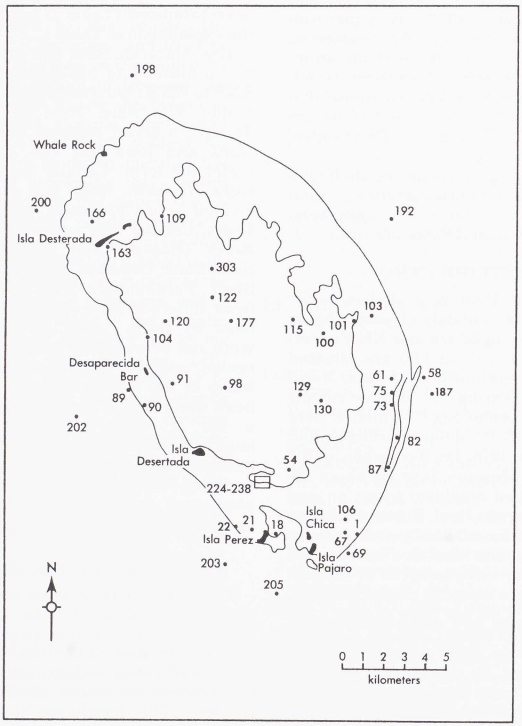
The type collection of ostracode species of the Gulf of Mexico that Dr. Rothwell donated to the H. V. Howe collection and his unpublished distribution charts of *Atlantis* cruise 1947, were widely used to ascertain bathymetric limitations of a number of species. The graduate students who

helped in this study were Kevin Kilmartin (Exxon Company, Houston), Gail Erlebacher (Amoco Production Company, New Orleans), Woodson Godfrey (Shell Oil Company, New Orleans) and Maria Luisa Machain (Instituto de Ciencias del Mar y Limnología, Mexico). Earl Manning studied foraminifera and ostracodes from the Nicaragua shelf for his master's thesis at LSU, Baton Rouge, and his results have been used for comparison. John B. Saunders (Naturhistorisches Museum, Basel, Switzerland) provided the comparative material from Buccoo Reef on Tobago (Trinidad and Tobago, W. I.).

IV. DISCUSSION

The Reef Fauna.

The fauna of the sediments within the reef proper is characterized by the large number of species of the Bairdiinae and Xestoleberididae. In addition, locally occurring in large numbers, are: *Propontocypris*, *Macrocyprina*, *Radimella*, *Quadracythere*, *Jugosocythereis*, *Caudites*, *Acu-*



Text-fig. 1. Sample locations on and around the Alacran Reef. The location of samples 224, 231, 235, and 236 can be found in Hoskin (1966, fig. 5). A description of the reef topography can be found in Kornicker and Boyd (1962) and Hoskin (1968, fig. 1). The solid lines indicate the approximate extension of the reef surface and internal lagoon.

ticythereis, *Proteoconcha*, *Loxoconcha (Loxocorniculum)*, *Cytheretta*, *Cytherura*, and *Paracytheridea*. As is to be expected, the majority of these are represented by the so-called "platform" species (occurring mainly in the transition zone between the Gulf of Mexico and the Caribbean, where carbonate platforms predominate from the Bahamas, through Cuba and southern Florida to Yucatan and Belize) (Bold 1978, Palacios-Fest *et al.*, 1985). To these belong: *Cytherella arostrata*, *Actinocythereis bahamensis*, *Acuticythereis laevissima*, *Proteoconcha tuberculata*, *Cytheretta pumicosa*, and species of *Loxoconcha (Loxocorniculum)*.

Reef species are *Glyptobairdia coronata*, *Triebelina sertata*, *T. rugosa*, as well as other Bairdiidae (*e.g.*, *Paranesidea bensoni*).

Caribbean species found on Alacran Reef include: *Paranesidea bradyi*, *Gangamocytheridea? plicata*, *Quadracythere producta*, *Orionina serrulatá*. Most Caribbean species occur only at rare instances (see explanation of Table 1, species marked with C).

Gulf of Mexico species include *Cytherella vermilionensis*, *Hulingsina tuberculata*, *Peratocytheridea bradyi*, *Caudites angulatus* and possibly *Loxoconcha wilberti*. (See also explanation of Table 1: species marked G).

There is a total absence of South American species, the most northerly occurrence of which appears to be in Belize.

Some species appear to have a restricted occurrence in the reef:

A: Shallow, agitated environment, *e.g.*, windward reef flat, shallow patchreefs, leeward sandflats: *Cytherelloidea* sp. B (in fact, most species of *Cytherelloidea*), *Bairdia longisetosa*, *Glyptobairdia coronata* (the occurrence at 95 feet, sample 51, Table 1, may be transported), *Morkhovenia inconspicua*, *Radimella confragosa*, *Caudites howei*, *Quadracythere producta*, *Hermanites hornibrooki*.

