Gulf and Caribbean Research Vol 23, 1-12, 2011 Manuscript received, September 6, 2010; accepted, September 27, 2010

A 50 YEAR ACCOMPLISHMENT IN MARINE SCIENCE: A HISTORY OF THE JOURNAL PUBLISHED BY THE GULF COAST RESEARCH LABORATORY

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ABSTRACT: The Gulf Coast Research Laboratory (GCRL) has a 50 year history of annual publication of the peer-reviewed journal *Gulf and Caribbean Research* (GCR, 2000-present; formerly *Gulf Research Reports* (GRR) from 1961 - 1999). Other extant journals serving the region during this time include *Contributions in Marine Science* (since 1945), *Proceedings of the Gulf and Caribbean Fisheries Institute* (since 1948), *Bulletin of Marine Science* (since 1951), *Revista de Biología Tropical* (since 1953), and *Caribbean Journal of Science* (since 1961). In the early years of the GCR publication, papers were primarily concerned with research in Mississippi and the northern Gulf of Mexico (GOM), and the majority of authors were from USM/GCRL or the GOM region. However, in the past 15 years, studies from Mexico and the Caribbean have dramatically increased, with a concurrent increase in the geographical diversity of authors. Overall, surveys and inventories, taxonomy, and life history studies have been most common, and taxa have been dominated by fish and crustaceans. Offshore, benthic and marsh habitats have been the most commonly studied during GCR's 50 year history. In general, publications during the last 15 years are more similar to each other (≥ 65% similarity based on CLUSTER analysis and MDS ordinations) than to earlier publications for geography, taxon, habitat and subject areas. The journal is well cited in peer-reviewed literature, with 72% of the papers published in GRR and 65% of those published in GCR cited at least once. GCR provides an important outlet for peer-reviewed publications from the GOM and Caribbean region.

KEY WORDS: Citation history, taxa, habitats, Gulf of Mexico, Caribbean

INTRODUCTION

In the early 1960s, Dr. Gordon Gunter, then the Director of Gulf Coast Research Laboratory (GCRL), almost singlehandedly developed the concept of *Gulf Research Reports* (GRR) as a mechanism ". . . devoted primarily to publication of the data of the marine sciences, chiefly of the Gulf of Mexico and adjacent waters." The first issue appeared in April 1961 with Dr. Gunter as Editor-in-Chief, and since that time GRR has produced 51 issues covering over 453 reports (through the 2010 issue), including four special issues on the resources and processes of the Gulf of Mexico (GOM) and adjacent waters.

The journal has had 6 Editors-in-Chief during the course of publication (Figure 1), with the Director of the GCRL serving as Editor-in-Chief of GRR until the 1997 issue (volume 9(4)). The editorship of GRR was passed on to the late Dr. Harold D. Howse from Dr. Gunter beginning with the 1975 issue. At that time the journal was reformatted to a larger page size (Figure 2) and a nominal page charge

Figure 1. *Journal Editors-in-Chief. A. Gordon Gunter (1961-1974). B. Harold D. Howse (1975-1992). C. Thomas D. McIlwain (1994-1995). D. Robert T. van Aller (1996). E. Richard W. Heard (2002). F. Mark S. Peterson (1997-2001; 2003-present).*

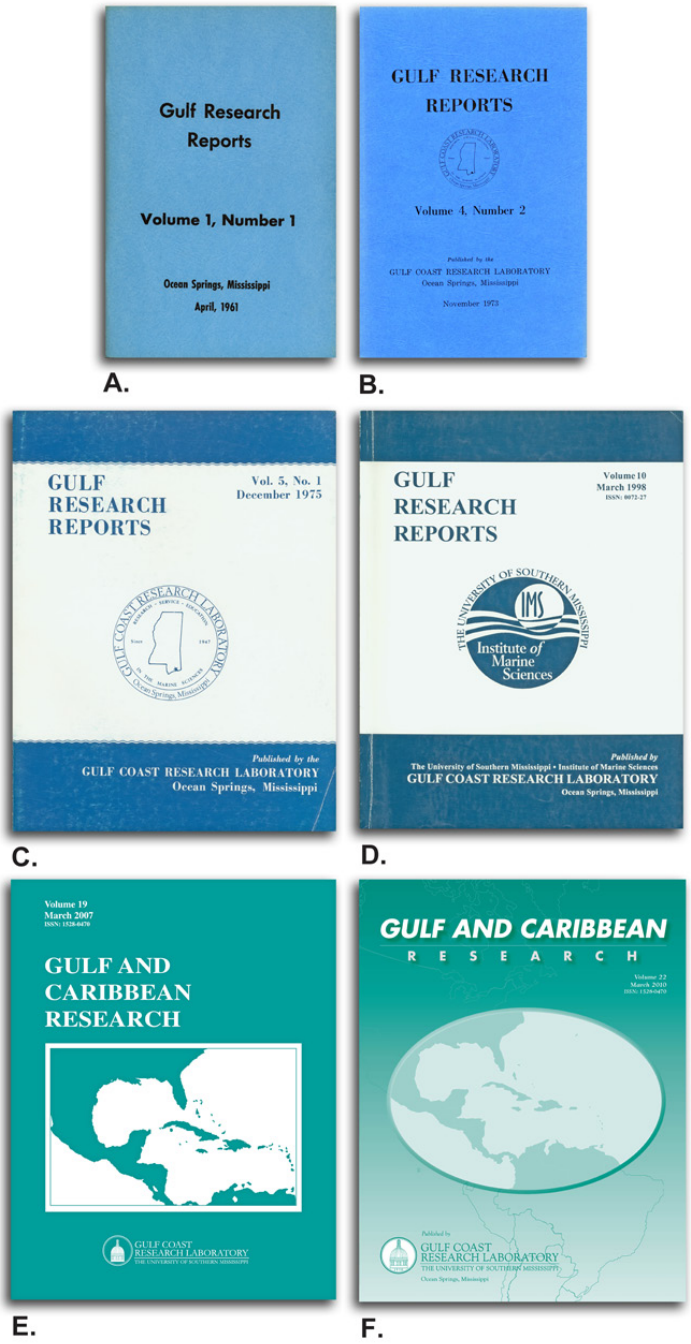

Figure 2. *Various covers of the journal illustrating changes made over the course of publication. A. 1961-1972; B. 1973-1974; C. 1975-1997; D. 1998-1999; E. 2000-2007; F. 2008-present.*

