Barbadian Bio-cultural Heritage: an Analysis of the Flying Fish

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ABSTRACT

The flying fish is a tangible species, but to Barbados it is a quintessential aspect of intangible heritage: a symbol of Barbadian *pride and industry* – the country's motto. It adorns the silver dollar coin and is on the logo of the Barbados Tourism Authority. Barbados has its own unique ways of preparing and cooking the flying fish, and it is part of the national cuisine. But the availability of the species is at risk, as are its associated traditions, and there is no regulatory framework to protect this icon of national heritage. It is threatened by a maritime boundary and fisheries dispute, it struggles under the legacy of price controls that hamper the profitability of the fishing industry, it is uncertain whether there will still be people to harvest the species in the next fifty years, there is a significant variability in abundance which could affect the accessibility of flying fish to Barbadians, and climate change could lead to the local extinction of flying fish. So should the flying fish continue to be the leading icon of Barbados? Although not a unanimous decision, the majority of Barbadians surveyed felt that the flying fish should be preserved as part of the island's heritage. Therefore, recommendations are made here for the preservation of this representative of local intangible heritage traditions.

Keywords

flying fish, natural and cultural heritage, bio-cultural heritage, screeler, UNCLOS, fisheries' dispute, climate change, traditional cuisine, Oistins, Barbados.

Plate 1
Catch of flying fish. Photo: Hazel Oxenford, 2012.

1. Introduction [Plate 1]

The way we speak, our dress, the way we walk, the foods we eat, the way we raise our children, the way we dance, our traditional games, warri, marbles, making kites and flying them, our folk medicine, the chattel house, cricket, calypso, crop over, picking dunks and ackees, market on Saturday, our history. (Deane: 2003, p.2-2)

All of these things and more are what make up Barbadian heritage. Yet, it is many of these everyday features that have become quintessential to Barbados that are being altered and in some cases lost. The desire to hold on to what nature and our forebears have bestowed upon us has led to the creation of various conservation groups, legislation and policies that seek to safeguard Barbados' natural and cultural heritage today.

While the flying fish is not unique to Barbados' waters, it has nevertheless generated a sense of possessive national ownership – as if to say it is *only we own*. So prized was the flying fish that it was named the national fish of Barbados, was incorporated into the national dish of Cou-Cou and Flying fish, and its motif adorns the dollar coin and monetary bills, as well as other national and commercial logos. Ultimately, it is agreed that Barbados was endowed with the title: 'The Land of Flying fish' because of the abundance of the species that was once found in our waters (Ministry of Education and Human Resource Development: 2010). But for how much longer will that name truly apply? [Plate 2 and Plate 3]

In response to this question, research was undertaken to examine the socio-cultural, political and environmental issues that could alter the way Barbadians use and view one of the most iconic representations of the island's natural and cultural heritage. The research was framed in the context of bio-cultural heritage: the complex interrelationship between native people and their natural environment. Bio-cultural heritage comprises biological resources (from genetic resources to landscapes) and the longstanding traditions, practices and knowledge which are adaptive to environmental change and conducive to the sustainable use of resources, and which are collectively held and transmitted from one generation to the next (IIED: 2011). Ordinarily, bio-cultural heritage studies focus on indigenous – some may say 'exotic' – communities that, by their nature, are remote and isolated (Posey: 1999 cited in Cocks: 2006, p.186). However, Cocks (2006) instructs that for bio-cultural diversity to become more accessible to communities other than those that are classified as 'indigenous', two of its key concepts will need to be re-conceptualised. First, the resilience of culture, and how it can be modified, adapted and maintained in the presence of agents of change, must be recognised. Secondly, the cultural value of nature must be extended beyond areas such as sacred forests and landmarks to include wild resources harvested from natural areas.

Plate 2
Logo of the Barbados Tourist Authority.

Plate 3
Barbados one dollar coin. Photo: author, 2012.

Thus in this paper the wild resource, the flying fish, which is harvested in Caribbean waters, is studied to determine whether people in modernised and urban communities also desire and benefit from a *nature-related sense of cultural identity* (Cocks: 2006, p.191). Secondly, its resilience as a critical representation of culture is assessed in the context of an evolving society with changing dietary tastes, fluctuations in stock abundance and availability, maritime boundary disputes with the neighbouring twin-island republic of Trinidad and Tobago, price concerns, an aging fishery, and the potential threat of climate change.