B: Deeper or more protected environment, *e.g.*, *Thalassia* patches, cellular reef deeps, windward trough and lagoon: *Cytherella arostrata* (in fact, most species of *Cytherella*), *Propontocypris*, *Macrocyprina*, *Triebelina sertata*, *Acuticythereis laevissima*, *Pterygocythereis alophia*, *Radimella wantlandi*. *Keijia demissa* has been found only in the lagoon. Of course, many species actually living in the agitated environment will get swept into quieter places of the reef.

The fauna of the Alacran Reef shows similarity (55%, see Text-fig. 2) to that of the carbonate barrier rim and platform of the Belize shelf (Teeter, 1975). Teeter indicates that this environment is characterized by *Bairdia* and *Paranesidea*, *Triebelina*, *Glyptobairdia*, *Morkhovenia inconspicua*, *Orionina bradyi*, *Jugosocythereis pannosa*, *Cytheretta pumicosa*, *Cushmanidea cristifera*, *Loxoconcha wilberti*, *Loxoconcha (Loxocorniculum)* spp., *Hemicytherura bradyi*, *Paracytheridea* spp. and *Xestoleberis* spp. All these are present and often common to abundant on the Alacran Reef. *Cytherella arostrata*, *Triangulocypris laeva*, *Quadracythere producta* and some others are less restricted in their distribution in Belize. *Glyptobairdia*, *Triebelina*, *Loxoconcha (Loxocorniculum)*, *Hemicytherura bradyi* and *Xestoleberis* are especially common in *Thalassia* patches on the Belize reef. For the Alacran Reef we may add *Havanardia sohni* to this restricted occurrence. Summarizing: Of the 102 species of Belize, 58 have been found on the Alacran Reef. The species not reaching Alacran are nearly all Caribbean forms (and especially South and Central American ones), and brackish water forms (totally absent on Alacran). The additional species found on Alacran Reef are Gulf of Mexico or platform species.

The ostracode fauna of the reef slope off northern Jamaica (Bold, 1978, Table 2) shows the presence of some reef and platform species (*Propontocypris* sp. 1 = *P. multiporifera*, *Macrocyprina* sp. aff. *M. maculata* = *M. propinqua*) and Caribbean species with almost total absence of Gulf of Mexico species (except *Triangulocypris laeva*, which may belong to the platform species) (53% Alacran species, see Text-fig. 2). Note among the platform species the absence of *Cytherella arostrata* and *Actinocythereis bahamensis*.

Comparison with the ostracodes of the Flower Garden Bank (Maddocks, 1974) shows that of the 34 species reported here, 14 occur on Alacran (41%, see Text-fig. 2). The Flower Garden fauna lacks Caribbean species and has only two platform species.

The Anton Lizardo reefs (Krutak, 1982)

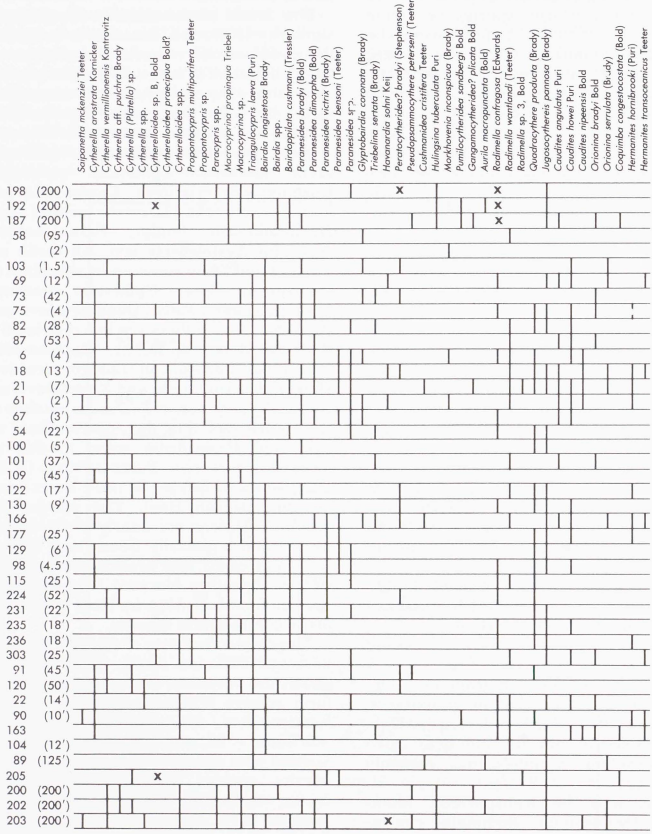
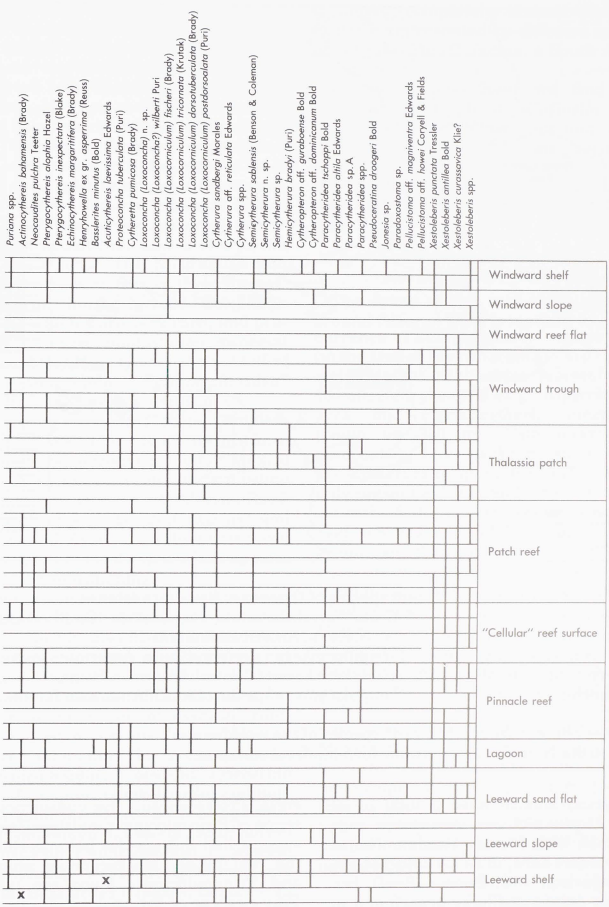


