

# **Status of Fishery Management Knowledge in the U.S. Caribbean I. Report of 1990 Fishery Specialists Survey**

STEPHEN MEYERS

*Caribbean Fishery Management Council  
Suite 1108, Banco de Ponce  
Hato Rey PR, 00918*

## **ABSTRACT**

As part of the Caribbean Fishery Management Council's (CFMC) Data Collection And Analysis Initiative, seven specialists assessed available information needed to adequately manage U.S. Caribbean fisheries. The survey questionnaires covered 23 data/research categories for the 80 species in approved and draft CFMC Fishery Management Plans (FMP) for shallow water reef fishes, coastal migratory pelagic fishes, queen conch, and spiny lobster. Additionally, the specialists were asked to prioritize the importance of the 64 species in the shallow water reef FMP to better focus future research needs.

Results indicate a severe paucity of knowledge necessary to adequately manage the fisheries resources in the U.S. Caribbean. The consensus of the specialists was that no species within the FMPs has a knowledge base adequate for fishery management.

## **INTRODUCTION**

The Caribbean Fishery Management Council (CFMC) recognizes that several major problems limit the efficient management of the fishery resources in the Caribbean. One of these problems is the lack of specific fisheries information needed to make informed management decisions. In an effort to address this situation, the CFMC has established a *Data Collection And Analysis Initiative* which will examine the current state of data collection and analysis, describe current and future problems, and list solutions. One of the first steps in the initiative is to assess the existing knowledge base needed for stock assessment using the expertise of recognized specialists in the U.S. Caribbean fisheries.

## **METHODS**

Four questionnaires were sent to each member of the CFMC Scientific And Statistical Committee (SSC) covering species within approved and draft Fishery Management Plans (FMPs). These are the 64 species in the Shallow Water Reef Fish FMP, the 14 species in the draft Coastal Migratory Pelagic FMP, the spiny lobster, and the queen conch. (One species, *Caranx ruber*, is included in both the Shallow Water Reef Fish and draft Coastal Migratory Pelagic FMPs).

The data/research categories are the same as used by the Northeast Fishery Center of the National Marine Fisheries Service in reviewing the condition of the stocks in that region. The questionnaires address categories for fishery

management data required under the Magnuson Fishery Conservation and Management Act. The participants in the study were given the option of making additional comments.

Some of the specialists questioned if information from other regions is germane to fishery management needs in the U.S. Caribbean, and if these data should be included in the analysis. The participants were asked to give their best response based on their professional understanding as to how the data would be applicable to fishery management in the U.S. Caribbean. Once all the questionnaires have been examined, a conference will be organized with the specialists to review the conclusions and ascertain why some participants scored data/research categories with higher ranks than other participants. The participants will then be asked to reevaluate their responses based on this examination of this input. Additionally, the specialists will be asked to review the data to ascertain whether this information is applicable for fisheries management in the U.S. Caribbean.

The SSC members were asked to insert the appropriate rank in the space for each data/research category per species. In order to limit subjectivity in completing the questionnaires, the study participants were asked to use the following guidelines:

#### **Ranks**

1. **No Data**—the participants were not aware of any existing data for this topic;
2. **Data Insufficient Or Unsatisfactory**—the participants believe that some data do exist, but these data are either too inadequate or imprecise to give meaningful estimates;
3. **No Analysis**—data of sufficient quality do exist to begin analysis, but to the participants' knowledge, no analysis has yet to begin;
4. **Analysis Underway**—the participants believe that data do exist of sufficient quality for analysis. This analysis has begun, but conclusive estimates have not yet been reached;
5. **Significant Progress Made**—the participants believe that analysis has been performed and indicate initial estimates of the parameters necessary for management of the species within the fishery; and
6. **Acceptable State Of Knowledge**—the participants believe that analysis has produced precise estimates of parameters necessary for management of the species within the fishery.

