

La Biología y Pesquería de Langosta (*Panulirus argus*) y Caracol Reina (*Strombus gigas*) a Través de las Memorias del Instituto de Pesquerías del Golfo y el Caribe

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RESUMEN

El primer aporte sobre el tema de biología y pesquería de langosta apareció publicado en el volumen 2 (1949), y desde entonces ha estado presente en 32 de los 57 volúmenes publicados hasta la fecha. El número de trabajos directamente relacionados con el tema se eleva a 112, repartidos en las áreas de pesquerías (34), reclutamiento (25), manejo (15) y biología (12). Esta información ha sido levantada por 254 autores y coautores, entre los que destacan R.N. Lipcius (7), W.F. Herrnkind, J.H. Hunt y D.B. Eggleston (6), así como S. Salas Márquez y T.R. Matthews (5). Los trabajos se han llevado a cabo en más de 23 países, siendo el estado de La Florida y México las regiones que han aportado más publicaciones (25 y 20, respectivamente). Por su parte, *Strombus gigas* fue mencionado por primera vez en el volumen 9 (1956). La siguiente referencia fue en 1968. La mayoría de las 209 contribuciones se han focalizado en temas biológicos (45), seguidos por acuicultura (41), evaluación pesquera (28), así como ecología y comportamiento (22). Por mucho, la mayoría de los trabajos provienen de México (64), seguido por Las Bahamas (30) y La Florida (25). Fueron pocos los aportes de información en los primeros 35 volúmenes, situación que mejoró en los años siguientes, alcanzando un máximo de 25 publicaciones la memoria 55. El investigador con más trabajos como primer autor es D. Aldana Aranda (16), seguida por C.J. Berg, Jr., M. Davis, y R.A. Glazer, con 8 cada uno. El presente trabajo ilustrará las tendencias históricas en los principales parámetros biológico-pesqueros a lo largo de la región, en una perspectiva de 57 años de relevantes y significativas contribuciones.

PALABRAS CLAVES: Langosta, caracol reina, biología y pesquería, GCFI

Biology and Fisheries of the Spiny Lobster (*Panulirus argus*) and the Queen Conch (*Strombus gigas*) Based on the Proceedings of the Gulf and Caribbean Fisheries Institute

INTRODUCTION

The first contribution dealing with lobster biology and fisheries was published in volume 2 (1949). Since then it has been in 32 of the 57 proceedings published up to the present. There have been 112 contributions directly related to this topic. Lobster fisheries have attracted the most interest (34), followed by recruitment (25), management (15) and biology (12). The papers come from 254 authors and coauthors, including R.N. Lipcius (7), W.F. Herrnkind, J.H. Hunt and D.B. Eggleston (6), as well as S. Salas Márquez and T.R. Matthews (5). These studies have been carried out in 23 countries, with the state of Florida and Mexico as the areas that have supported the most publications (25 and 20, respectively). On the other hand, *Strombus gigas* was first mentioned in the 9th volume (1956). The next reference was in 1970 although this was simply a figure detailing exports. The majority of the 210 ensuing contributions focused on biology (45), followed by aquaculture (41), stock assessments (28), as well as ecology and behavior (22). By far, the most contributions were from Mexico (64), followed by the Bahamas (30) and Florida (25). There were very few contributions in the first 35 Proceedings; after that, there were multiple contributions within each volume culminating in the 55th (25). The first author with the most publications was D. Aldana Aranda (16), followed by CJ Berg, Jr., M. Davis, and R.A. Glazer with eight each. Present study illustrates the historical tendencies in the primary biological and fishery factors throughout the region, from the perspective of 57

years of relevant and significant contributions.

MATERIALS AND METHODS

We use the recently implemented GCFI online search engine tool (<http://procs.gcfi.org>) in order to determine the number and focus of papers that were published in the Proceedings of the Gulf and Caribbean Fisheries Institute devoted to the spiny lobster, *Panulirus argus* and queen conch, *Strombus gigas*. The database was analyzed from the first GCFI Proceedings published in 1948 though the last Proceedings in the database from the 57th Proceedings published in 2004. Our intention was to identify the topics of focus of the papers, examine the regional interest in the respective species, identify the authors who were most prolific, and to determine temporal trends.

