THE ECOLOGY OF LUCAYAN ARAWAK FISHING PRACTICES

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Fishing is a form of predator-prey interaction. As such, the behaviors of fishes can be used to define a restricted range of human behaviors that resulted in their capture. In this report, ecological evidence, fishbone analysis, ethnohistoric reports for the prehistoric Caribbean, experimental fishtrap samples, and ethnographic reports of fishing in other coral waters are brought together in the analysis of prehistoric fishing in the Bahama Archipelago. The analysis is conducted at two levels. First, general fishing strategies are distinguished on the basis of behavioral evidence; and second, specific capture techniques are identified through comparisons with experimental fishtrap samples.

The specific details about marine fishing practices are difficult to reconstruct from archaeological evidence alone. Ethnographers have documented multivariate environmental interactions in the

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fishing decision-making process. Tidal fluctuations, diurnal rhythms, seasonal availabilities, spawning aggregations, weather, currents, and fish behavior all condition the timing and selection of capture techniques (Cordell 1978; Davenport 1960; Johannes 1981). Such complexity need not, however, preclude the interpretation of prehistoric fishing practices (Kirch 1982). Fishing is a form of predator-prey interaction with capture resulting from the articulation of behaviors. It should therefore be possible to define a restricted range of human behaviors by examining the behaviors of prey types identified in archaeological deposits.

This report presents a preliminary interpretation of Lucayan Arawak fishing practices using evidence from the Turks and Caicos Islands. The analysis is accomplished in two stages. First, ethnohistoric and archaeological sources of evidence are used to identify the probable fishing techniques, with the efficiency of these techniques evaluated with reference to fish behaviors. Fish behaviors are distinguished by primary habitat (tidal flats or coral reef), activity period (diurnal or nocturnal), mobility, and aggregation. These behavioral categories are sufficient for the initial identification of the technological inputs that might have produced the archaeological deposits.

The second stage involves the comparison of modern fishtrap catches and the relative frequency of fishes assigned to different capture techniques. This comparison refines the reconstruction of probable fishing practices and indicates the relative importance of different techniques. Modern fishtrap catches are, at present, the only available comparative data base.

The results indicate that fishing practices correspond to both habitat and niche characteristics of fish species. This correspondence provides a means for distinguishing prehistoric fishing behavior and for reconstructing the return rates from this component of the Lucayan Arawak economy.

STUDY AREA AND MODERN STUDIES

The study population is the Lucayan Arawaks who occupied the Bahama Archipelago between A.D. 700–1500 (Sears and Sullivan 1978). Extensive manioc and maize cultivation was the foundation of their subsistence economy, with almost all of their animal protein obtained from marine fishes and molluscs (Keegan 1985; Sullivan 1981). Evidence for Lucayan fishing practices is limited to two wooden fishhooks, ethnohistoric reports that spears and the bow-and-arrow were used, and to fish bones identified in archaeological sites (Granberry 1978; Rouse 1963; Wing and Reitz 1982; Wing and Scudder 1983). Ethnohistoric reports for the Greater Antilles state that cotton or fiber nets, weirs, poison, and basketry traps were in use among the Taino Arawaks (Loven 1935; Rostlund 1952; Rouse 1963). All of these techniques probably were of general knowledge because communications were maintained between the Taino and the Lucayans. Similar techniques are recorded for the Island Carib of the Lesser Antilles, although nets were apparently of lesser importance (Price 1966).

Fish bones from three Lucayan Arawak sites in the Turks and Caicos Islands have been analyzed at the zooarchaeology laboratory, Florida State Museum (Wing and Reitz 1982; Wing and Scudder 1983). The sites are located on Middle Caicos (MC-6, MC-12) and on Pine Cay (PC-1) (Figure 1; see Sullivan 1981). Material culture and radiocarbon determinations indicate that these sites were occupied during the terminal period (ca. A.D. 1200), at which time intensified marine resource procurement was practiced (Keegan 1985; Sullivan 1981).

Site MC-6 is above the Caicos Bank on the south coast with access to shallow grass flats, tidal channels, and an extensive lagoon. Site MC-12 is adjacent to a shallow grass reef flat that gradually increases in depth through patch reefs until reaching the barrier coral reef about 2 km from the north shore. The Pine Cay site is on a deep water channel that flows between the Caicos Bank and a reef flat that extends to the barrier reef.