#### **Data/research categories**

1. **Literature Review**—a centralized listing of prior work (natural history, fishery information, etc.);
2. **Stock Id**—information that a "stock" has been identified;

3. **Commercial Landings**—landings from the commercial harvest of the species;
4. **Recreational Landings**—landings from the recreational harvest of the species;
5. **By-Catch And Discards**—the quantity that the species occurs as by-catch in other fisheries and is discarded;
6. **Fishing Effort**—fishing effort as measured by number of boats, amount of fishing gear, number of fishermen, time fishing, etc.;
7. **L/F of Commercial Landings**—the length frequencies of individuals in the commercial harvest;
8. **L/F of Recreational Landings**—the length frequencies of individuals in the recreational harvest;
9. **A/F of Commercial Landings**—the age frequencies of individuals in the commercial harvest;
10. **A/F of Recreational Landings**—the age frequencies of individuals in the recreational harvest;
11. **L/F of Population**—the length frequencies of individuals in the population;
12. **A/F of Population**—the age frequencies of individuals in the population;
13. **Survey Abundance Indexes**—indexes such as catch per unit of effort, kilograms per unit area, etc.;
14. **General Production Models**—surplus production models, such as Graham-Schaefer, Fox, Pella-Tomlinson, etc.;
15. **Mortality**—the rates at which mortality occur within the stock;
16. **Growth**—the rates at which growth occur within the stock;
17. **Selectivity Studies**—studies on catch patterns using different fishing gears;
18. **Yield per Recruit**—dynamic pool models of the species in the fishery;
19. **Virtual Population Analysis**—analysis of numbers of individuals in the population using virtual population analysis or cohort analysis;
20. **Prediction Models**—models that predict future stock levels based on biotic and/or abiotic factors;
21. **Consumption Rate**—the rate at which food is consumed or ingested, which in term influences growth;
22. **Food Habits**—the types and location of prey organisms consumed; and
23. **Pathology**—information on how parasites and diseases affect the species in the fishery.

Additionally, the participants were requested to complete a "Priority List" of the 64 species covered under the Shallow Water Reef Fish FMP. By listing 1 through 64 next to each species in order of importance, the participants indicated which species should receive increased research focus.

### RESULTS AND DISCUSSION

Seven SSC members and their proxies returned questionnaires. Only 15 of the 80 species in the four questionnaires had data/research categories with ranks averaging 3 and above (Table 1). Three species had categories with ranks ranging between 4.0 and 4.9, and 2 species had categories with ranks ranging between 5.0 and 5.9. No species had categories with ranks averaging 6.0, although some participants did score individual ranks at this level. The knowledge base needed to effectively manage the fishery resources is clearly not adequate.

The seven returned priority listings of the shallow water reef fish showed desire to focus on the traditionally important families in the fishery (Table 2). Priority listing by species (Table 3) showed rankings that also stressed research focus for traditionally important species. It is interesting to note that the Yellowtail Parrotfish (*Sparisoma rubripinne*) is not included in any current or draft CFMC FMP, and that this fish is now the most commonly landed fish in St. Thomas (J. Beets, pers. comm., Fisheries Chief, Division of Fish And Wildlife, Department of Planning and Natural Resources, 101 Estate Nazareth, St. Thomas U.S.V.I. 00802.). The 1991 survey will include this species.

In examining the condition of the various knowledge bases, it becomes apparent that "bits and pieces" of information exist for several species. These data are not widely known, however, and may be from special, sporadic studies, and may not be comparable due to differing formats or from a lack of precise documentation as to how parameters were generated from these data. It becomes vital for effective fishery management in the Caribbean that all reports that have estimates of fishery parameters be stored in a central depository, and that the conclusions of these reports be summarized and distributed to fishery scientists and managers.

A special research program beyond the CFMC *Data Collection And Analysis Initiative* is needed to address the paucity of fishery information in the U.S. Caribbean. This program should be structured similar to the MARFIN programs of the South Atlantic and Gulf of Mexico, which both funds and coordinates necessary research.

### REFERENCES

Beets, J. Personal communication.

**Non-Peer Reviewed Section**

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**Table 1.** Summary of species surveyed by Fishery Management Plan and family, listing average data/research scores greater than 3, where 1 = no data, 2 = data insufficient or unsatisfactory; 3 = no analysis; 4 = analysis underway; 5 = significant progress made; 6 = acceptable state of knowledge; FMP = Fishery Management Plan; CMP = Coastal Migratory Pelagic FMP; QC = Queen Conch FMP; SL = Spiny Lobster FMP; and SWRF = Shallow Water Reef Fish FMP.