RESULTS AND DISCUSSION

Spiny Lobster (*Panulirus argus*)

Considering the economic importance of the spiny lobster fishery in the region of the Gulf of Mexico and the Caribbean, it has been poorly represented in the publications printed in the proceedings of the Gulf and Caribbean Fisheries Institute. There have been 112 contributions directly related to this topic, which represents only the 4.8% of the total number of 2330 printed manuscripts until the year of 2004 (Volume 57).

However, the first contribution dealing with lobster biology and fisheries was published in Volume 2 (Creaser

1950) (Figure 1). Since then it has been in 32 of the 57 proceedings published up to the present (Figure 1). Lobster fisheries have attracted the most interest (34), followed by recruitment (25), management (15) and biology (12) (Figure 2).

Only topics related with lobster biology and fisheries are since the early years of the proceedings (Creaser 1950; Volume 2) and (Creaser 1952, Sutcliffe 1952, Mattox 1952; Volume 4), respectively (Figure 3). Recruitments appears in volume 31 (Menziés and Kerrigan 1979) and management in the 32 (Davis and Dodrill 1980) (Figure 3). The 112 contributions come from 254 authors and coauthors. Only 6 of them participated in 5 contributions or more (Table 1). A total of 112 researchers have contributed with just one printed participation.

These studies have been carried out in 23 countries, with the state of Florida and Mexico as the areas that have supported the most publications (25 and 20, respectively) (Figure 4). However, only Puerto Rico (10) allows for a long-term historical analyses, looking for changing in trends on fisheries and biological parameters (Figure 5).

Spiny lobster in Puerto Rico attained economic importance around 1947. At that time, only rowboats, sailboats and low powered motorboats (5 to 10 HP) were used in the fishery. By 1952, Mattox (1952) documented the participation of 213 fishers involved in the lobster fishery, landing 466.800 pounds of lobsters. The price oscillated between US\$ 18 cent/pound (fisher price) and 25 cents/pound (market price). The average size and weight of landed lobsters were 117 mm CL and 2.56 pounds, respectively.

By 1958, Feliciano (1958) reported lightly changes in the fishery, with lobsters reaching a value of US\$ 25-30 cent/pound (fisher price), but showing a decrease in both the averaging size (up to 107 mm CL) and weight (up to

2.00 pounds). At that time, the only protective regulation on the lobster fishery was related with the prohibition for taking, killing, possess or selling of berried lobsters.

Twenty-three years later, Castillo-Barahona (1981) registered a total production of 491,941 pounds of lobsters, a similar value to the landings recorded at the beginning of the fishery, but with a significant decrease in lobster size and weight (up to average values of 93.5 mm CL and 1.72 pounds, respectively). A 40.6% of the landed lobsters were below 89 mm CL, the minimum landing size established for the state of Florida lobster fishery.

Considering this trend, Dennis *et al.* (1996) stated the fishery has shown indications of overfishing. By 1989 - 1991, Matos-Caraballo (1999) registered the increase in the number of fishers related to the lobster fishery up to 576, keeping the level of production to the regular obtained levels (211,941 pounds). The value of the lobster rose up to US\$ 4.50/pound (fisher price) and the average size of the landed lobsters oscillated between 88 and 92 mm CL. A 595 of the lobsters captured by traps were below the minimum landing size of 89 mm CL.

During the years of 1992-1998, Matos-Caraballo (1999) observed an increase in the average size of the landed lobsters (up to 96 mm CL) and he interpreted it as a consequence of an enforcement of the regulations by the Puerto Rico Department of Natural Resources, by 1995. The number of lobster fishers was estimated on 650 and the total landing was established on 276.000 pounds. The value of marketed lobsters rose up to US\$ 5.50/pound (fisher price) and 9.00/pound (market price).