1.1 Methodology

An extensive literature review was undertaken on the natural history of Barbados (specifically on the flying fish), the issues surrounding the fisheries' dispute, and the possible effects of climate change on tropical, pelagic species. Additionally, semi-structured interviews were held with key persons associated with the history of Barbados, heritage and cultural preservation, and fisheries' biology and management. A survey of one hundred participants was conducted in order to capture the views of Barbadians on the flying fish as a national icon, and their ability to prepare it in the traditional fillet style. Using convenience sampling, the survey was administered to random individuals at various locations across the island. By no means a representative sample, these hundred individuals nevertheless offered some insight into local views on this aspect of Barbadian heritage.

2. The flying fish species

The flying fish is a subtropical, pelagic-neritic, schooling species that is found in the waters of the eastern-, western-, and north-west Atlantic and the Indo-Pacific (Fishbase: 2010). Between eleven and thirteen species of flying fish have been reported in the eastern Caribbean; however, it is the four-winged flying fish, *Hirundichthys affinis,* which is the most economically important of the species (Parker: 2003; Fanning and Oxenford: 2008; Sobers: 2010). The H. *Affinis* is a short-lived species, with a life-cycle of approximately one year. At full maturity it can reach a maximum length of about 25-30 cms (Fanning and Oxenford: 2008; Sobers: 2010). Its diet consists mainly of zooplankton and nektons (Sobers: 2010). Video clips of the species in its natural habitat can be found at: http://dsc.discovery.com/tv-shows/life/videos/flying-fish-fly.htm. [Plate 4]

The flying fish season typically extends from November to July of the following year, with the majority (about 94%) being harvested between the months of December and June (Parker: 2003; Sobers: 2010). Of the seven countries engaged in the eastern Caribbean flying fish fishery, Barbados lands the largest share – approximately 65% of the reported regional catch and about two-thirds of total national landings (Fanning and Oxenford: 2008; Mahon et al.: 2000; Fisheries Division, 2004). It is reported that over 6,000 people are either employed directly in the Barbadian flying fish fishery (harvesting and other related activities) or benefit indirectly from related support services such as tourism (Sobers: 2010).

Plate 4
A four-winged flying fish. Photo: David Gill, 2012.

3. Flying fish: the making of an icon

Within the Barbadian context, the flying fish presents an interesting blend of being a tangible, yet intangible heritage resource, and is simultaneously a part of the island's natural and cultural heritage. For generations the flying fish has supported local livelihoods and enriched the culinary arts. It can be seen gliding over the waters surrounding the island; and in years past people could have heard the call of *flying fish, fish, fish* as a hawker passed through their neighbourhood pushing a cart containing the latest catch.

Some of the earliest mentions of the flying fish in Barbadian waters, and of its use by locals, can be had from the 17th to 19th century chroniclers of the island's social and natural history. In his 1848 history of Barbados, Schomburgk wrote that the common flying fish was so well-known that it did not require of him any special description. Furthermore, the flying fish was *so abundant in some seasons of the year about Barbados, that they constitute*[d] *an important article of food, and during the season a large number of small boats* [were] *occupied in fishing and such numbers* [were] *occasionally caught that they* [met] *with no sale and* [were] *thrown away, or used as manure.* (Schomburgk: 1848, p. 675)

Skeete (1988) noted that Pére Labat[1] commented that although the flying fish was common in tropical waters, he knew of no other country but Barbados where it was eaten. For instance, it was caught in Martinique, but not as food. The assumption was that with a growing population and limited provisions, Barbadians were driven to consume flying fish and therefore learnt how to debone them (a technique possibly learnt from the Dutch who had experience filleting herrings). This art of deboning flying fish appears to have taken on a form of jurisdictional identity, as it was said that on the west coast, flying fish were boned from the back, whereas in the rest of the island they were boned from the front.