was, for the first time, assessed to help defray the cost of publication. The first "Guide to Authors" appeared in that issue and manuscripts had to be found acceptable by at least two referees (Howse 1975). Dr. Howse remained Editor-in-Chief of GRR through 1992 (volume 8(4)), at which time Dr. Thomas D. McIlwain became Editor and guided the 1994 and 1995 issues to print. Interim GCRL Director, Dr. Robert T. van Aller, served as Editor of GRR for the 1996 issue. In 1997, the duties of GCRL Director and Editor were separated, and Dr. Mark S. Peterson became Editor-in-Chief with the 1997 through 2001 issue and has continued to serve in that capacity from the 2003 issue through the present time. Dr. Richard W. Heard was Editor-in-Chief for the 2002 issue (Volume 14).

As the number of submissions to the journal increased, an editorial staff became a necessity to help make the journal a better publication. From 1980 until 1996, Ms. Susan Griggs acted as Assistant or Managing Editor, Ms. Linda Skupien was Managing Editor from 1998-2000, and later Ms. S. Dawne Hard was Assistant (1998-2000) and then Managing Editor (2001-2007), each providing guidance with their expert editorial, type-setting, and managerial skills. In addition to the editorial staff, Catherine M. Campbell (1975-1985), Mereau Tacon (1989), Gina Dieterick (1991-1994), Vicki Crane (1991-1998), Dale Fremin (1997-2000), and the Gunter Library staff (Joyce M. Shaw (2002-2008) and Marjorie G. Williams (2002-2007)) assisted with journal production activities. A new editorial team came on board in 2007, comprised of Nancy Brown-Peterson (Assistant Editor, 2007-present), Diana Reid (Graphic Designer, 2007-present), Angela Bone (Editorial Assistant, 2007-2009), and Pamela Moeller (Editorial Assistant, 2009-present). This team has allowed us to produce an updated and more professional journal and these changes, plus a more-stylistic cover (Figure 2) and layout modifications, have been received well by the authors and readership of GCR.

Changes in GRR procedures were instituted in 1997 and continue to be modified and refined today. An Advisory Board, chaired by the Editor-in-Chief, was appointed in 1997, providing vital information, guidance and policy for the production of GRR. All changes and modifications to GRR are discussed, reviewed and voted on by the Advisory Board. At this time, a set of Associate Editors was also appointed, comprising national and international experts, to bring disciplinary depth and international perspective to GRR. All Associate Editors have a two year appointment, but a number serve longer with mutual approval between the Associate Editor and the Editor-in-Chief. Some have served as long as six years. This major change in GRR policy has been an important and fruitful one.

The Advisory Board has approved a series of operational and cosmetic changes to the journal in the past 13 years. In 1997, we removed the page charges for published manuscripts and initiated a nominal subscription fee, but in 2009 we went back to a page charge for manuscripts longer than 10 printed pages as costs continued to increase. The 1997 issue also included a complete revision of the "Guide to Authors" and "Scope" of GRR, and a change in the volume numbering sequence of GRR issues. The Advisory Board modified the cover again in the 1998 issue (volume 10) by including the new Institute of Marine Sciences logo in lieu of the GCRL logo (1998-1999 and supplement 1 that year;

Figure 2). These modifications were made to help our readership recognize the changes within the GCRL, the publisher of GRR (Grimes 1998).

During 1998, the Advisory Board, in consultation with GCRL Director Dr. Jay Grimes, began discussions about major changes in GRR. These changes would result in the ultimate goal of making GRR a ". . . widely recognized source of scientific information that underpins the understanding, planning, and management of GOM and Caribbean natural resources and processes" (Grimes 1998). Our goal was thus to reformulate and repackage the original vision of GRR. At the 1998 Advisory Board meeting, we voted to update the "Guide to Authors" and the "Scope" and to remove a published submission deadline such that more manuscripts might be submitted to the journal, with the ultimate vision of publishing two issues annually. Finally, we voted to change the name of the journal from *Gulf Research Reports* to *Gulf and Caribbean Research* (GCR) effective in Volume 12 published in the year 2000 (Figure 2). This name change more accurately reflects the scope of the papers published in the journal and better reflects our mission and audience. The Advisory Board felt these changes supported and extended the original vision of the journal founder, Dr. Gordon Gunter.

In an effort to provide visibility for GOM scientific societies, the journal has periodically published abstracts/symposium sessions from their meetings. Abstracts from the annual meeting of the Gulf Estuarine Research Society (GERS) were published in GRR in 1998, 1999 and 2001. Two special issues (Marine Protected Areas and Large Pelagic Fishes in the Caribbean Sea and Gulf of Mexico: Current Status and Integrated Management) that were based on special symposia at the Gulf and Caribbean Fisheries Institute (GCFI) meetings were published in 2003 and 2007. Additionally, two special sections, published in 2004 and 2005, included papers from the southern GOM based on undergraduate research theses at the Iztacala campus of the Universidad Nacional Autónoma de México. These efforts represented the first scientific publication for many young Mexican scientists.

The March 2011 issue will be the 50th year of publication for GRR/GCR. In acknowledgement of this golden anniversary, the Advisory Board decided to review the scope and direction of the journal over the course of its existence. The purpose of this article is to provide a summary of the authors, topics, and diversity of this well established regional marine science journal, and to illustrate that despite growth and numerous changes, GCR remains true to its initial mission of disseminating information pertinent to the GOM and adjacent waters.