Finally, Matos-Caraballo *et al.* (2004) evaluated the Puerto Rico lobster fishery during the period 1995 - 2001 and observed an increase in the average size of landed lobster (up to 101 mm CL), with a reduction in the percentage of lobsters below the minimum legal landing size of 89 mm CL (31%, traps).

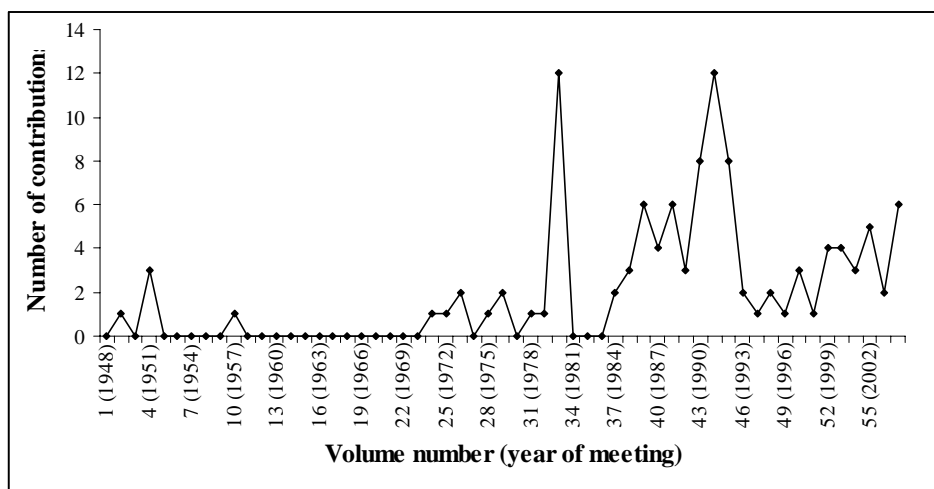


Figure 1. The number of contributions published in the Proceedings of the Gulf and Caribbean Fisheries Institute related to *Panulirus argus* fisheries and biology from 1948 to 2004.

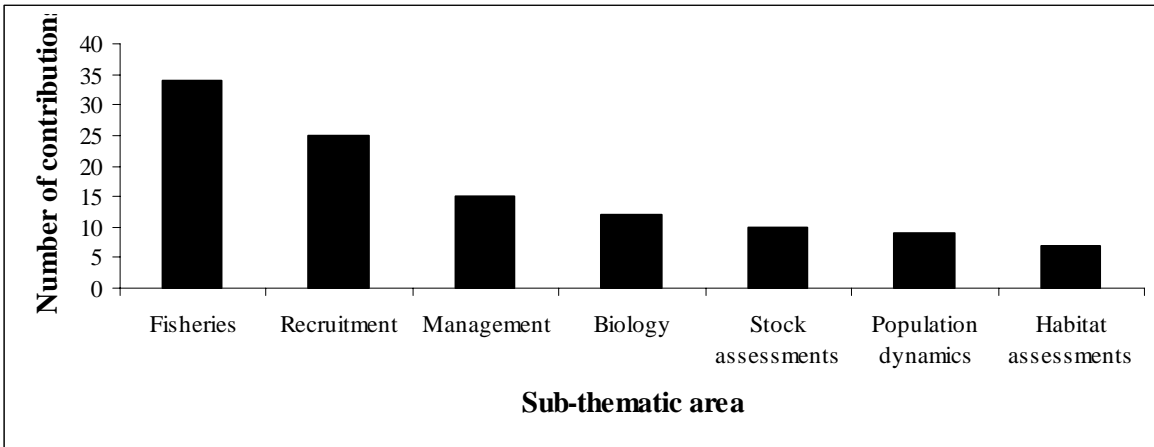


Figure 2. The number of contributions by lobster fishery and biology by theme published in the Proceedings of the Gulf and Caribbean Fisheries Institute from 1948 to 2004.