To facilitate the interpretation of prehistoric faunal samples, an experimental fish-trapping project was conducted on Pine Cay. From December 1980 through July 1981, Haitian-style basketry traps, of a type in use today, were set in patch reef and tidal flat/lagoon habitats (Keegan 1982a). The project was monitored by a local technician, whose father was a fisherman, working with the P.R.I.D.E. Foundation on their conch mariculture project. The traps, measuring about 1.5 by .5 by .5 m, were emptied at 1-week intervals, weather permitting; the species, length, and weight of every fish were recorded.

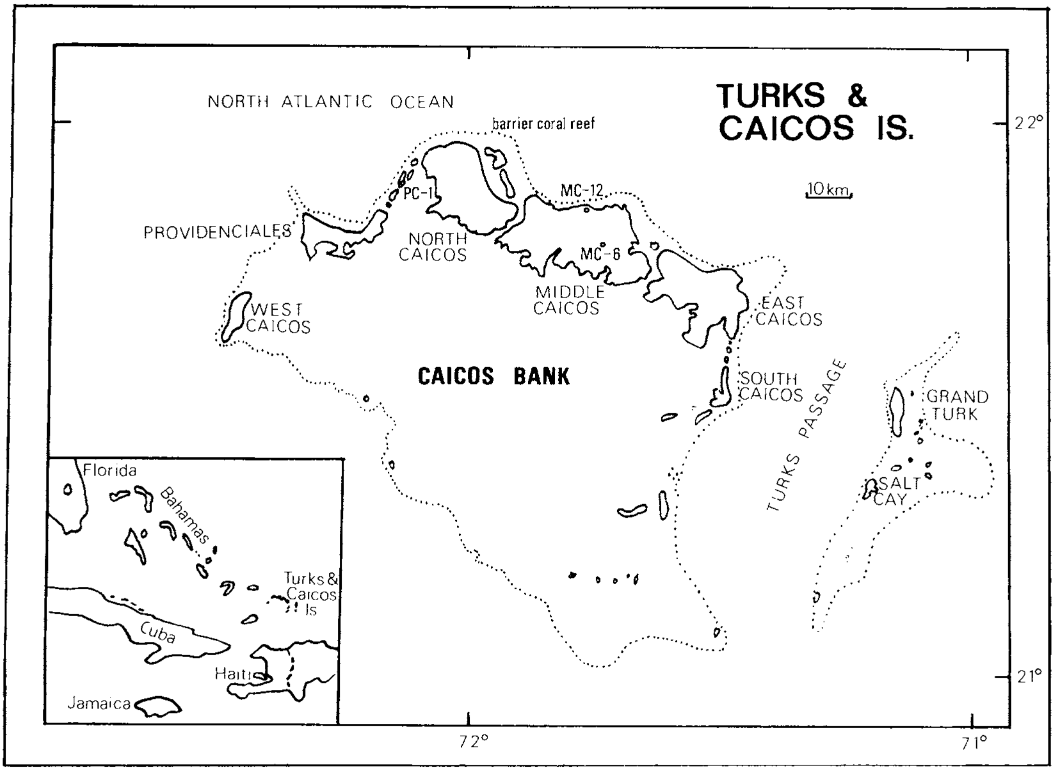

Figure 1. Sample locations in the Turks and Caicos Islands.

Basketry traps were selected because modern yields appeared to match lists of genera from prehistoric sites (Wing et al. 1968), and because studies had shown that modern traps of local manufacture provide high returns (High and Ellis 1973). The project provided data on the relative abundance and sizes of fish species in different habitats, and a controlled sample of trap yields.

FISH BEHAVIOR AND FISHING TECHNOLOGY

Wing and Scudder (1983) have compared the types and sizes of fishes identified at MC-6 and MC-12 with marine habitats that occur within site catchments (cf. Sullivan 1981). They concluded that "exploitation was confined to the major aquatic habitats closest to each site; the patch reefs next to MC-12 and the lagoon and tidal flats near MC-6" (p. 209). They suggested that the techniques used in these habitats were nets and weirs (MC-6), and spears, hook-and-line, and traps (MC-12). The results of the Pine Cay fishing project, ecological studies, and ethnographic reports from other coral reef locations are used to examine and refine those conclusions.