Methods

In order to examine journal content and thus trends over time, we pooled all papers within five year periods of time from 1961-2010 (n = 10 date sets). We then developed six topics to examine over these date sets: large-scale author affiliation (2 locations - USM/GCRL vs. other intuitions), finer-scale geographic distribution of authors (n = 8 locations), geographic distribution of study sites (n = 6), subject areas (n = 11 categories), taxon representation (n = 9), and habitat

TABLE 1. *Summary of important metrics for each set of five years of the journal. 1-λ' represents a form of Simpson Index (Krebs 1989; Clarke and Gorley 2006) and is interpreted as low values equal low diversity and high values equal high diversity. Large format issues started in 1975. The values in parentheses after the data sets correspond to the MDS plots in the figures.*

Date set	# issues	#total papers	#total pages	mean# pages/ article	Author geographic distribution 1-λ'	Study site geographic distribution 1-λ'	Subject 1-λ'	Taxon 1-λ'	Habitat 1-λ'
61-65(1)	7	10	470	47.0	0.407	0.618	0.499	0.727	0.750
66-70(2)	4	17	529	31.17	0.438	0.489	0.811	0.762	0.684
71-75(3)	5	34	703	20.7	0.247	0.555	0.824	0.870	0.814
76-80(4)	5	61	377	6.2	0.135	0.622	0.853	0.876	0.841
81-85(5) & supplement	6	73	484	6.6	0.406	0.661	0.857	0.836	0.795
86-90(6)	1	12	145	12.1	0.280	0.519	0.491	0.673	0.617
91-95(7)	4	43	334	7.8	0.467	0.693	0.807	0.745	0.770
96-00(8) & supplement	6	47	489	10.4	0.600	0.761	0.843	0.798	0.621
01-05(9) & special issue	6	79	687	8.7	0.783	0.767	0.848	0.723	0.789
06-10(10) & special issue	7	64	475	7.4	0.662	0.682	0.860	0.661	0.730

type representation (n = 9). Detailed information regarding contents of the categories within the topics can be found in Appendix 1. We also calculated the number of papers, the total number of pages, and the mean number of pages per paper by date set. Published information not incorporated into these analyses included annual reports of GCRL activities, GERS abstracts, editorials, introductions or summaries to special sections or symposia, and obituaries. We examined what other journal papers cite our journal using *ISI Web of Science, Publish or Perish*™ and *Google Scholar* software (Harzing 2010), what were the most cited papers, and who are the most cited authors. We also determined the longevity of similar regional marine science serial publications and provide our readership information on what abstracting or indexing services list our journal.

Cluster analysis based on the hierarchical agglomerative method with the group-average linkage and non-metric multi-dimensional scaling (MDS) procedures were used to compare the six topics (based on square root transformation of categories within each topic separately by the 10 date sets) with the Bray–Curtis similarity coefficient. Both analyses were computed using PRIMER (version 6.1.6; PRIMER-E Ltd, Plymouth, UK, Clarke and Gorley 2006); these values range from 0 to 100 % with 0 % being no similarity and 100 % being identical (Clarke 1993). Both analyses attempt to create groupings of topics based on the date sets through a generated similarity matrix. We also conducted a SIMPROF test on the cluster analysis to search for meaningful structure within the clusters. Finally, we superimposed groups based on SIMPROF results, or if no structure was identified, by visual groupings in the cluster dendrogram at similarity level, visually defining groups onto the ordination to search for mutual consistency between techniques.

We also calculated a form of Simpsons Diversity Index (1-λ'; Clarke and Gorley 2006) for these topics by date sets. This index is interpreted as low values equal low diversity and high values equal high diversity. This index is one of the least influenced by differences in sample size (Magurran 1988; Krebs 1989), and represents changes in patterns (i.e., diversity of topics over date sets).

Finally, we compared our results to similar patterns from the 60 year history of the *Proceedings of the Gulf and Carib-*

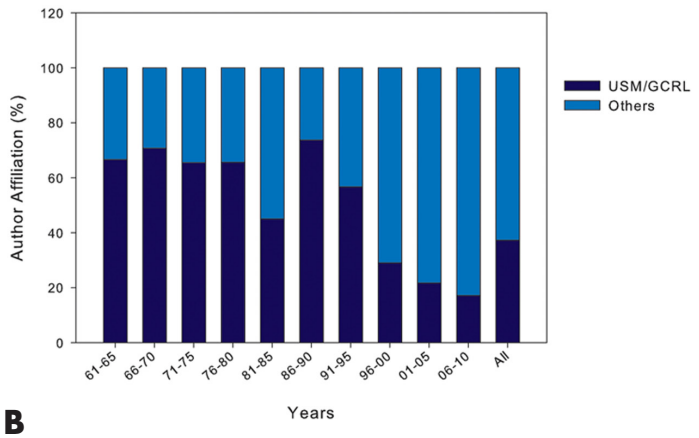

Figure 3. *Summary of (A) large-scale author affiliation (USM/GCRL) vs other affiliated authors who published in the journal by date set and (B) MDS plot of square-root transformed data in panel A.*

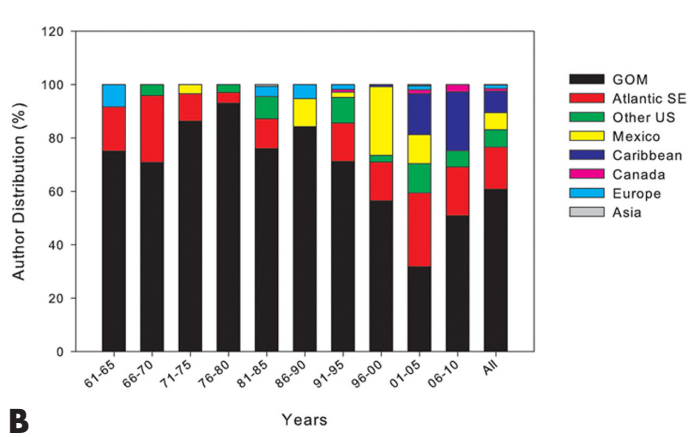

Figure 4. *Summary of (A) fine-scale distribution of the author's affiliation who published in the journal by date set and (B) MDS plot of square-root transformed data in panel A.*

TABLE 2. *Summary of publication duration of regional journals that publish or are focused on marine science research in the Gulf of Mexico and Caribbean areas. Journals in bold are still published. * = not peer-reviewed. Superscripts of the same letter indicate different titles of the same journal.*