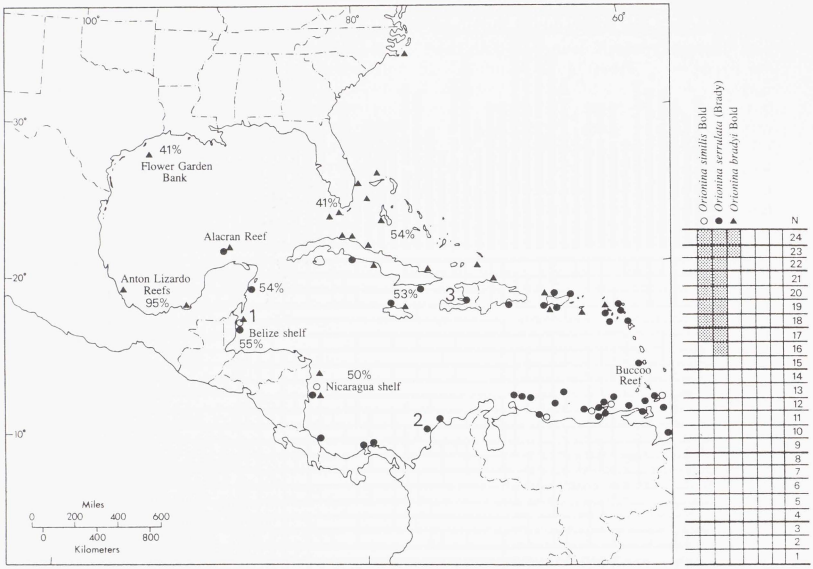
TABLE 1. Distribution of ostracodes across the Alacran Reef, Gulf of Mexico, omitting all species that were restricted to a single sample. Those not included in the table are: *Thalassocypris* sp. (187); *Aglaiocypris croneisi* Teeter (200); *Cytheromorpha apheles* Bold (166) C; *Pumilocytheridea alayai* Morales (21) G; *Keijia demissa* (Brady) (91) C; *Malzella evexa* Hazel (187) G; *Aurila auricula* (Teeter) (21) C; *Quadracythere lankfordi* Teeter (103) C; *Puriana convoluta* Teeter (82) C; *Caribella yoni* (Puri) (6); *Loxoconcha (Loxoconcha) avellana* Brady (187) C; *Phlyctocythere* sp. 2 (Bold, 1988) (192) C;



"*Monoceratina*" sp. (198); *Sclerochilus* sp. (200); *Kangarina depressa* Bold (177) C; *Microcythere howei* (Puri) (91); and *Microxestoleberis* sp. (163).

C = Caribbean form; G = Gulf of Mexico form. Numbers in parenthesis refer to localities in Text-fig. 1.

Species indicated by X on the distribution chart are believed to be transported.



Text-fig. 2. Distribution of Recent species of *Orionina*. Numbers refer to:
(1) Northernmost occurrence of *Costa variabilocostata recticostata* (South American fauna) and of *Reussicythere howei* (Central American fauna);
(2) Westernmost occurrence of "*Campylocythere*" *perieri* (South American fauna) and easternmost occurrence of *Reussicythere howei* (Central American fauna);
(3) Northernmost occurrence of "*Campylocythere*" *perieri* (South American fauna).

% indicates percentage of "Alacran" species of the total fauna
N refers to the N-zones of planktonic foraminiferal zonation.

of Veracruz, Mexico have a total of 22 species, 21 of which are in common with Alacran, 11 with Flower Garden. *Keijia demissa* occurs here, in Belize and Tobago (see comparison with Buccoo Reef), but only a few specimens have been found in the Alacran lagoon (loc. 91), and none on the the Flower Garden Bank.