	<b>FMP</b>	<b>Family</b>	<b>Genus</b>	<b>Species</b>
1	CMP	CARANGIDAE	<i>Caranx</i>	<i>bartholomaei</i>
2	CMP	CARANGIDAE	<i>Caranx</i>	<i>crysos</i>
3	CMP	CARANGIDAE	<i>Caranx</i>	<i>latus</i>
4	CMP	CARANGIDAE	<i>Caranx</i>	<i>ruber</i>
5	CMP	CARANGIDAE	<i>Elagatis</i>	<i>bipinnulatus</i>
6	CMP	CARANGIDAE	<i>Seriola</i>	<i>dumerili</i>
7	CMP	CARANGIDAE	<i>Seriola</i>	<i>rivoliana</i>
8	CMP	CORYPHAENIDAE	<i>Coryphaena</i>	<i>hippurus</i>
	A.	Literature Review	- 3.5	
	B.	Selectivity Studies	- 3.5	
9	CMP	SCOMBRIDAE	<i>Acanthocybium</i>	<i>solanderi</i>
10	CMP	SCOMBRIDAE	<i>Euthynnus</i>	<i>alletteratus</i>
11	CMP	SCOMBRIDAE	<i>Scomberomorus</i>	<i>cavalla</i>
	A.	Literature Review	- 3.5	
12	CMP	SCOMBRIDAE	<i>Scomberomorus</i>	<i>regalis</i>
	A.	Yield Per Recruit	- 3.3	
13	CMP	SCOMBRIDAE	<i>Thunnus</i>	<i>atlanticus</i>
14	CMP	SPHYRAEINIDAE	<i>Sphyraena</i>	<i>barracuda</i>
	A.	Literature Review	- 4.3	
15	QC	STROMBIDAE	<i>Strombus</i>	<i>gigas</i>
	A.	Literature Review	- 5.0	
	B.	Stock ID	- 3.2	
	C.	Commercial Landings	- 3.4	
	D.	L/F of Commercial Landings	- 3.0	
	E.	Survey Abundance Indexes	- 3.0	
	F.	Selectivity Studies	- 4.6	
	G.	Pathology	- 3.6	
16	SL	PALINURIDAE	<i>Panulirus</i>	<i>argus</i>
	A.	Literature Review	- 5.4	
	B.	Stock ID	- 3.2	
	C.	Commercial Landings	- 3.8	
	D.	L/F of Commercial Landings	- 4.2	
	E.	L/F of Population	- 3.0	
	F.	Selectivity Studies	- 3.0	
	G.	Yield Per Recruit	- 3.2	

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Table 1. Continued.