Journal	Initial year	Final year
Alabama Marine Resources Bulletin	1969	1982
Bulletin of Marine Science of the Gulf and Caribbean[a]	1951	1964
Bulletin of Marine Science[a]	1965	
University of Texas, Publication of the Institute of Marine Science[b]	1945	1966
Contributions in Marine Science[b]	1967	§
Caribbean Journal of Science	1961	
*Florida Board of Conservation, Marine Research Laboratory Professional Papers**	1960	1967
*Florida Department of Natural Resources, Marine Research Laboratory Professional Papers**	1969	1973
*Florida Department of Natural Resources, Florida Marine Research Publications**	1973	1998
Gulf Research Reports[c]	1961	1999
Gulf and Caribbean Research[c]	2000	
Journal of Marine Science[d]	1969	1973
Northeast Gulf Science[d]	1977	1996
Gulf of Mexico Science[d]	1997	
Proceedings of the Gulf and Caribbean Fisheries Institute*	1948	
*Proceedings of the Annual Conference SE Association of Game and Fish Commissioners**[e]	1956	1975
Proceedings of the Annual Conference SE Association of Fish & Wildlife Agencies*[e]	1976	
Revista de Biología Tropical	1953	
Tulane Studies in Zoology[f]	1953	1968
Tulane Studies in Zoology and Botany[f]	1968	2002

§ indicates irregular, non-annual publication since 1999.

bean Fisheries Institute. Percentages of author affiliation, subject matter and taxon in categories similar to those for the GRR/GCR analysis were calculated from data presented in Posada and Franks (2008).

Results and Discussion

Our journal was established in 1961 and has been published once yearly (some years had two issues and some had additional special issues, sections or supplements) except during the years 1986 thru 1988 and 1990 when budget issues prohibited publication. Overall, the journal has published a total of 51 issues, 453 total articles, 4,693 total pages, and the mean number of pages per article ranged from 6.2 to 47.0 (Table 1). The mean number of pages per article decreased starting in 1976 when page size of our journal increased (Table 1).

Many of the papers in early volumes focused on local and regional issues, processes and problems. Through the years, however, papers appeared from authors outside the local and regional areas which focused on organisms and/or processes relevant to the GOM and adjacent waters. Papers have been published from scientists in Denmark, Germany, Sweden, Canada, Japan, Mexico, and the Caribbean Sea nations, giving a more international flavor to the journal.

Our journal is one of the longest published regional marine science journals compared to other serial publications in the region that publish marine science disciplines (Table 2). The only other regional journals in continuous publication longer than GRR/GCR are *Bulletin of Marine Science*, *Proceedings of the Gulf and Caribbean Fisheries Institute*, *Caribbean Journal of Science*, and *Revista de Biología Tropical* (Table 2).

Our journal is also abstracted and indexed in seven services:

- ASFA: Aquatic Sciences and Fisheries Abstracts
- Biological Abstracts
- British Library Direct
- ProQuest CSA Illumina
- Oceanic Abstracts
- Zoological Record
- REFERATIVNYI ZHURNAL (All-Russian Institute of Scientific and Technical Information Journal (www.viniti.ru)).

This makes articles published in GCR readily available to the scientific and management communities worldwide.

Analysis of published articles

After the initial processing of data and statistical procedures, it was clear that results from the 1986-1990 date set skewed all analyses because there was only one issue published in those five years (Table 1). Thus, although we plotted data from this date set in the histograms and included

these data in calculated Simpson's diversity estimates, we did not include those data in the cluster analysis or the MDS ordinations. Also, we did not calculate Simpson's diversity for the author affiliation data (Table 1) because there were only 2 categories. Finally, the SIMPROF analysis on the clusters indicated only the author affiliation (Figure 3), subject area (Figure 6), and the taxon analyses (Figure 7) had significant structure with all clusters, and for those analyses we used those groups to superimpose onto the MDS plots based on similarity values. However, for the remaining data sets that did not show significant structure, we superimposed groups based on the actual breaks in the cluster analysis to aid in interpreting the patterns in the MDS plots.

During the first 20 years of publication, authorship was dominated by USM/ GCRL personnel; however, during the last 15 years, the majority of authors have not been from USM/GCRL (Figure 3A). Overall, 37% of the articles published in GRR/GCR have been by authored or co-authored by personnel affiliated with USM/GCRL. SIMPROF analysis indicated there were three significant groups within the structure of the cluster and MDS analyses of author affiliation (Figure 3B). These groupings show the clear trend of a lower percentage of USM/GCRL authors in recent years.

For the geographic distribution of authors data set, there was a general pattern of domination by authors from the GOM during 1961-1995 (Figure 4A) and highly variable diversity (Table 1). However, since 1996 there has been an increased percentage of authors from Mexico and the Caribbean region, as well as stable, high Simpson's diversity (Figure 4A, Table 1). This difference is reflected in three distinct groups displayed on the MDS plot (Figure 4B) at the 78% similarity level.

The geographic areas reflected in the published studies also show profound variation over time. During the first 15 years, most studies were conducted in Mississippi with a relatively small percentage of studies from other GOM areas, the Caribbean and Mexico (Figure 5A), and these years also showed the lowest diversity indices (Table 1). Beginning in 1976, the percentage of Mississippi studies declined, the percentage of GOM studies increased, and studies from the southeastern Atlantic first appeared (Figure 5A). Diversity was similar among issues from 1976 – 1995 (Table1) and these years cluster together in the MDS plot (Figure 5B). During the last 15 years, ≤50% of the papers published have