Comparison of the Alacran and Belize faunas with those from the Nicaraguan shelf (1985) at water depth to 46.5 m, shows in the latter the almost complete absence of platform species: *Actinocythereis bahamensis*, *Cytherella arostrata*, *Cytheretta pumicosa* (only a few juveniles), *Acuticythereis*, *Proteoconcha*. The conspicuous absence of *Propontocypris multiporifera* may suggest that this species belongs rather to the reef fauna. *Macrocyprina propinqua* and *Triangulocypris laeva* are present. Fifty percent of the species also occur on the Alacran Reef. Compared with Belize there are also fewer Gulf of Mexico species; only *Caudites angulatus*, *Triangulocypris laeva* and *Loxoconcha wilberti* (the latter two may be platform species). On the other hand we find the (predictable) occurrence of widespread Caribbean species, some of which (*e.g.*, *Cativella pulleyi* and *Loxoconcha spinoalata*) do not

occur at Alacran. Central American taxa, such as *Reussicythere howei* and *Ruggieria? dictyon*, which occur on both the Nicaraguan and Belize shelves, are also not reported from the Mexican Caribbean coast (Palacios-Fest, *et al.*, 1985) and apparently never reached the Yucatan channel (see Text-fig. 2). Simple percentages of species in common with the Alacran Reef show that all platform areas (Bahamas, Jamaica, Belize, Cozumel) share 53-55% of their species. The percentage drops to 50% on the Nicaraguan shelf and to 41% on the Florida West coast. The Nicaraguan and Belize shelves share 66% of their species. The Alacran fauna has 18 Caribbean species (of which 4 are very rare, and presumably just at the limit of their dispersal zone) and 14 species typical of the Gulf of Mexico fauna (*e.g.*, *Peratocytheridea? bradyi*, *Hulingsina tuberculata*).

In order to present a more complete overview of the relations of the platform faunas with those from the Gulf of Mexico and the Caribbean, an alphabetical listing of all taxa reported from the Alacran Reef, Mexican Caribbean coast (Cozumel) and the Belize and Nicaraguan shelves is given in Table 2; previously described species are listed in the Appendix.

A comparison with the ostracode fauna of the Buccoo Reef of Tobago gives interesting similarities and dissimilarities. Both contain *Propontocypris multiporifera* but the Buccoo reef has in addition *P. cantaraensis* (Pleistocene of Venezuela), different from the *P.* sp. of Alacran. Bairdiidae are less numerous than in Alacran or Belize, but include *Bairdia longisetosa*, *Paranesidea bradyi*, *P. bensoni*, *Triebelina sertata*, *T. rugosa*, *Glyptobairdia coronata* and *Havanardia sohni* (all reef species). *Pumilocythereidea sandbergi*, *Morkhovenia inconspicua*, *Caudites howei*, *C. nipeensis*, *Radimella*, *Puriana*, *Quadracythere producta*, *Basslerites minutus*, *Loxoconcha* ex gr. *postdorsoalata* and *Xestoleberis* (mostly *X. punctata*) are locally abundant on Buccoo Reef. The differences are the absence of platform genera such as *Actinocythereis*, *Acuticythereis*, *Proteoconcha* and *Cytheretta*, and the near absence of the *Loxoconcha (Loxocorniculum)* group [one occurrence of *L. (L.) fischeri*, a few rare ones of *L. (L.) tricornata*]. *Cytherella* is almost completely absent. *Paracytheridea* is represented by different species, as is *Cytherura (C. luciae*, a South American form).

In the Buccoo Reef we find *Gangamocytheridea? plicata*, *Cativella navis*, *Costa variabilocostata recticostata*, *Keijia demissa* and *"Campylocythere" perieri*, all South American or Caribbean forms, most of which are also reported from Belize (except *"C." perieri*, see explanation Text-fig. 2).

Fauna of the Shelf and Reef Slope (Table 1).

The fauna of the reef slope and shelf around Alacran Reef is marked by the occurrence of *Echinocythereis margaritifera* (in the Gulf of Mexico from 31 - 470 - 1051 m water depth), *Hulingsina tuberculata* (2-104 m), *Henryhowella* ex gr. *asperrima* (41-3273 m), *Pterygocytheris inexpectata* (down to -230 m), *Cytheropteron* aff. *guraboense*, *Loxoconcha* n. sp. (31-±200 m), *Cytherura* n. sp. (in the Gulf of Mexico only present at 124 m and 335 m), as well as several of the species occurring on the reef, which are found downslope in greater numbers than could be accounted for by slope transport from the reef. These ubiquitous forms are: *Pterygocythereis alophia* (down to 230 m in the Gulf), *Cytheretta pumicosa* (down to 97 m), *Actinocythereis bahamensis* (-182 m), *Basslerites minutus* (31-105 m), *Macrocyprina propinqua* (-230 m), *Paracytheridea tschoppi* (-±200 m). Of all these, *Hulingsina* and *Pterygocythereis* are Gulf of Mexico forms, *Cytheretta pumicosa*, *Actinocythereis bahamensis* and possibly *Macrocyprina propinqua* are platform species. *Echinocythereis* and *Henryhowella* are widely distributed in deeper water, mainly outer continental shelf and continental slope.