Tidal Flat and Reef Flat Habitats

These shallow, sand substrate habitats support dense growths of marine spermatophytes known as seagrasses. The visual impression is of a low-cut grassland with few obstructions for shelter, and a corresponding absence of visible activity. The flats support a small resident population of adult carnivorous fishes (e.g., bonefish, *Albula vulpes*; porgy, Sparidae; needlefish, Belonidae; mojarra, Gerridae and *Eucinostomus*; filefish, *Alutera*), along with juvenile representatives of many reef dwelling species (e.g., parrotfishes, Scaridae; angelfish, *Pomacanthus* and *Holocanthus*; wrasses, *Halichoeres*). Although the tidal flats appear to be vacant during the day, a variety of reef omnivores and schooling carnivores disperse over the flats to feed at night (Ehrlich 1975; Randall 1965).

The principle adult residents are bonefish and porgies. They occur alone or in small schools and are diurnal feeders. Bonefish frequently are observed in shallow waters feeding during incoming tides (Bohlke and Chaplin 1968). Individuals and schools are visible from a distance due to the characteristic wake they create while moving through shallow water (Randall 1967). Bonefish, porgies, mojarra, and other adult residents of the tidal flats account for 45% of the identified fishbones (MNI) at MC-6, 29% at PC-1, and 8% at MC-12 (Keegan 1982a; Wing and Scudder 1983).

The mobile clumped characteristics of those fishes favor a "widely foraging" predation strategy (Pianka 1974:203). That strategy is consistent with the behavior required to capture the primary grass flat food source, the queen conch (*Strombus gigas*). Queen conch are widely distributed, semi-sedentary, epi-faunal gastropods that are visible from surface craft and are sought through a random search of the environment (Keegan 1982b). Collecting trips would have brought the Lucayans into contact with fishes feeding on the flats and in patch reefs during the day. Thus, both fishing and collecting promote the same foraging strategy.

A variety of techniques can be used to capture bonefish and porgies, but methods that maintain the integrity of schools provide the highest yields (cf. Johannes 1981). Nets provide an effective means for impacting schools, and weirs would be effective where fishes frequent particular coastal locations (cf. Rostlund 1952). Bow-and-arrow, spears, and hook-and-line could also have been used but the fish would scatter following initial contact and yields would be lower (Grosvenor 1965:133; Randall 1967). Basketry traps apparently are not effective because only one porgy (.4% of total) was caught during the Pine Cay fishing project (Keegan 1982a; also see High and Ellis 1973; Munro et al. 1971; Stevenson and Marshall 1974). Modern fishing practices provide few analogs for interpreting the prehistoric capture of these fishes. Resident tidal flat fish populations have been depleted through intensive near-shore fishing and by sportfishing for bonefish.

Nocturnal visitors to the flats are the other main component of site samples. These reef omnivores (parrotfishes; surgeonfish, *Acanthurus*) and schooling carnivores (grunts, *Haemulon*; snapper, *Lutjanus*) constitute 34% of the MC-6 sample and 48% of the PC- 1 sample. The behavioral characteristics of these fishes promote a "sit and wait" or ambush form of predation strategy (Pianka 1974:203). During the day these fishes are inaccessible among coral heads, but at dusk they form mixed schools and travel along narrowly defined routes from deeper-water reef to shallow grass flat feeding grounds (Ehrlich 1975; Starck and Schroeder 1971). By impacting the schools along their crepuscular migration routes, the probability of capture is greater than it would be for attempts to intercept individuals foraging across the flats. Traps, weirs, and stationary nets should therefore have provided the primary methods of capture.