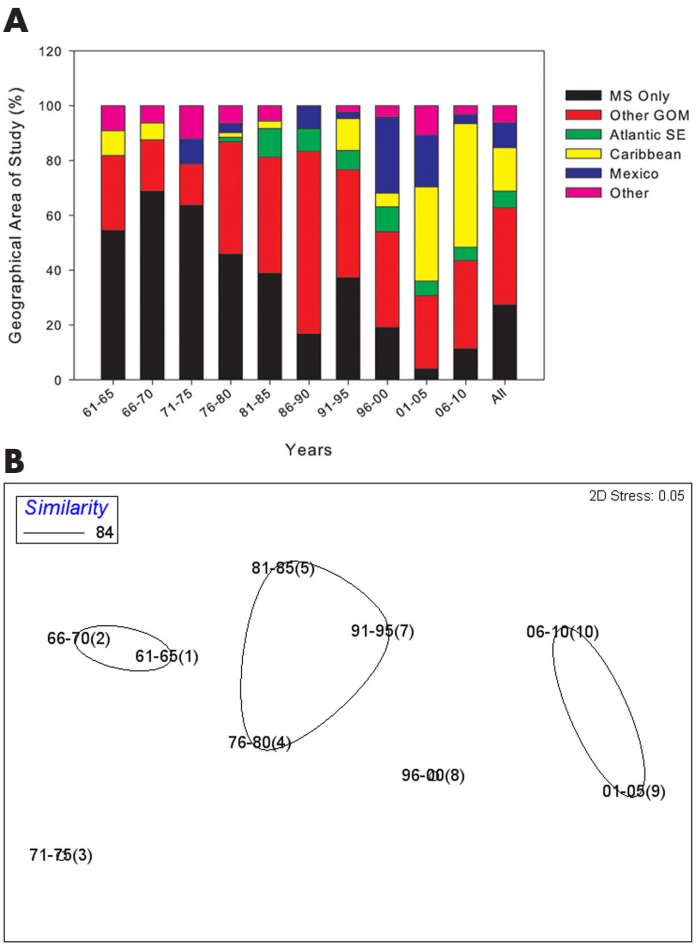

Figure 5. *Summary of the (A) geographic area of study sites published in the journal by date set and (B) MDS plot of square-root transformed data in panel A.*

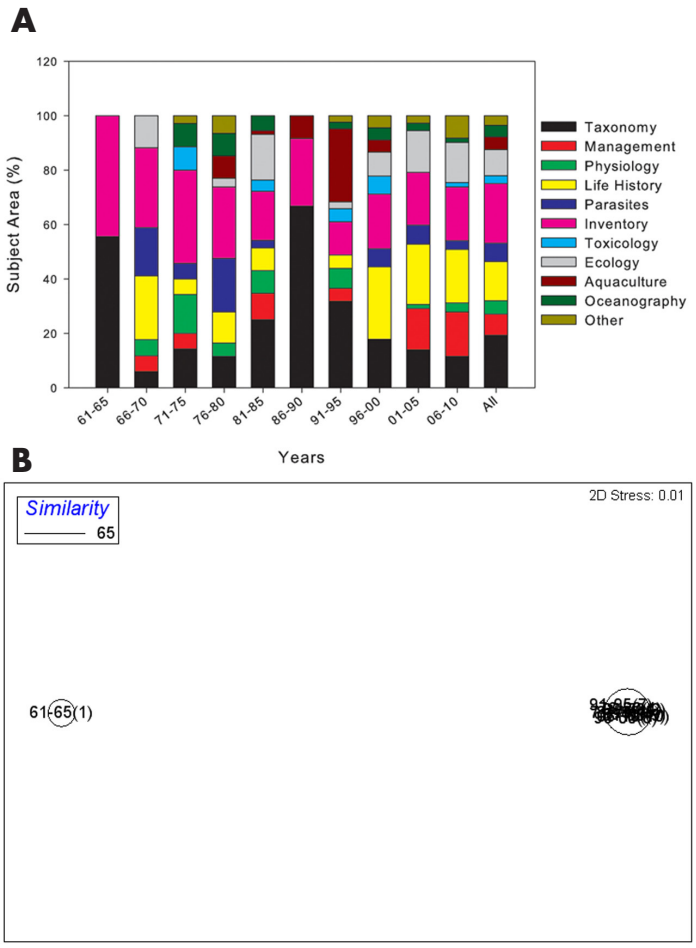

Figure 6. *Summary of (A) subject areas published in the journal by date set and (B) MDS plot of square-root transformed data in panel A.*

TABLE 3. *Summary of external citations using articles from Gulf Research Reports and Gulf and Caribbean Research.*

***Gulf Research Reports* (1965-2010)**	**ISI Web of Science™ articles**	**Times cited**	**Total number of citations**	**Publish or Perish™ & Google Scholar articles**	**Total number of citations**
	5	40+	269	3	209
	12	20-39	353	12	332
	44	10-19	570	28	374
	159	1-9	551	112	463
Totals	220		1,743	155	1,378
***Gulf and Caribbean Research* (2000-2010)**					
	7	10+	144	8	212
	9	5-9	58	18	103
	61	1-4	121	72	115
Totals	77		323	98	430

been from the GOM region (including Mississippi) and the contribution of studies from Mexico and the Caribbean has been noticeably higher. The most recent date sets show the highest Simpson's diversity index (Table 1) and are separated from the other years on the MDS plots (Figure 5B).

With the exception of 1961-1965 and 1986-1990, there was a high diversity in subject area for all date sets (Table 1), resulting in just 2 significantly separated groups in the MDS plots (Figure 6B). The only subject areas occurring in all date sets were inventory/surveys and taxonomy, and these two categories, along with life history studies, were the most common subject areas overall (Figure 6A). Some subjects were only found during certain periods of the journal's publication history, such as aquaculture (1976 – 2000). Papers on parasites were not published from 1986 – 1995, but were present in all other years after 1965 and oceanography papers were published in all years after 1970 with the exception of 1986 – 1990.

There is a high diversity in the taxon data set for all years (Table 1), yet SIMPROF clearly showed significant structure in the clusters and MDS plot, with the 1961-1965 data set separated from all other data sets (Figure 7B). This separation could be due to the high percentage of papers in the multi-taxa category in 1961-1965 (Figure 7A) because of the numerous inventories conducted during those years. Overall, fish was the most common taxon (28.7%), followed closely by Crustacea (27.4%, Figure 7A). Microorganisms and Mollusca were more commonly represented prior to 1986, and plants occurred in only 4 of the 10 date sets (Figure 7A). All 9 taxon categories were only represented from 1971 – 1985 and again in 2006-2010, although there was a much more even representation among the taxon categories in the 1970's and early 1980's (Figure 7B).

For the habitat data sets, the offshore and benthic categories dominate the overall patterns, but there was a consistent but lower percentage of marsh habitat as well; these are the only 3 habitat categories that were represented in all date sets (Figure 8A). The MDS plots show that the first 25 years grouped together, likely due to a similar distribution and number of habitat categories (Figure 8A,B). The data set from 1991-95 grouped with the 2006-10 data set, most likely due to a similar percentage of lab studies in those years (Figure 8A,B). Data sets from 1996-2005 each had 6 habitat categories and were grouped together (Figure 8A,B).