Note on the Distribution of *Orionina* (Text-fig. 2)

The distribution of *Orionina serrulata* and *O. bradyi* was summarized by Bold (1978, p. 178-179, fig. 3) with *Orionina serrulata* as the typical Caribbean form, whereas *O. bradyi* occupies the northern fringes of the Antilles, the Bahama platform and the Gulf of Mexico. Some incon-

sistencies in this distribution were noted, where mixed populations of the two species occur. One of these was off northern Venezuela, one around Puerto Rico, the northernmost Lesser Antilles and Virgin Islands, and a third in Belize (Teeter, 1975). We can add to this the Nicaraguan shelf and the Alacran reef.

The material from around the islands of the coast of Venezuela was re-examined. It turned out that, wherever single valves of the supposed *O. bradyi* could be examined, the specimens had an indented line of concrescence and bunched radial porecanals; therefore, they are not *O. bradyi* but instead *O. similis* (Bold, 1963, p. 47, pl. 4, Fig. 7, 8, pl. 6, Fig. 8, 9). This species may be the same as *O. ebanksi* (Teeter, 1975, p. 488, Fig. 11 j-1, 12 b) and possibly also the same as *Orionina reticulata* (Hartmann) [*Cythereis (Elofsonella) reticulata* Hartmann, 1956, p. 37, Fig. 45-52, *Orionina reticulata* Hartmann, 1959, p. 240, pl. 58, Fig. 197-198)]. Note,

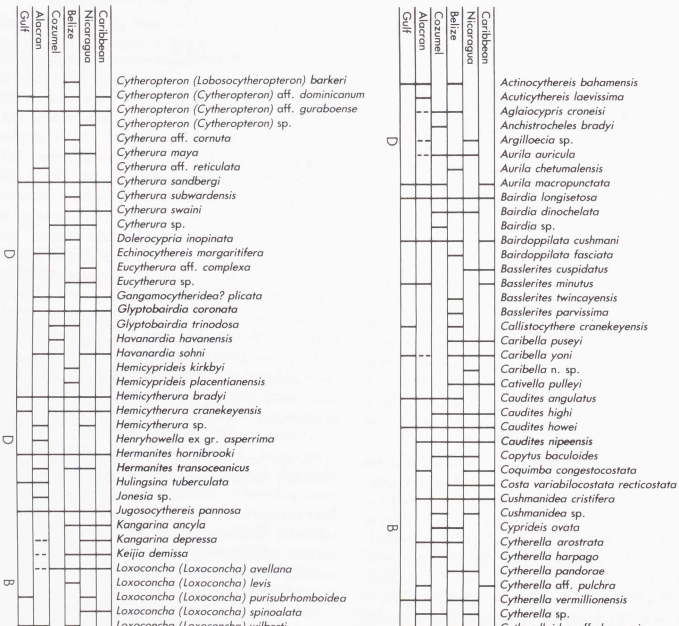


TABLE 2. Distribution of ostracodes in the area from Alacran reef, Cozumel (and Isla Mujeres), Belize and the Nicaragua shelf, compared to species that are typical for the Caribbean or for the Gulf of Mexico. The majority of species, which are restricted to this particular area and are not reported from the Gulf of Mexico or Caribbean, are platform

that the latter name is preoccupied by *Cythereis ornatissima reticulata* Jones and Hinde, 1889.

Re-examination of the material from the northern Lesser Antilles showed it to be correctly determined. Around Puerto Rico, Baker and Hulings (1966) reported many samples to contain *O. serrulata* and *O. bradyi*, both from the north and south sides of the island. In view of the fact that both species also occur together in a sample from Simpson Lagoon, St. Martin, this mixed distribution is accepted here.

On the Nicaragua shelf *O. serrulata* is somewhat more concentrated inshore, whereas *O. bradyi* occurs in offshore samples. Here also we find mixed populations. Teeter (1975) noted that in Belize *O. serrulata* (and *O. ebanksi* = *similis*?) occurs mainly in the main lagoon (and especially towards its southern end) and is extremely rare on the carbonate platform, whereas *O. bradyi* is restricted to the carbonate platform. Note that Palacios-Fest, *et al.*

species, except some deepwater forms (D) or brackish water forms (B). The distribution at Cozumel is taken from Palacios-Fest *et al.*, 1985; that at Belize from Teeter (1975); and that from the Nicaragua shelf from an unpublished master's thesis at L.S.U. by E. Manning (1985).