	FMP	Family	Genus	Species
17	SWRF	ACANTHURIDAE	<i>Acanthurus</i>	<i>bahainus</i>
18	SWRF	ACANTHURIDAE	<i>Acanthurus</i>	<i>chirurgus</i>
19	SWRF	ACANTHURIDAE	<i>Acanthurus</i>	<i>coeruleus</i>
20	SWRF	BALISTIDAE	<i>Balistes</i>	<i>vetula</i>
21	SWRF	BALISTIDAE	<i>Canthidermis</i>	<i>sufflamen</i>
22	SWRF	BALISTIDAE	<i>Melichthys</i>	<i>niger</i>
23	SWRF	BALISTIDAE	<i>Xanthichys</i>	<i>ringens</i>
24	SWRF	CARANGIDAE	<i>Caranx</i>	<i>bartholomaei</i>
25	SWRF	CARANGIDAE	<i>Caranx</i>	<i>crysos</i>
26	SWRF	CARANGIDAE	<i>Caranx</i>	<i>latus</i>
27	SWRF	CARANGIDAE	<i>Caranx</i>	<i>lugubris</i>
28	SWRF	CARANGIDAE	<i>Caranx</i>	<i>ruber</i>
29	SWRF	CHAETODONTIDAE	<i>Chaetodon</i>	<i>capistratus</i>
30	SWRF	CHAETODONTIDAE	<i>Chaetodon</i>	<i>ocellatus</i>
31	SWRF	CHAETODONTIDAE	<i>Chaetodon</i>	<i>striatus</i>
32	SWRF	HAEMULIDAE	<i>Haemulon</i>	<i>album</i>
33	SWRF	HAEMULIDAE	<i>Haemulon</i>	<i>aurolineatum</i>
34	SWRF	HAEMULIDAE	<i>Haemulon</i>	<i>flavolineatum</i>
	A.	Pathology	- 3.2	
35	SWRF	HAEMULIDAE	<i>Haemulon</i>	<i>plumieri</i>
	A.	L/F of Commercial Landings	- 3.0	
36	SWRF	HAEMULIDAE	<i>Haemulon</i>	<i>sciurus</i>
	A.	Pathology	- 3.0	
37	SWRF	HOLOCENTRIDAE	<i>Holocentrus</i>	<i>ascensionis</i>
38	SWRF	HOLOCENTRIDAE	<i>Holocentrus</i>	<i>rufus</i>
39	SWRF	LABRIDAE	<i>Bodianus</i>	<i>rufus</i>
40	SWRF	LABRIDAE	<i>Halichoeres</i>	<i>radiatus</i>
41	SWRF	LABRIDAE	<i>Hemipteronotus</i>	<i>novacula</i>
42	SWRF	LABRIDAE	<i>Lachnolaimus</i>	<i>maximus</i>
43	SWRF	LUTJANIDAE	<i>Lutjanus</i>	<i>analis</i>
44	SWRF	LUTJANIDAE	<i>Lutjanus</i>	<i>apodus</i>
45	SWRF	LUTJANIDAE	<i>Lutjanus</i>	<i>griseus</i>
46	SWRF	LUTJANIDAE	<i>Lutjanus</i>	<i>jocu</i>
47	SWRF	LUTJANIDAE	<i>Lutjanus</i>	<i>mahogoni</i>
48	SWRF	LUTJANIDAE	<i>Lutjanus</i>	<i>synagris</i>
	A.	Selectivity Studies	- 3.0	
49	SWRF	LUTJANIDAE	<i>Ocyurus</i>	<i>chrysurus</i>
	A.	Yield Per Recruit	- 3.2	
	B.	Pathology	- 3.0	
50	SWRF	MULLIDAE	<i>Mulloidichthys</i>	<i>martinicus</i>
51	SWRF	MULLIDAE	<i>Pseudupeneus</i>	<i>maculatus</i>
52	SWRF	OSTRACIIDAE	<i>Lactophrys</i>	<i>bicaudalis</i>
53	SWRF	OSTRACIIDAE	<i>Lactophrys</i>	<i>polygonia</i>