Recently, the Gulf and Caribbean Fisheries Institute celebrated their 60th year, and analyzed trends in papers presented at annual meetings from 1948 - 2004 and subsequently published in the *Proceedings* (Posada and Franks 2008). Although the papers published in the *Proceedings* reflect the identified themes established for each annual meeting, there are some similarities among publication trends with GRR/GCR when looking at geographical distribution of authors, subject areas, and taxa.

Author data from the *Proceedings* are based on the 20 most published authors for each 10 year period, and thus are not directly comparable to author data from GCR. However, from 1948-1977 the majority of articles were authored by scientists from the GOM, and the second largest percentage of authors were from the southeastern United States (Posada and Franks 2008), similar to trends seen in GRR/GCR. Interestingly, from 1978 until 2004, authors from Caribbean countries represent the highest percentage in the *Proceedings*, whereas Caribbean authors have only made a significant contribution to GCR since 2001 (Figure 4A). Finally, the recent prevalence of authors from Mexico is evident in both journals; from 1998 – 2004, 25% of the articles in the *Pro-*

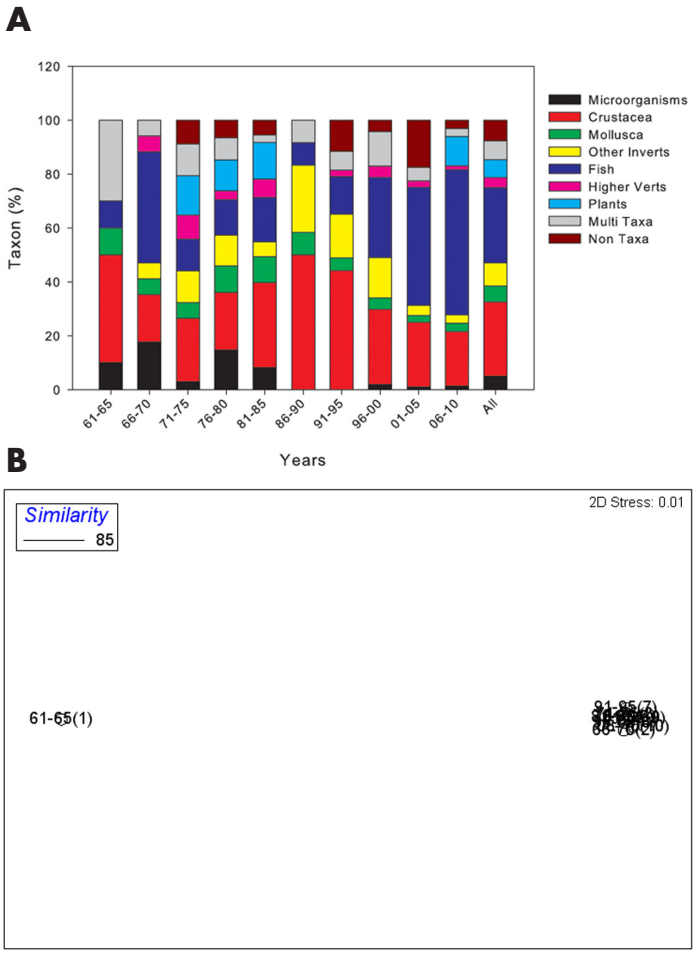

Figure 7. *Summary of (A) taxon representation published in the journal by date set and (B) MDS plot of square-root transformed data in panel A.*

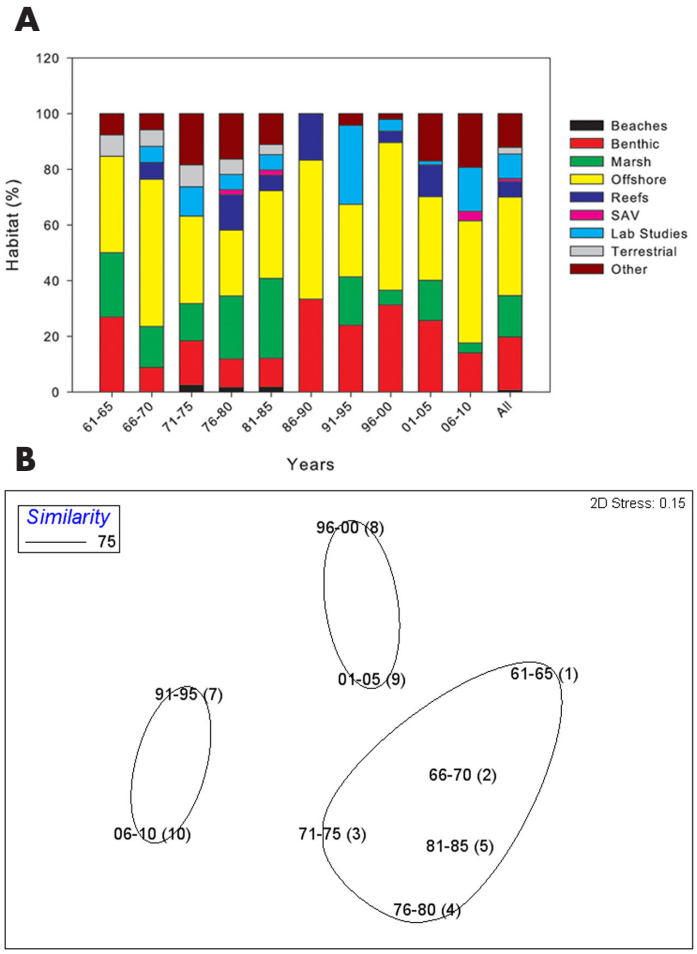

Figure 8. *Summary of (A) habitat type representation published in the journal by date set and (B) MDS plot of square-root transformed data in panel A.*

ceedings were by Mexican authors (Posada and Franks 2008), whereas from 1996 – 2000 25% of the articles in GCR were authored by Mexican nationals (Figure 4A). Overall, the *Proceedings* does not have as diverse an authorship as GRR/GCR (authors from other U.S. regions, Canada, Europe and Asia were rarely, if ever represented), but similar trends in the decrease of authors from the GOM and the southeastern United States and an increase in Caribbean and Mexican authors over time are consistent between both journals.