(1985) report only *O. serrulata* from the Cozumel-Isla Mujeres area.

On the Alacran Reef *O. bradyi* occurs mainly on the windward (ENE) side, but *O. serrulata* occurs mostly on the leeward (WSW) side. Although no mixed populations were found, there is one anomalous occurrence of *O. serrulata* inside the northern part of the reef (Fig. 1, loc. 166).

As *O. serrulata* shows up first in the early late Miocene in northern South America and Panama (Bold, 1964) and only in the Pliocene of the Greater Antilles, it might be classified as an originally South American species. The Alacran Reef appears to be its most northern Recent extension. *Orionina bradyi*, on the other hand, appears to be a southern North Atlantic form (Bermuda, Bahamas, U. S. Atlantic coast) and could possibly be related to the platform fauna. It has penetrated the Caribbean sea only at its northeastern end (Puerto Rico and Northern Lesser Antilles) and at its western end (south coast of Cuba, Nicaragua shelf and Belize).

V. CONCLUSIONS

Caribbean reef fauna: *Propontocypris multiporifera, Paranesidea bensoni, Triebelina sertata, T. rugosa, Glyptobairdia coronata, Havanardia sohni.*

Northwestern reefs: *Cytherella arostrata (Triangulocypris laeva?).*

Southeastern reefs: *Propontocypris cantaraensis, Triangulocypris keiji.*

Platform fauna: *Macrocyprina propinqua, Actinocythereis bahamensis, Acuticythereis laevissima, Proteoconcha tuberculata, Cytheretta pumicosa*, abundance of *Loxoconcha (Loxocorniculum)* spp. *(Triangulocypris laeva?, Loxoconcha wilberti?).*

Caribbean fauna: *Cativella pulleyi, C. navis, Quadracythere producta, Q. lankfordi, Gangamocytheridea? plicata, Cytherella polita, Orionina serrulata.*

Gulf of Mexico fauna: *Cytherella vermillionensis, Hulingsina tuberculata, Peratocytheridea bradyi, P. setipunctata, Caudites angulatus, (Triangulocypris laeva?, Loxoconcha wilberti?)*

Central American fauna: *Reussicythere howei, Pseudopsammocythere peterseni.*

South American fauna: "*Campylocythere*" *perieri, Costa variabilocostata recticostata.*

Outer shelf and outer slope: *Echinocythereis margaritifera, Henryhowella* ex gr. *asperrima.*

Ubiquitous shelf species: *Radimella* spp., *Caudites nipeensis, Hermanites hornibrooki, Puriana* spp., *Paracytheridea* spp., *Xestoleberis* spp.

VI. NOTES ON TAXONOMY

In order to keep the number of species at a practical level, only those species which could be identified with certainty have been tabulated (Table 1), if they occurred at more than one location. The ones with only a single occurence have been listed in the explanation of the table. After the identifiable species have been segregated, a small number of specimens are left, which cannot be assigned to any known species. They are often immature specimens, or are only rare occurrences. These have been indicated under the heading *Cytherella* spp., *Cytherelloidea* spp., etc.

A few of the species need some clarification.

Cytherelloidea sp. B (Bold, 1966) = *C. umbonata* Edwards of Teeter, 1975, not *C. umbonata* Edwards, 1944.

Bairdoppilata cushmani (Tressler) = *Bairdia* aff. *B. amygdaloides* Brady (Bold, 1978, table 3).

Aurila macropunctata (Bold, 1946) = *A. amygdala* (Stephenson) of Benson and Coleman (1963), not *Hemicythere amygdala* Stephenson, 1944.

Actinocythereis bahamensis (Brady) = *A.* aff. *A. bahamensis* (Brady) of Howe and Bold, 1975; = *A. subquadrata* Puri of Garbett and Maddocks, 1979; = sp. 35 of Rothwell, 1949 (H. V. Howe collection no. 6369, *Atlantis* cruise 1947, st. 363 at 70 m). Specimens of *A. subquadrata* Puri (1960) in the H. V. Howe collection are smaller and abraded. The present species is very common in samples of the Bahamas platform and, I believe, is identical with Brady's species, described in Les Fonds de la Mer (1870, p. 241, pl. 32, fig. 1, 2). It occurs in the Gulf of Mexico between 29 and 122 m (concentrated from 40-90 m).

Loxoconcha (Loxoconcha) n. sp. = types 9, 70 and ?94 of Rothwell (H. V. Howe collection no. 6327, station 73 of *Atlantis* 1947 cruise, waterdepth 80.5 m). It is a slightly punctate, tumid form with strongly compressed and smooth anterior and posterior margins. Its depth distribution in the Gulf of Mexico is from 31 - ±200 meters with a few isolated occurrences at greater depth.

Macrocyprina propiqua as used in this report comprises several species and should be replaced throughout by *Macrocyprina* sp. aff. *M. propinqua*.