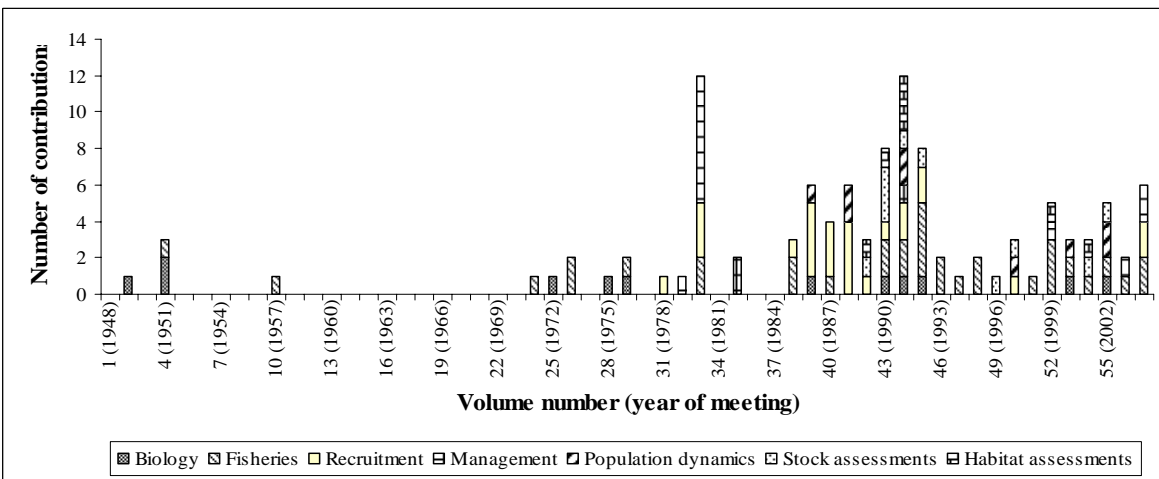


Figure 3. The number of contributions by lobster fishery and biology sub-thematic area published each year in the Proceedings of the Gulf and Caribbean Fisheries Institute from 1948 to 2004.

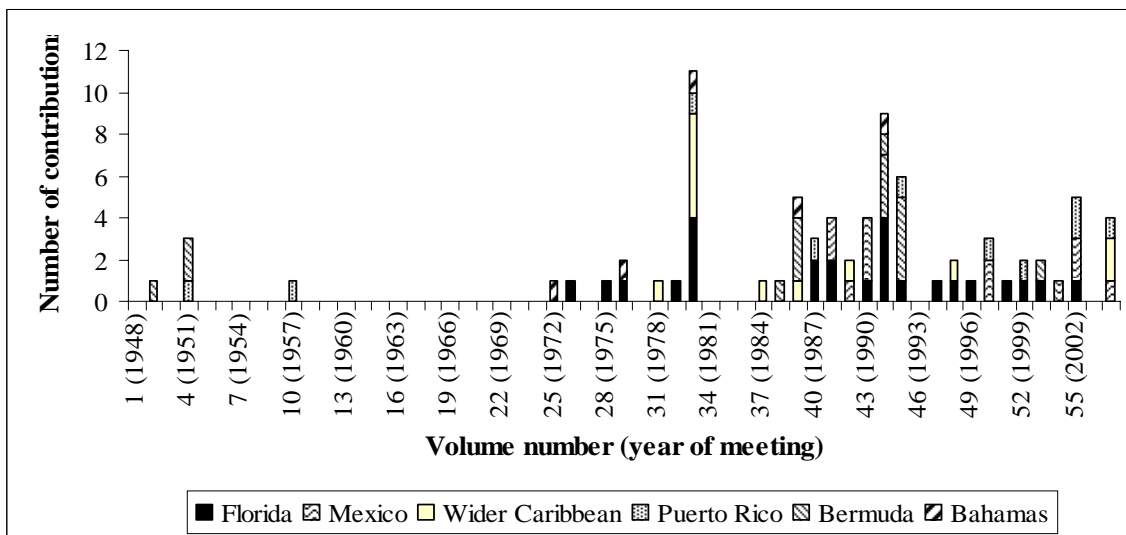


Figure 4. The number of contributions related to lobster fisheries and biology by country published in the Proceedings of the Gulf and Caribbean Fisheries Institute from 1948 to 2004.