Although Posada and Franks (2008) list 40 different scientific thematic areas represented by publications in the *Proceedings*, these can be condensed into 6 general subject areas (management, life history, aquaculture, toxicology, inventories and other) to enable comparison with GRR/GCR subject categories. A major difference between the *Proceedings* and GRR/GCR is the high percentage of papers related to management in the *Proceedings*; 49.8% in the first 30 years (1948-1977) and 25.4% in the last 27 years (1978-2004) (Posada and Franks 2008). In contrast, management papers never represented more than 10% of papers published in GRR/GCR through 2000, and only represented 15-16% of papers since that time (Figure 6A), reflecting the different scope of the two journals. Life history papers were the second most common category in the *Proceedings*, representing 27.4% of papers from 1948-1977 and 40% of papers from 1978-2004 (Posada and Franks 2008). These percentages are higher than seen in GRR/GCR (Figure 6A), although life history is one of the three top categories in our journal. Finally, aquaculture increased in importance to represent 9.7% of publications from 1978-2004 in the *Proceedings*, although the number of aquaculture publications noticeably declined beginning in 2002 (Creswell 2008), similar to trends seen in GCR/GRR (Figure 6A).

The taxonomic diversity of the *Proceedings* is similar to that of GRR/GCR, with the exception that microorganisms and plants were not represented in the thematic areas listed by Posada and Franks (2008). Multi-taxa studies dominate the *Proceedings*, but this is likely due to the inability to differentiate among taxa included in several thematic areas (stock assessement, harvesting, fisheries management) in Posada and Franks (2008). Overall, fish make up the most abundant single taxon group in the *Proceedings* (25%, Posada and Franks 2008), similar to the overall percentage of fish studies in GRR/GCR (27.8%, Figure 7A). Interestingly, Mol-

lusca makes up a much higher percentage in the *Proceedings* (15.5%) from 1978 - 2004 (Posada and Franks 2008) than during any time period in GRR/GCR (Figure 7A). In contrast, Crustacea represent 17% - 50% of taxa in GRR/GCR during all date sets (Figure 7A) in comparison to a maximum of 14.6% in the *Proceedings* (Posada and Franks 2008).

Journal citation trends

An *ISI Web of Science*™ cited reference search found that, of the 303 published articles between 1961 and 1999 in GRR, 220 have been cited a total of 1,743 times (Table 3), and 72% of the articles published in GRR have been cited at least one time. Dawson (1966) was the most cited article, with a total of 76 citations. Of the five most cited articles, three of them were authored or co-authored by C.E. Dawson and included his bibliography on fish anomalies and updates to the bibliography (Dawson 1966, 1971, Dawson and Heal 1976).

A second search of GRR was done using *Publish or Perish* ™ software and *Google Scholar* (Harzing 2010). This search resulted in 155 articles cited 1,378 times, with 3 cited 40+ times, 12 cited 20-39 times, 28 cited 10-19 times, and 112 cited 1-9 times (Table3). Overall, 51 % of published articles were cited at least once. According to this search, C.E. Dawson's bibliography of fish anomalies was cited 110 times and was the most cited article published in GRR. However, this appears to be a combination of Dawson (1966), Dawson and Heal (1976), and possibly Dawson (1971) (Table3).

Of 152 published articles in GCR, the *ISI Web of Science*™ search noted 77 articles have been cited a total of 323 times (Table 3) and showed that 51% of published articles have been cited at least once. Of the 77 articles, the most cited article was Cowen et al. (2003), which was cited 39 times. Of the 6 most cited articles from the *ISI Web of Science*™ search, 5 of the 6 appeared in the special issue "Caribbean Marine Protected Areas: Practical Approaches to Achieve Economic and Conservation Goals: Proceedings of a Symposium at the 54th Annual Meeting of the Gulf and Caribbean Fisheries Institute Symposium, Turks and Caicos, November 2001" published in 2003 as GCR 14(2).

The *Publish or Perish*™ and *Google Scholar* search resulted in 98 articles cited 430 times (Table 3), with 64% of the articles cited at least once. Eight articles were cited 212 times, 18 articles were cited 103 times, and 72 articles were cited 115 times (Table 3). Once again, Cowen et al. (2003) was the most cited article (52 times) Similar to results from the

TABLE 4. *Listing of marine science journals that have cited articles in Gulf Research Reports (GRR) and Gulf and Caribbean Research (GCR).*

Journal Name	**GRR** (1965-2010)	**GCR** (2000-2010)
Bulletin of Marine Science	76	9
Estuaries	56	
Fishery Bulletin	55	
Journal of Experimental Marine Biology and Ecology	53	5
Marine Ecology Progress Series	50	22
Marine Biology	47	7
Transactions of the American Fisheries Society	41	
Journal of Crustacean Biology	35	
Estuarine, Coastal Shelf Science	33	
Journal of Shellfish Research	29	
Hydrobiologia	29	
Aquaculture	29	
Zootaxa	26	11
Crustaceana	26	
Gulf Research Reports	25	
Journal of Fish Biology	22	9
Ecology	18	
Proceedings of the Biological Society of Washington	17	
Revista de Biología Tropical	17	
Copeia	16	
Environmental Biology of Fishes	16	6
Canadian Journal of Fisheries & Aquatic Sciences	15	
Contributions in Marine Science	15	
Journal of the Marine Biological Association (UK)		8
Coral Reefs		7
Fisheries Research		7

ISI Web of Science™, The *Publish or Perish*™ and *Google Scholar* search identified 8 articles in the Caribbean Marine Protected Areas volume 14(2) that were cited 10+ times.

Finally, we were interested in which journals cite articles from GRR and conducted an *ISI Web of Science*™ search from 1965-July 2010. Twenty three journals cited an article from GRR at least 15 times (Table 4). We conducted a similar search for GCR from 2000-July 2010, and identified 10 total journals (including 3 that did not cite articles in GRR) citing GCR articles between 6-22 times (Table 4). These results illustrate both GRR and GCR are well cited within many top-tier journals that publish marine-oriented articles, although it is important to note GRR has been in existence for 50 years whereas GCR has only been published for the past 10 years.