Phlyctocythere sp. (explanation Table 1) (Alacran 291) = *Phlyctocythere* sp. 2 Bold (1988) of the Pliocene of the Dominican Republic = type 41 of Rothwell of the Gulf of Mexico (HVH no. 6357) station 75 at 80.5 m waterdepth.

Semicytherura n. sp. = type 109 of Rothwell, 1949. In the Gulf of Mexico it was found only as single specimens at stations 471 (335 m waterdepth) and 490 (124 m waterdepth) of *Atlantis* 1947 cruise.

Cytheropteron (Cytheropteron) aff. *dominicanum* Bold, 1988 = type 7 of Rothwell, 1949 (HVH no. 6325) station 74, at 73 m waterdepth. It is similar to *C.* (C.) *subreticulatum* Bold 1946, but smaller. It has been found at water depths ranging from 29 - 1317 m, most commonly 29-70 m.

Cytheropteron (Cytheropteron) aff. *guraboense* (Bold, 1988). Probably more than one species, some may be related to the *Lobosocytheropteron* group of *C. (L.) palton*, *C. (L.) barkeri* etc. Others may be identical to *C. guraboense*.

Paracytheridea sp. A, Bold, 1988, p. 63,pl. 11, fig. 3.

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APPENDIX

Alphabetical list of modern ostracodes in the Gulf of Mexico and Caribbean biogeographic provinces.

Actinocythereis bahamensis (Brady, 1870)
Acuticythereis laevissima Edwards, 1944
Aglaiocypris croneisi Teeter, 1975
Anchistrocheles bradyi Scott, 1905
Aurila auricula (Teeter, 1975)
Aurila chetumalensis Teeter, 1975
Aurila macropunctata (Bold, 1946)
Bairdia dinochelata Kornicker, 1961
Bairdia longisetosa Brady, 1902
Bairdoppilata cushmani (Tressler, 1941)
Bairdoppilata fasciata (Brady, 1870)
Basslerites cuspidatus Bold, 1966
Basslerites minutus Bold, 1958
Basslerites twincayensis Teeter, 1975
Basslerites parvissima Teeter, 1975
Callistocythere cranekeyensis Puri, 1960
"Campylocythere" perieri (Brady, 1868)
Caribella puseyi Teeter, 1975
Caribella yoni (Puri, 1960)
Cativella pulleyi Teeter, 1975
Caudites angulatus Puri, 1960
Caudites highi Teeter, 1975
Caudites howei Puri, 1960
Caudites nipeensis Bold, 1946
Copytus baculoides (Brady, 1890)
Coquimba congestocostata (Bold, 1963)
Costa variabilocostata recticostata Bold, 1970
Cushmanidea cristifera Teeter, 1975
Cyprideis ovata (Mincher, 1941)
Cytherella arostrata Kornicker, 1963
Cytherella harpago Kornicker, 1963
Cytherella pandorae Kornicker, 1963
Cytherella aff. *pulchra* Brady, 1866
Cytherella vermillionensis Kontrovitz, 1976
Cytherelloidea aff. *leonensis* Howe, 1934
Cytherelloidea praecipua Bold, 1963
Cytherelloidea sp. B Bold, 1966
Cytheretta pumicosa (Brady, 1866)
Cytheromorpha apheles Bold, 1963
Cytheropteron (Cytheropteron) aff. *dominicanum* Bold, 1988
Cytheropteron (Cytheropteron) aff. *guraboense* Bold, 1988
Cytheropteron (Lobosocytheropteron) barkeri Teeter, 1975
Cytherura aff. *cornuta* Brady, 1868
Cytherura lucinae Bold, 1966
Cytherura maya Teeter, 1975
Cytherura aff. *reticulata* Edwards, 1944
Cytherura sandbergi Morales, 1966
Cytherura subwardensis Teeter, 1975
Cytherura swaini Bold, 1963
Dolerocypria inopinata Klie, 1939
Echinocythereis margaritifera (Brady, 1866)
Eucytherura aff. *complexa* (Brady, 1866)
Gangamocytheridea? plicata Bold, 1968
Glyptobairdia coronata (Brady, 1870)
Glyptobairdia trinodosa Teeter, 1975
Havanardia havanensis Pokorý, 1968
Havanardia sohni Keij, 1976
Hemicyprideis kirkbyi (Brady, 1866)
Hemicyprideis placentiaensis (Teeter, 1975)
Hemicytherura bradyi (Puri, 1960)
Hemicytherura cranekeyensis Puri, 1960
Henryhowella ex gr. *asperima* (Reuss, 1850)
Hermanites hornibrooki (Puri, 1960)
Hermanites transoceanicus Teeter, 1975
Hulingsina tuberculata Puri, 1958
Jugosocythereis pannosa (Brady, 1869)
Kangarina ancyla Bold, 1963
Kangarina depressa Bold, 1968
Keijia demissa (Brady, 1868)
Loxoconcha (Loxoconcha) avellana (Brady, 1866)
Loxoconcha (Loxoconcha) levis Brady, 1870