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**Table 1. Continued.**

	<b>FMP</b>	<b>Family</b>	<b>Genus</b>	<b>Species</b>
54	SWRF	OSTRACIIDAE	<i>Lactophrys</i>	<i>quadricornis</i>
55	SWRF	OSTRACIIDAE	<i>Lactophrys</i>	<i>trigonus</i>
56	SWRF	OSTRACIIDAE	<i>Lactophrys</i>	<i>triqueter</i>
57	SWRF	POMACANTIDAE	<i>Holacanthus</i>	<i>ciliaris</i>
58	SWRF	POMACANTIDAE	<i>Holacanthus</i>	<i>tricolor</i>
59	SWRF	POMACANTIDAE	<i>Pomacanthus</i>	<i>arcuatus</i>
60	SWRF	POMACANTIDAE	<i>Pomacanthus</i>	<i>paru</i>
61	SWRF	SCARIDAE	<i>Scarus</i>	<i>coelestinus</i>
62	SWRF	SCARIDAE	<i>Scarus</i>	<i>coeruleus</i>
63	SWRF	SCARIDAE	<i>Scarus</i>	<i>croicensis</i>
64	SWRF	SCARIDAE	<i>Scarus</i>	<i>guacamaia</i>
65	SWRF	SCARIDAE	<i>Scarus</i>	<i>taeniopterus</i>
66	SWRF	SCARIDAE	<i>Scarus</i>	<i>vetula</i>
67	SWRF	SCARIDAE	<i>Sparisoma</i>	<i>aurofrenatum</i>
68	SWRF	SCARIDAE	<i>Sparisoma</i>	<i>chrysopterygium</i>
69	SWRF	SCARIDAE	<i>Sparisoma</i>	<i>viride</i>
70	SWRF	SERRANIDAE	<i>Epinephelus</i>	<i>adscensionis</i>
71	SWRF	SERRANIDAE	<i>Epinephelus</i>	<i>cruentatus</i>
	A.	Pathology	- 3.0	
72	SWRF	SERRANIDAE	<i>Epinephelus</i>	<i>fulvus</i>
73	SWRF	SERRANIDAE	<i>Epinephelus</i>	<i>guttatus</i>
	A.	Literature Review	- 3.6	
	B.	L/F of Commercial Landings	- 3.3	
	C.	A/F of Commercial Landings	- 3.3	
	D.	Mortality	- 3.6	
	E.	Selectivity Studies	- 3.0	
74	SWRF	SERRANIDAE	<i>Epinephelus</i>	<i>itajara</i>
	A.	Literature Review	- 3.5	
	B.	Commercial Landings	- 3.3	
	C.	L/F of Commercial Landings	- 3.2	
	D.	Pathology	- 3.0	
75	SWRF	SERRANIDAE	<i>Epinephelus</i>	<i>striatus</i>
76	SWRF	SERRANIDAE	<i>Mycteroperca</i>	<i>venenosa</i>
77	SWRF	SPARIDAE	<i>Archosargus</i>	<i>rhomboidalis</i>
	A.	Yield Per Recruit	- 3.0	
78	SWRF	SPARIDAE	<i>Calamus</i>	<i>bajonado</i>
79	SWRF	SPARIDAE	<i>Calamus</i>	<i>penna</i>
80	SWRF	SPARIDAE	<i>Calamus</i>	<i>pennatula</i>

Table 2. Priority ranking for research focus by family.

Rank	Family
1	SERRANIDAE
2	LUTJANIDAE
3	OSTRACIIDAE
4	HAEMULIDAE
5	MULLIDAE
6	BALISTIDAE
7	ACANTHURIDAE
8	SCARIDAE
9	POMACANTIDAE
10	SPARIDAE
11	CARANGIDAE
12	HOLOCENTRIDAE
13	LABRIDAE
14	CHAETODONTIDAE

Table 3. Priority ranking for research focus by species.

RANK	FAMILY	GENUS	SPECIES
1	SERRANIDAE	<i>Epinephelus</i>	<i>guttatus</i>
2	SERRANIDAE	<i>Epinephelus</i>	<i>striatus</i>
3	BALISTIDAE	<i>Balistes</i>	<i>vetula</i>
4	HAEMULIDAE	<i>Haemulon</i>	<i>plumieri</i>
5	LUTJANIDAE	<i>Ocyurus</i>	<i>chrysurus</i>
6	LUTJANIDAE	<i>Lutjanus</i>	<i> analis</i>
7	SERRANIDAE	<i>Epinephelus</i>	<i>itajara</i>
8	SERRANIDAE	<i>Epinephelus</i>	<i>fulvus</i>
9	LUTJANIDAE	<i>Lutjanus</i>	<i>synagris</i>
10	OSTRACIIDAE	<i>Lactophrys</i>	<i>polygonia</i>
11	OSTRACIIDAE	<i>Lactophrys</i>	<i>triqueter</i>
12	HAEMULIDAE	<i>Haemulon</i>	<i>sciurus</i>
13	OSTRACIIDAE	<i>Lactophrys</i>	<i>trigonus</i>
14	LUTJANIDAE	<i>Lutjanus</i>	<i>griseus</i>
15	LABRIDAE	<i>Lachnolaimus</i>	<i>maximus</i>
16	LUTJANIDAE	<i>Lutjanus</i>	<i>apodus</i>
17	OSTRACIIDAE	<i>Lactophrys</i>	<i>bicaudalis</i>
18	SERRANIDAE	<i>Epinephelus</i>	<i>adscensionis</i>
19	OSTRACIIDAE	<i>Lactophrys</i>	<i>quadricornis</i>
20	SERRANIDAE	<i>Mycteroperca</i>	<i>venenosa</i>
21	POMACANTIDAE	<i>Pomacanthus</i>	<i>arcuatus</i>
22	MULLIDAE	<i>Mulloidichthys</i>	<i>martinicus</i>



Non-Peer Reviewed Section

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Table 3. Continued.