Coral Reef and Patch Reef Habitats

Reef fishes tend to be sedentary and completely dependent upon the reef for food and protection from predators (Ehrlich 1975; Randall 1965). They typically venture only a short distance from the reef during the day, and would be most easily caught by hook-and-line or traps set in the reef. Line fishing is indicated by two wooden fishhooks, and what may be a gorge, recovered from a cave site adjacent to a barrier reef habitat (Granberry 1978). The hooks are similar to the "fong" hooks of Oceania that are used to capture small-mouthed carnivores (e.g., triggerfish, *Balistes*; groupers, Serranidae; hinds, *Epinephelus*; hogfish, *Lachnolaimus*; wrasses) (Johannes 1981). Other types of hooks probably were used (see Price 1966; Rostlund 1952), but they have not, as yet, been recovered during site excavations. Line fishing apparently provided relatively minor yields. Even if every carnivore in the MC-12 faunal sample is attributed to this technique, it would account for only 19% of the total sample.

The capture of reef omnivores, which constitute 61% of the MC-12 faunal sample, cannot be attributed to line fishing or spearing. The primary food sources for these fishes are algae and seagrasses so they are unlikely to take a hook, and they are inaccessible during the day (Fry et al. 1982; Randall

Table 1. Body Weights of Common Fish Genera in Sites MC-6 and MC-12, and the Minimum Number of Individuals in PC-1.

Fish Genera (Common Name)	Site MC-6 Weight ($\bar{x}$; kg)	Site MC-6 Range (kg)	Site MC-6 N[a]	Site MC-6 MNI/%MNI	Site MC-12 Weight ($\bar{x}$; kg)	Site MC-12 Range (kg)	Site MC-12 N[a]	Site MC-12 MNI/%MNI	Site PC-1 MNI/ %MNI
Haemulon (grunt)	.24	.05–1.89	69	10/8.5	1.33	.52–2.56	6	7/5.8	10/10.6
Lutjanus (snapper)	.67	.16–1.89	49	12/10.2	1.43	—	1	3/2.5	19/20.2
Acanthurus (surgeonfish)	.46	.22–1.22	15	2/1.7	.39	.18–.75	35	4/3.3	1/1.1
Scarus (parrotfish)	.49	.27–.77	12	9/7.6	.81	.80–.90	3	10/8.3	3/3.2
Sparisoma (parrotfish)	.59	.24–.97	24	7/5.9	.61	.41–.86	17	60/49.6	12/12.8
Epinephelus (grouper)	.72	.51–.97	2	5/4.2	—	—	—	5/4.1	2/2.1
Calamus (porgy)	—	—	—	2/1.7	0	0	0	0/0	15/16.0
Albula vulpes (bonefish)	.87	.27–2.15	257	37/31.4	.84	.27–1.23	5	10/8.3	10/10.6
Mulloidichthys (goatfish)	0	0	0	0/0	0	0	0	0/0	0/0
Pomacanthus (angelfish)	0	0	0	0/0	0	0	0	0/0	0/0
Other (Table 4)	.46	.08–.76	205	34/28.8	.71	.57–2.0	168	22/18.2	14/14.9
Totals				118/100				121/100.1[b]	94/100

Note: Body weights were calculated with the regression formula: Log y = 2.047(Log x) + 1.162, where y is body weight in grams and x is the anterior diameter of the centrum (mm). The formula is based on the known dimensions and body weights of 50 specimens ($r^2 = 0.72$) (Wing and Scudder 1983).

[a] Number of vertebrae measured.

[b] Percentages sum to more than 100 due to rounding.

Table 2. Body Weights and Lengths of Common Fish Genera in Tidal Flat Trap Samples.

Fish Genera	Weight ($\bar{x} \pm s$; kg)	Range (kg)	Length ($\bar{x} \pm s$; cm)	Range (cm)	N	%N
Haemulon	.24 ± .1	.09–.57	20.6 ± 6.1	10.2–38.1	44	16
Lutjanus	.58 ± .6	.14–2.7	28.8 ± 10.3	17.8–53.3	51	18.5
Acanthurus	.31 ± .1	.20–.40	23.5 ± 6.2	15.2–30.5	13	4.7
Scarus	.87 ± .5	.43–1.6	41.2 ± 10.8	25.4–61.0	9	3.3
Sparisoma	.27 ± .1	.11–.45	22.5 ± 5.3	12.7–35.6	75	27.3
Epinephelus	1.03 ± .8	.23–2.7	35.8 ± 10.7	16.5–61.0	28	10.2
Mulloidichthys	.22	.20–.28	20.7 ± 2.3	17.8–26.0	20	7.3
Pomacanthus	.36 ± .1	.20–.57	27.2 ± 4.8	15.2–33.0	20	7.3
Calamus	—	—	—	—	1	0.4
Albula vulpes	0	0	0	0	0	0
Other (Table 4)	.41 ± .3	.11–1.4	24.6 ± 5.8	15.2–35.6	14	5.1
Totals					275	100.1[a]

[a] Percentages sum to more than 100 due to rounding.