Loxoconcha (Loxoconcha) purisubrhomboidea Edwards, 1954
Loxoconcha (Loxoconcha) spinoalata Bold, 1946
Loxoconcha (Loxoconcha) wilberti Puri, 1954
Loxoconcha (Loxocorniculum) dorsotuberculata (Brady, 186)
Loxoconcha (Loxocorniculum) fischeri (Brady, 1869)
Loxoconcha (Loxocorniculum) postdorsalata (Puri, 1960)
Loxoconcha (Loxocorniculum) tricornata (Krutak, 1971)
Macrocyprina propinqua Triebel, 1960
Malzella evexa Hazel, 1983
Microcythere howei (Puri, 1964)
Microcythere cf. *inflexa* Müller, 1894
Morkhovenia inconspicua (Brady, 1880)
Munseyella aff. *minuta* (Bold, 1946)
Nearocytherura bananaformis (Coryell and Fields, 1937)
Neocaudites pulcher Teeter, 1975
Neocaudites scottae Teeter, 1975
Neomonoceratina mediterranea (Ruggieri, 1953)
Occultocythereis angusta Bold, 1963
Orionina bradyi Bold, 1963
Orionina serrulata (Brady, 1869)
Orionina similis Bold, 1963
Paracypris franquesoides Swain, 1967
Paracytheridea altila Edwards, 1944
Paracytheridea edwardsi Teeter, 1944
Paracytheridea tschoppi Bold, 1946
Paracytheridea sp. A, Bold, 1988
Paracytheroma aff. *johnsoni* (Mincher, 1941)
Paracytheroma stephensoni (Puri, 1960)
Paradoxostoma pequegnati McKenzie, 1971
Paranesidea arostrata Kornicker, 1961
Paranesidea bensoni Teeter, 1975
Paranesidea bradyi (Bold, 1957)
Paranesidea dimorpha (Bold, 1963)
Paranesidea gigancantha (Kornicker, 1961)
Paranesidea harpago (Kornicker, 1961)
Paranesidea laevicula (Edwares, 1944)
Paranesidea victrix (Brady, 1869)
Pellucistoma aff. *howei* Coryell and Fields, 1937
Pellucistoma aff. *magniventra* Edwards, 1944
Peratocytheridea bradyi (Stephenson, 1938)
Peratocytheridea setipunctata (Brady, 1869)
Perissocytheridea bisulcata Teeter, 1975
Perissocytheridea subrugosa (Brady, 1870)
Phlyctocythere sp. 2, Bold, 1988
Polycope aff. *maculata* Müller, 1894
Pontocypris ex gr. *dreikanter* (Coryell and Fields, 1937)
Propontocypris cantaraensis Bold, 1972
Propontocypris multiporifera Teeter, 1975
Proteoconcha tuberculata (Puri, 1960)
Pseudoceratina droogeri Bold, 1965
Pseudopsammocythere peterseni (Teeter, 1980)
Pseudopsammocythere ex gr. *vicksburgensis* (Howe and Law, 1936)
Pterygocythereis alophia Hazel, 1983
Pterygocythereis hondurasensis Teeter, 1975
Pterygocythereis inexpectata (Blake, 1929)
Pumilocytheridea alayai Morales, 1966
Pumilocytheridea sandbergi Bold, 1963
Puriana convoluta Teeter, 1975
Puriana ex gr. *gatunensis* (Coryell and Fields, 1937)
Quadracythere lankfordi Teeter, 1975
Quadracythere producta (Brady, 1866)
Radimella confragosa (Edwards, 1944)
Radimella wantlandi (Teeter, 1975)
Radimella sp. 3, Bold, 1975
Reussicythere howei Bold, 1983
Ruggieria? dictyon Bold, 1966
Saipanetta kelloughae Maddocks, 1972
Saipanetta mckenziei Teeter, 1975
Semicytherura sablensis (Benson and Coleman, 1963)
Tetragonodon ctenorhynchus (Brady, 1887)
Triangulocypris laeva (Puri, 1960)
Triebelina rugosa Allison and Holden, 1971
Triebelina sertata Triebel, 1948
Uroleberis angulata (Brady, 1870)
Xestoleberis antillea Bold, 1988
Xestoleberis curassavica Klie, 1939
Xestoleberis punctata Tressler, 1949

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REVIEW

HANDBOOK OF PALEOZOOLOGY, by Emil Kuhn-Schnyder and Hans Rieber; translated by Emil Kucera. Published by The Johns Hopkins University Press, Baltimore and London, 1987, a volume in the series Johns Hopkins Studies in Earth and Planetary Sciences, xiii + 394 pp., illustrated, index, $32.50

This work, originally published in German (1984), was designed to provide students with a greatly condensed but well-illustrated introduction to the systematics of fossil animals. As the known fossil forms are so abundant and diverse, the treatment of fossil animals in this book was of necessity selective and subjective. Thus, even though both the invertebrates and