RANK	FAMILY	GENUS	SPECIES
23	SERRANIDAE	<i>Epinephelus</i>	<i>cruentatus</i>
24	SPARIDAE	<i>Calamus</i>	<i>bajonado</i>
25	ACANTHURIDAE	<i>Acanthurus</i>	<i>bahainus</i>
26	SCARIDAE	<i>Sparisoma</i>	<i>aurofrenatum</i>
27	SCARIDAE	<i>Sparisoma</i>	<i>viride</i>
28	SCARIDAE	<i>Sparisoma</i>	<i>chrysopterum</i>
29	SCARIDAE	<i>Scarus</i>	<i>vetula</i>
30	CARANGIDAE	<i>Caranx</i>	<i>crysos</i>
31	CARANGIDAE	<i>Caranx</i>	<i>ruber</i>
32	LUTJANIDAE	<i>Lutjanus</i>	<i>mahogoni</i>
33	MULLIDAE	<i>Pseudupeneus</i>	<i>maculatus</i>
34	POMACANTIDAE	<i>Pomacanthus</i>	<i>paru</i>
35	ACANTHURIDAE	<i>Acanthurus</i>	<i>coeruleus</i>
36	BALISTIDAE	<i>Canthidermis</i>	<i>sufflamen</i>
37	SCARIDAE	<i>Scarus</i>	<i>croicensis</i>
38	CARANGIDAE	<i>Caranx</i>	<i>bartholomaei</i>
39	LUTJANIDAE	<i>Lutjanus</i>	<i>jocu</i>
40	HAEMULIDAE	<i>Haemulon</i>	<i>flavolineatum</i>
41	SPARIDAE	<i>Calamus</i>	<i>pennatula</i>
42	ACANTHURIDAE	<i>Acanthurus</i>	<i>chirurgus</i>
43	SCARIDAE	<i>Scarus</i>	<i>taeniopterus</i>
44	HAEMULIDAE	<i>Haemulon</i>	<i>aurolineatum</i>
45	BALISTIDAE	<i>Melichthys</i>	<i>niger</i>
46	SPARIDAE	<i>Archosargus</i>	<i>rhomboidalis</i>
47	POMACANTIDAE	<i>Holacanthus</i>	<i>ciliaris</i>
48	POMACANTIDAE	<i>Holacanthus</i>	<i>tricolor</i>
49	HOLOCENTRIDAE	<i>Holocentrus</i>	<i>rufus</i>
50	HOLOCENTRIDAE	<i>Holocentrus</i>	<i>ascensionis</i>
51	SCARIDAE	<i>Scarus</i>	<i>coelestinus</i>
52	SCARIDAE	<i>Scarus</i>	<i>coeruleus</i>
53	SPARIDAE	<i>Calamus</i>	<i>pennatula</i>
54	CARANGIDAE	<i>Caranx</i>	<i>latus</i>
55	SCARIDAE	<i>Scarus</i>	<i>guacamaia</i>
56	CHAETODONTIDAE	<i>Chaetodon</i>	<i>capistratus</i>
57	HAEMULIDAE	<i>Haemulon</i>	<i>album</i>
58	CHAETODONTIDAE	<i>Chaetodon</i>	<i>ocellatus</i>
59	CHAETODONTIDAE	<i>Chaetodon</i>	<i>striatus</i>
60	LABRIDAE	<i>Bodianus</i>	<i>rufus</i>
61	CARANGIDAE	<i>Caranx</i>	<i>lugubris</i>
62	LABRIDAE	<i>Halichoeres</i>	<i>radiatus</i>
63	BALISTIDAE	<i>Xanthichys</i>	<i>ringens</i>
64	LABRIDAE	<i>Hemipteronotus</i>	<i>novacula</i>