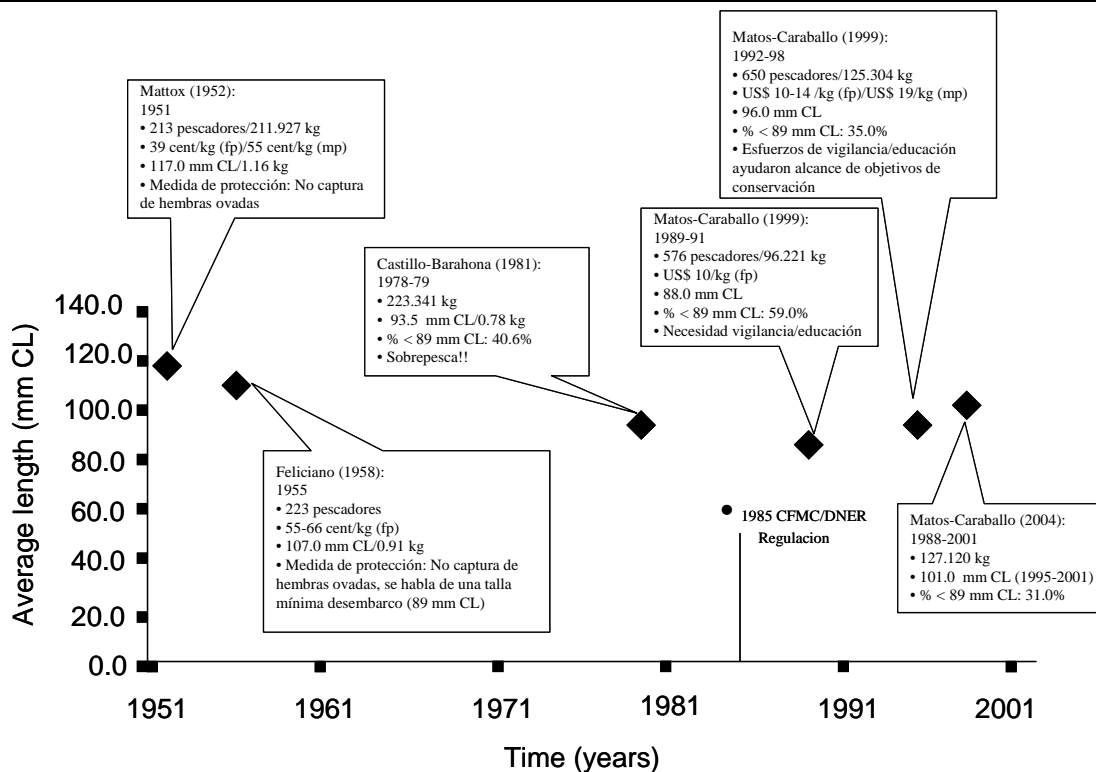


Figure 5. Chronologic reconstruction of the status of the spiny lobster fishery and management in Puerto Rico.

Table 1. The most prolific authors publishing papers related to *Panulirus argus* in the Proceedings of the Gulf and Caribbean Fisheries Institute from 1948 to 2004.

Name of the Researcher	Number of Contributions
Lipcius, R.N.	7
Herrnkind, W.F.	6
Hunt, J.H.	6
Eggleston, D.B.	6
Salas-Marques, S.	5
Matthews, T.R.	5

Queen Conch (*Strombus gigas*)

Despite the fact that queen conch represent a significant fishery in the Caribbean and tropical western Atlantic, there was very little mention of the resource prior to the 1980s (Figure 6). The first time queen conch appeared in the Proceedings of the GCFI was in 1956 in the 9th Proceedings where conch in the Yucatan Peninsula were mentioned as plentiful but collected solely for local consumption (Carranza 1957). During the 1950s and 1960s, numerous papers were published on the non-conch fisheries of the region, their catches, and how they could be further developed, but conch were not mentioned in the

suite of fishery species. Even in 1967, when the fisheries of the Colombian Archipelago were examined, there was no mention of *S. gigas* (Ciardelli Fadul 1968). In 1970, there was a figure that showed the exports of conch from the USVI but there was no mention in the text of this resource (Swingle *et al.* 1970). Finally, a paper published in 1971 mentioned conch fisheries for the first time; conch were mentioned together with lobster as comprising a limited export product (Juhl 1971) (Table 2)