1967). Traps set in the reef, and traps or nets set along crepuscular migration routes, are the most probable techniques used for the capture of reef omnivores.

Fishing Practices

Traps, nets, weirs, hook-and-line, spears, and bow-and-arrow were all probably in use when fishing was intensified during the terminal period of Lucayan settlement (Keegan 1985). In the preceding discussion of fish behavior, three categories of fishing practices were identified: (1) the capture of bonefish and porgies was attributed to the use of nets and/or weirs, although the use of hooks, spears, and arrows could not be eliminated; these fishes constitute 45% of the MNI at MC-6, 29% at PC-1, and 8% at MC-12; (2) the capture of schooling omnivores and carnivores was attributed to the use of traps, weirs and/or nets, with these fishes constituting 34% of the MNI at MC-6, 50% at PC-1, and 74% at MC-12; and (3) the capture of reef carnivores was attributed to line fishing, comprising 19% of the MNI at MC-12. The remainder of the fishes identified in site samples (21% of the MNI at MC-6, 23% at PC-1, and 6% at MC-12) were not attributed to a specific capture technique. They could, however, have been captured using any of the aforementioned techniques.

A more specific identification of which technique(s) was responsible for the capture of fishes in the second category can be accomplished with reference to modern trap catches. At present, this is the only experimental or ethnographic data set that is available for comparative analysis.

The prehistoric use of traps was expected for several reasons. First, there is a close, superficial correspondence between the fish genera and their relative frequencies in site and trap samples (Keegan 1982a; Wing et al. 1968). Second, the use of traps would have been promoted by the minimal investment of time in their use. For instance, a daily examination of untended traps would provide a basis for determining what, if any, other foraging activities should be pursued. This examination could have been combined with other foraging activities that would share the costs of travelling to the stationary traps.

Before comparing modern trap and prehistoric site samples it must be demonstrated that they are drawn from the same population. Three sources of variability are possible: geographical, temporal, and species diversity. The fact that samples were collected from different sections of the same barrier reef and banks should eliminate significant biogeographical differences.

Second, ecological evidence supports the assumption that reef fish communities have remained fairly stable for the past 500 to 1,000 years. The characteristic stability of the coral reef habitat has produced a level of species diversity and coevolution that must have required a long period of development (Ehrlich 1975; Glynn 1973). Fossil coral reefs in the Bahamas exhibit a stable structure and species diversity that began in the Pleistocene (Adams 1981). Changes in species composition

Table 3. Body Weights and Lengths of Common Fish Genera in Coral Reef Trap Samples.

Fish Genera	Weight ($\bar{x} \pm s$; kg)	Range (kg)	Length ($\bar{x} \pm s$; cm)	Range (cm)	N	%N
Haemulon	.24 ± .1	.11–.57	23.4 ± 4.7	12.7–48.3	87	44
Lutjanus	.39 ± .2	.14–.91	29.5 ± 5.1	17.8–45.7	37	19
Acanthurus	.14	—	10.2	—	2	1
Scarus	.61	.57–.62	45.7 ± 4.4	40.6–48.3	3	1.5
Sparisoma	.28 ± .1	.23–.74	25.1 ± 4.8	20.3–43.2	42	21
Epinephelus	.61 ± .4	.28–1.4	31.8 ± 7.2	22.9–39.4	5	2.5
Mulloidichthys	.23 ± .1	.14–.34	24.8 ± 2.5	22.9–30.5	8	4
Pomacanthus	.45	—	30.5	—	1	0.5
Calamus	—	—	—	—	2	1
Albula vulpes	0	0	0	0	0	0
Other (Table 4)	.27 ± .1	.03–.51	24.4 ± 9.1	7.6–34.9	13	6.5
Totals					200	101[a]

[a] Percentages sum to more than 100 due to rounding.

probably have been minor over the past millennium, and all of genera from Lucayan sites are common on the reef today (cf. Randall 1968; Wing and Reitz 1982).