In reviewing the citation history of GRR and GCR articles captured using the *ISI Web of Science*™ "cited reference" search, it immediately became apparent there were numerous errors in the search results. For GRR, about 28% of the articles were cited incorrectly. For GCR, the percentage of error in citation was slightly lower at 20%. Citation errors included misspelled author's name, and incorrect volume numbers, dates, and pages. The worst corruption of a single reference, cited incorrectly twice, was:

Heard, R.W. 1952. Observations on the food and food habitats of clapper rails, Rallus longirostis (Boddaert), from tidal marshes along the East and Gulf Coasts of the United States. Gulf Resource Report 2 392-412.

The correct citation is:

Heard, R.W. 1982. Observations on the food and food habits of clapper rails, Rallus longirostris (Boddaert) from tidal marshes along the East and Gulf Coasts of the United States. Gulf Research Reports 7(2):125-135.

The two citing articles had included the bad citation exactly the same in their literature cited with all four elements (journal title, year, volume, and pagination) incorrect. One was found using *ISI Web of Science*™ and the other using *Google Scholar* (http://scholar.google.com/).

Moed and Vriens (1989) quantified citation database errors in cited literature using a small sample of 29 articles and found most of the errors in citations were author errors. The 20-28% error rate for GRR and GCR are similar to those found by Benning and Speer (1993), who compared the citation errors in library literature with those reported in medical literature. They found incorrect citations in 27% of the references in library literature and a 28% error in medical literature citations. The rate of error is fairly common, with studies showing percentage of error from various journals ranging from 10.7% to 50% (Smith, 1981). Citation errors found in *ISI Web of Science*™ were corrected during the course of this study.

Summary

Our analysis shows that GRR/GCR fulfills an important niche in the marine science literature. Although GRR/GCR is considered a regional journal, it represents an international region, and this influence is seen in the geographic distribution of authors and study sites as well as the subject matter and taxa covered. From its beginning as a small, editor-reviewed journal primarily publishing the results of scientists from GCRL, GCR has grown into a respected peer-reviewed journal with contributions from scientists from many national and international institutions. However, throughout its growth, GCR has remained true to its initial mission of disseminating knowledge regarding the biota and related information from the GOM and adjacent (Caribbean) waters.

Acknowledgments

Special thanks to S. Carranza and D. Reid for assistance with development of Figures 1 and 2. Our sincere thanks to L. DeHart, Librarian at the University of Texas Marine Science Institute at Port Aransas for performing the retrospective *ISI Web of Science*™ for GRR/GCR and the *Public or Perish* searches. Finally, we thank a number of people, from the authors who contributed their research to GRR and GCR over the last 50 years to the reviewers and Associate Editors, who made and continue to make the product much better. Without each of you the journal would not exist.

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APPENDIX 1. *Topics and categories used in this paper and details associated with each.*

Topics	Category	Detail
Author large-scale geographic distribution	USM/GCRL Non-USM/GCRL	
Author small scale geographic distribution	GOM	All Gulf of Mexico - Texas through west Florida
	Atlantic SE	Southeastern US Atlantic coastal states—Virginia to east Florida, including Gainesville, Florida and Florida Keys
	Other US	All non-GOM and non-Atlantic SE states
	Mexico	All Mexican states
	Caribbean	All countries in the Caribbean Sea, including Bermuda and Brazil
	Canada	All Canadian provinces
	Europe	All European Countries, including Germany, Sweden, Denmark
	Asia	Japan
Geographic area of study site (some data were partitioned into multiple areas if the samples were from more than one site)	MS only	All areas of Mississippi
	Other GOM	Texas, Louisiana, Alabama, west Florida
	Atlantic SE	Southeastern US Atlantic coastal states—Virginia to east Florida
	Caribbean	All countries in the Caribbean Sea, including Bermuda and Brazil
	Mexico	All Mexican states
	Other	Bibliographies, legal aspects of salt marsh systems
Subject area	Taxonomy	Also includes systematics and species distributions
	Management	Also includes stock structure, fisheries models, gear efficiencies and socio-economics
	Physiology	Also includes morphology, gross physical abnormalities and histology
	Life History	Also includes reproductive biology, feeding and growth
	Parasites	Also includes diseases and symbionts
	Inventory	Also includes surveys, distributions, range extensions, monitoring, species lists, bibliographies, single observations
	Toxicology	Also includes pollution
	Ecology	Also includes species assemblages and trophic analyses
	Aquaculture	All aspects of aquaculture
	Oceanography	Includes chemical, physical and geological oceanography

APPENDIX 1. Continued...

Topics	Category	Detail
	Other	Includes genetics, behavior, methods papers, hurricane balls, law and tidal wracks
Taxa	Microorganisms	Viruses, bacteria, protists (ciliates, dinoflagellates, diatoms, foraminiferans) and fungi
	Crustacea	Crustaceans as the primary subject
	Mollusca	Molluscs as the primary subject
	Other invertebrates	All invertebrates other than crustaceans and molluscs
	Fish	Fish as the primary subject (fish feeding studies generally in this category rather than in Multiple Taxa)
	Higher vertebrates	All vertebrates other than fish
	Plants	Algae, seagrasses, salt marshes, mangroves, etc. as the primary subject
	Multiple taxa	Two or more of the above taxonomic categories as the primary subjects (includes faunal surveys, benthic studies, zooplankton studies, etc.)
	Non-taxa	Chemistry, geology, history, hydrology, marine law, marine reserves, methods, nutrient flux, etc.
Habitats	Reefs	Oyster, coral and artificial reefs (primarily coral reefs)
	Open water	Bays, sounds, nearshore waters and offshore waters
	Marsh	Salt and fresh water marshes; barrier island ponds
	Submerged aquatic vegetation	Seagrasses in shallow sounds, bays and low salinity estuaries
	Benthic	Shallow water (shoreline and estuarine) and deep water environments
	Beaches	Mainland and barrier island beaches; swash zone
	Laboratory studies	Experimental laboratory studies (organisms associated with benthic, demersal and pelagic habitats)
	Terrestrial	Upland forests, grasslands, etc.
	Other	Multi-habitats associated with MPAs and marine reserves, management and design of MPAs, fisheries management, fisheries economics, geology, rivers, and bibliographies