Conch mariculture was first mentioned in the Proceedings in a review of molluscan mariculture published in 1969, in which Webber and Riordan (1969) suggested that queen conch are a species that should be examined for its mariculture potential. It wasn't until 1977 that conch mariculture was mentioned again and this was in the context of hatchery production to replenish depleted stocks using artisanal fishers (Bullis Jr. 1978). Ironically, replenishment of depleted stocks was suggested at the same time that the first paper was published reporting that conch stocks were indeed depleted: Gibson (1978) reported that the peak harvest in Belize was achieved in 1972 (5,600 mt) and decreased to 3,597 mt in 1976.

Table 2. The number of publications focusing on *Strombus* spp. by region identified in the Proceedings of the Gulf and Caribbean Fisheries Institute from 1948 through 2004. 'Regionwide' indicates publications that examined the resource from a regional perspective. The locations indicate the focus of the projects and do not necessarily indicate the first affiliation of the author(s). Only locations with more than five papers are presented. Other locations with less than five papers are the Dominican Republic (4), Colombia (3), Cuba (3), Netherland Antilles (3), Martinique (3), the British Virgin Islands (1), the Grenadines (1), Nicaragua (1), Panama (1), St. Kitts/Nevis (1), and St. Lucia (1).

	Regionwide	Mexico	Bahamas	Florida	Turks and Caicos	Puerto Rico	Venezuela	Belize	USVI	Bermuda	Jamaica	Other
1952												1
1956		1								1		1
1961							1					
1964												
1967												1
1968	1								1			
1969												
1970	1											
1977	1	1					1					
1978		1										
1979	1											
1980												
1982	4		2		1	2	1	1	1			1
1984	1											1
1985	2	2	2	2	1	1			2			4
1986	1		2	1	1							
1987			2	1	1	1						
1988	1		2	1	1	1	1			1		1
1989			6	1	1	1				1	1	1
1990		2	1		1		1					1
1991		2	3			3			1			
1992		7	5			1		1			1	
1994		10	2				1	1		1		
1995		4	1	1				1	1	1	1	
1996	1	2	1	3							1	
1997		5	1	2		1						1
1998		3	1	1								1
1999		2	1				1					
2000		4		1			1					2
2001		2		2	6							
2002		14		3			3					5
2003	1	4	1	3	1							1
2004	3	3		3	1	1	1				1	
Total	18	69	30	24	15	12	10	6	6	5	5	22

A paper published in 1979 examined conch consumption by income status in Jamaica (i.e., *Fish Preferences and Prejudices in a Small Caribbean Island: A Study of Fish Consumption Patterns in St. Vincent Based on a Household Survey*). The author noted that only lower income households in Kingston and St. Vincent consumed conch; middle and upper income families were not interested in eating conch (Adams 1980).

In 1980, conch emerged as a species with increasing focus in the Proceedings. A paper from the Grenadines by Goodwin (1980) examined the integration of conch mariculture into conch management. A special session on conch science was convened at the 35th GCFI in The Bahamas in 1982 with 13 published papers on all aspects of conch fisheries, mariculture, and ecology. The next conch publication was in 1984 and represented the first paper dealing with population genetics. From 1985 until 2004, there were no fewer than four papers published each

year on conch topics in each of the Proceedings with the exception of 1986 when only two papers were published.

The number of publications peaked with a symposium held at the 55th GCFI held in Xel-Hà, Quintana Roo, Mexico in 2002 and entitled *El Caracol Strombus gigas, Conocimiento integral para su manejo sustentable en el Caribe*. Twenty-two papers were published in a special publication from presentations on biology, ecology, fisheries, aquaculture, and education (Aldana Aranda 2003).