Finally, fishes from site samples are identified only to the taxonomic level of family or genus. Therefore, congeneric size differences could affect the comparison of modern and prehistoric samples. For example, if the archaeological sample was constituted primarily of larger-size species, then the sample might differ from modern mean sizes that included all of the species in a genus. However, the large size of dynamic units (i.e., interacting fish communities) and competition for limited space indicate that fish populations are likely to show the stability of size recognized for tropical forest animal populations (Ehrlich 1975; Stevenson and Marshall 1974). Size differences should therefore reflect capture technique rather than congeneric differences in species size. Furthermore, a review of genera and species suggests that comparisons made in this report are not affected to a significant degree by congeneric size differences (see Randall 1968).

It is not known why particular fish enter traps; bait does not appear to exert an influence (High and Ellis 1973; Munro et al. 1971). However, once fish are in a trap they attract others of the same species as well as predators. Traps act like artificial reefs by providing shelter from predators although such protection may be temporary as predators find access through the trap's opening. The result is the capture of omnivores and carnivores, along with the attraction of predators that are too large for the trap (e.g., nurse sharks, *Ginglymostoma cirratum*) (cf. High and Ellis 1973; Smith 1972). The attraction of large predators to traps would make these fishes vulnerable to capture when the traps were emptied.

Two criteria can be used to judge the probable significance of traps as a capture technique. First, because the entrances to traps restrict the maximum size and trap mesh establishes a minimum by allowing smaller fishes to escape, faunal samples resulting from trap catches should exhibit a uniformity in size (Wing and Reitz 1982). Second, the types of fishes captured in traps should be represented in archaeological faunal samples.

The mean body weights of fish genera identified in sites MC-6 and MC-12 and of those captured in reef and tidal flat traps are listed in Table 1. The comparison of mean body weights of fishes from MC-6 and the tidal flat trap reveal two significant differences. These differences are the heavier weights of parrotfishes, *Scarus* in the tidal flat traps and *Sparisoma* sp. in the site sample. With those exceptions, all of the body weights of fishes in the site sample fall within the range of the fishtrap sample. This comparison suggests that fishtraps could account for the MC-6 faunal sample.

That conclusion is called into question when the types of fishes captured in traps are compared with those identified in site MC-6. The major discrepancy is the absence of goatfish (*Mulloidichthys*) in the site sample. Goatfish constituted about 7% of the fishtrap sample, and their benthic feeding behavior would promote their capture in traps over other fishing techniques. The absence of goatfish from the site sample suggests that some form of selection has taken place. Such selection could

Table 4. List of the Less Common Genera ("Other") Fishes in Site and Trap Samples.

Fish Genera (Common Name)	MC-6	MC-12	PC-1	Tidal Flats	Reef
Inshore-Estuarine Fishes:					
Lactophrys (trunkfish)	1	1	1	2	2
Gerreidae (mojarro)	4	0	2	0	0
Eucinostomus (mojarra)	10	0	0	0	0
Diodon (porcupinefish)	1	6	1	1	0
Sphoeroides (puffer)	1	0	2	0	0
Lachnolaimus (hogfish)	0	1	0	3	2
Strongylura (needlefish)	0	0	1	0	0
Belonidae (needlefishes)	3	0	0	0	0
Centropomus (snook)	1	0	0	0	0
Sciaenidae (drums)	1	0	0	0	0
Selene (lookdown)	1	0	0	0	0
Banks and Reef Fishes:					
Halichoeres (wrasse)	1	5	3	0	0
Elegatis (wrasse)	0	0	0	0	1
Holocanthus (Angelfish)	0	0	0	2	4
Holocentrus (squirrelfish)	0	0	0	1	0
Flammeo (squirrelfish)	0	0	0	0	1
Chaetodon (butterflyfish)	0	0	0	0	1
Serranidae (groupers)	0	1	0	0	0
Ocyurus (yellowtail snapper)	0	0	0	4	0
Gymnothorax (moray eel)	1	0	0	0	0
Two or More Habitats:					
Scorpaena (scorpionfish)	0	0	0	0	1
Balistidae (triggerfish)	1	4	1	0	1
Carangidae (jacks)	3	2	1	1	0
Sphyraena (barracuda)	3	1	1	0	0
Sharks/rays	2	1	1	0	0
Totals	34	22	14	14	13