Within the Proceedings, most published papers focused on queen conch biology followed closely by aquaculture (Figure 7). Stock assessment, ecology, and behavior were the next most published area of focus. Most topics were examined at approximately the same frequency each year. However, towards the end of the time period, the new topics related to conch corresponded with emerging topics in marine science as a whole (e.g., ecosystem approaches including MPA science, education.)

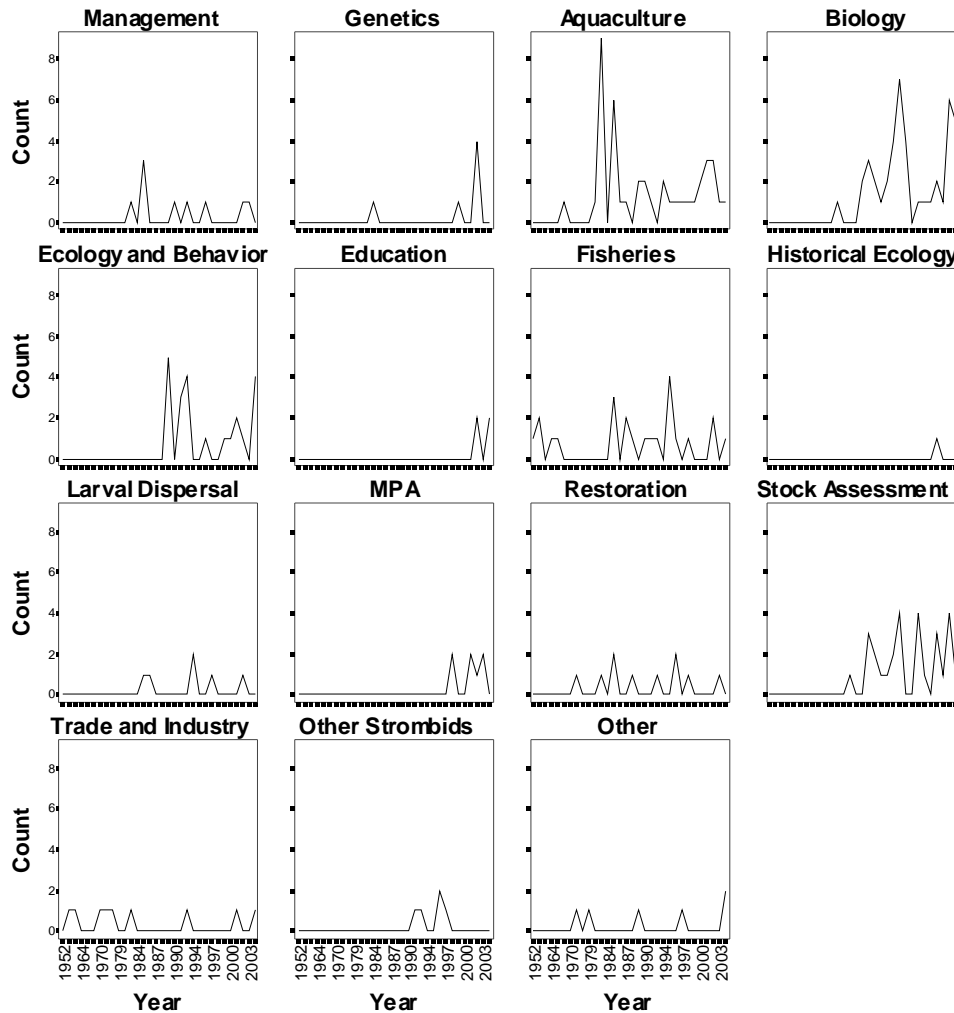


Figure 7. The number of contributions related to *Strombus* spp by specific area of focus published in the Proceedings of the Gulf and Caribbean Fisheries Institute from 1948-2004. Years where no publications were published are not presented.

The first author with the most publications was D. Aldana Aranda from Mexico (16). Other authors with numerous publications included C. J. Berg, Jr., M. Davis, and R. A. Glazer with eight each.