Note: Habitat distinctions are based on Wing and Reitz (1982).

occur if goatfish were not identified during faunal analysis, if fishing techniques did not result in their capture, or if these fish were captured but then discarded. Goatfish do not appear on species lists for the region (Wing and Reitz 1982; Wing and Scudder 1983), so this possible reason for their absence cannot be rejected. Discard following capture seems unlikely because there are no obvious reasons for such behavior.

The final hypothesis, that fishing practices did not result in the capture of goatfish, appears to provide the best explanation. An alternative fishing practice that should result in the capture of fishes represented in trap samples, especially if fishing was done at night, is the use of seine nets (Wing and Reitz 1982). Seine nets could also account for the high incidence of bonefish and porgies in the site sample. If this was the primary fishing technique, then goatfish and other benthic species could have escaped beneath the bottom of the nets. Although the competing hypotheses require further testing, the types and sizes of fishes and the morphology of the tidal flat substrate support the identification of seine nets as the primary capture technique employed on the flats near site MC-6.

The comparison of the types and sizes of fishes in the MC-12 faunal sample and in the reef traps suggests that basketry traps were the primary capture technique. There is a close correspondence between the types of fishes in both samples, and, although fishes in the site are significantly larger than those from the traps, they exhibit a uniformity in size that is expected from the use of traps. The size difference can be explained as the product of larger prehistoric traps.

The identification of larger mesh prehistoric traps is supported by the absence of smaller individuals of each genera, and by the lower mean body weights for surgeonfish. Surgeonfish are relatively taller and thinner than other fishes in the site sample so the capture of lower weight individuals is expected. In this case, seine nets would not provide an effective alternative technique because coral heads would limit their use.

CONCLUSIONS

When fishing is viewed as a predator-prey interaction the behaviors of fishes can be used to define a restricted range of human fishing behavior. This report has provided a preliminary reconstruction of prehistoric Lucayan Arawak fishing practices by examining the behavioral characteristics of prey types identified in archaeological sites. The results support Wing and Scudder's (1983) conclusions, and suggest that the technique employed corresponded to both habitat and niche characteristics of fish species.

Permanent residents of tidal flat habitats would have been sought through a widely foraging predation strategy with seine nets, spears, and bow-and-arrow. Nocturnal visitors could have been taken with traps, weirs, and nets set along the fishes's crepuscular migration routes and in feeding areas. Although the body weights for fishes captured in modern traps and those identified in site samples exhibit a close correspondence, the absence of certain benthic species suggests that seine nets were the primary method used to capture nocturnal visitors on the grass flats. Thus, a single technique can account for the majority of fishes in sites adjacent to tidal flat habitats.

Spears, hook-and-line, and bow-and-arrow could have been used to capture the stationary and clumped fishes on patch and barrier reefs. However, the primary component of the reef-associated site sample is fishes that disperse over the reef flat at night. Traps would provide the highest returns by capturing fishes along their crepuscular migration routes. The identification of traps as the primary capture technique is supported by the types of fishes and their uniformity in size in the MC-12 site sample. Finally, permanent residents of the reef flat (bonefish and porgies) would have been captured during diurnal foraging expeditions with seine nets, spears, or bow-and-arrow.

Additional research is required to test these preliminary conclusions. Site excavations should provide evidence for the use of nets through the recovery of net weights; the collection and identification of dated faunal samples should improve our discrimination of the types and sizes of fishes captured as well as changes in their relative frequency through time; and additional experimental and ecological studies should refine our interpretations of the return rates from different fishing techniques. All of these sources of evidence are necessary to develop an accurate understanding of the economics of prehistoric fishing practices. These data are the focus of ongoing research.

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