It is obvious that *S. gigas* has become a species of considerable interest in the region. However, this did not happen, at least in the context of publications within the GCFI Proceedings, until the stocks were already heavily exploited and, in many cases overfished. For example, Bermuda closed all harvest of conch in 1978, well before most papers on *S. gigas* were published in the Proceedings (Burnett-Herkes 1981).

However, this does not mean that *S. gigas* was not of

interest to managers and scientists in the region. For example, in 1982 a special symposium was held in Freeport which focused on conch fisheries and mariculture (Berg 1981). Furthermore, a number of publications appeared in the peer-reviewed literature prior the spike in interest in the early 1980s. It is unclear why papers examining *S. gigas* were so depauperate in the Proceedings prior to the 1980s except that, perhaps, the resource was viewed mostly as plentiful and, therefore, did not warrant extensive examination. However, of note is that the number of contributions followed closely with the total regional catch of *S. gigas* (Figure 8).

Interestingly, in the Proceedings after the 1985, there was a renewed interest that peaked about in 1992, the year that conch were added to Appendix II in CITES. Interest has remained fairly steady since this designation.

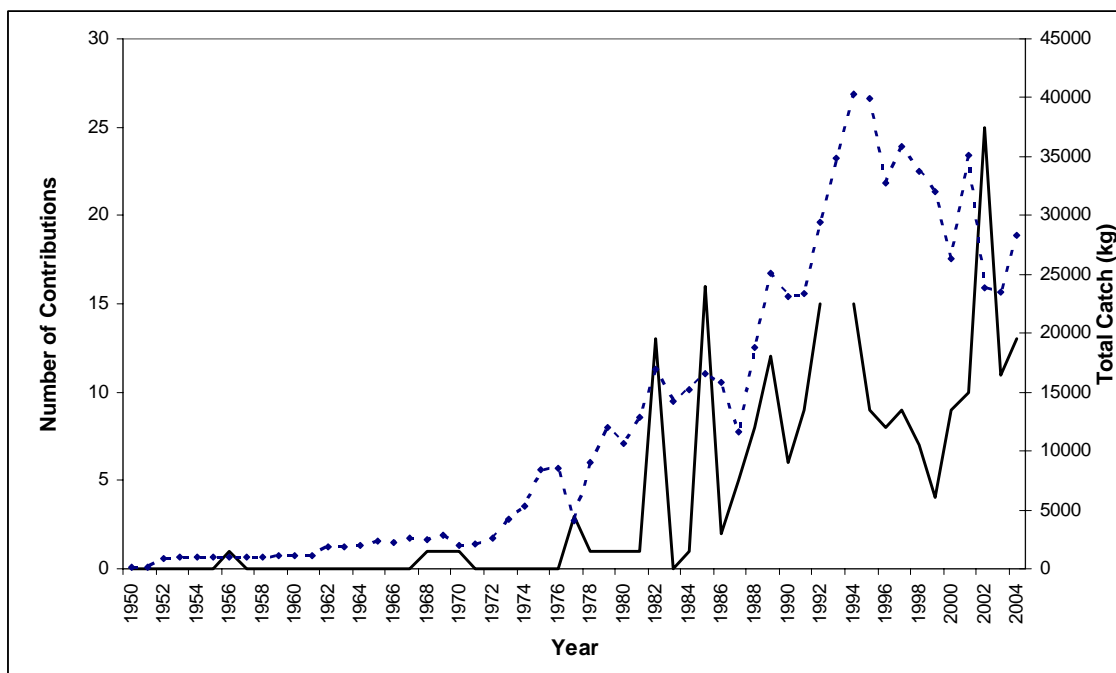


Figure 8. The number of contributions published in the Proceedings of the Gulf and Caribbean Fisheries Institute focusing on *Strombus* spp. from 1948 to 2004 relative to the total catch of *S. gigas* in the central western Atlantic. Catch data are from FAO online Global Capture Production 1950 - 2004

http://www.fao.org/figis/servlet/TableAndArea?tb_ds=Capture&tb_mode=TABLE&tb_act=SELECT&tb_grp=COUNTRY

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