Indeed, the flying fish industry was so important to Barbados that *The Graphic* (a British weekly illustrated newspaper) dedicated an entire article to it in 1897. Noting that flying fish was *a staple of a considerable industry,* the article went on to describe how flying fish were harvested, transported to market, and procured by fishwives *clad in white, with short skirts showing bare shiny black legs, who hoist the baskets* [containing flying fish] *on their heads, and cry their wares through the town* (*The Graphic*: 1897, p. 264).

Local Historian Trevor Marshall[2] has opined that official recognition of the flying fish as one of Barbados' icons likely came about after the island gained independence in 1966 and the Government was looking for symbols and icons that had been associated with the island for many years and that generated a sense of pride among the populace, for which they could say "*this belongs to us and nobody else*". Therefore, Barbados' icons came to include the Parliament Building, the national flag, the coat of arms, sugar cane, and Errol Barrow. This also applies to the flying fish.

3.1 Current perspectives on the flying fish as an icon

Archaeological excavations on known Amerindian settlements have revealed the bones of flying fish, suggesting that prehistoric Barbadians harvested and consumed the species (Drewett and Oliver: 1997). Karl Watson[3] has stated that Barbadians consumed the flying fish in such quantities throughout history that its particular connection with the island was regionally accepted, and Trevor Marshall concurred that Barbadians had little to no real regional competition for the flying fish. Tobagonians did not value the species very highly, despite it being relatively abundant and easy to catch in their waters, nor did the rest of the Caribbean show much interest in harvesting the fish as food. Moreover, no other islanders in the region learned the art of deboning the flying fish as Barbadians did. The point these two historians differ on, however, is whether the flying fish is still valued as much today as it was in the past. Watson suggests that the flying fish is still highly appreciated by Barbadians today, as it is still readily eaten. Another indication is that when travelling abroad, Barbadians often take with them frozen flying fish for friends and relatives. On the other hand, Marshall argued that it is very possible that present-day Barbadians may not value the flying fish as much, for it seems that the choice of protein has switched from fish to chicken. In his opinion, fish no longer dominates the menus of households or food businesses.

To gain insight into the continued relevance of the flying fish as a national icon, a hundred Barbadians were

surveyed; of whom forty were male and fifty-eight were female (two gender responses were unclear). Their ages ranged from twelve years to over sixty, and this diversity offers perspectives from a range of age groups. See Table 1.

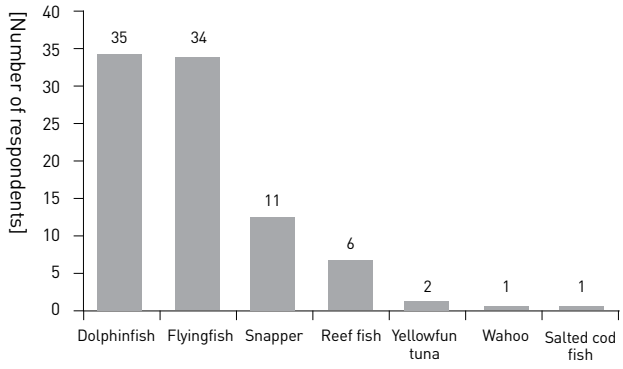
Table 1: Gender and age of sample

Age	Male	Female
12-18	6	12
19-30	13	19
31-40	2	13
41-50	11	7
51-60	5	4
60	3	3
	40	58

When presented with a list of icons and symbols which are representative of Barbados' natural and cultural heritage, 53% of the respondents felt that the broken trident, the symbol on the Barbadian flag, was the best portrayal of the country's heritage. This was followed by the Pride of Barbados flower (19%), the sugar mill (14%), the flying fish (12%), and the pelican bird (2%). These findings could signify that because a nation's flag is a construct of identity, a herald of a people, that Barbadians more readily identify the broken trident as a national symbol than the flying fish.

To determine the continued preference of the flying fish as a food, compared to other commercially important species, respondents were asked to indicate the fish they preferred to eat. Dolphin fish, *Coryphaena hippurus*[4], beat the flying fish as the favourite by just one percentage, with 35% and 34% respectively. Other species of fish rated considerably lower in terms of preference. (Figure 1) Therefore, flying fish remains among the top two fish meals of choice.

Figure 1: Preference of fish as a food



Respondents were also asked to state why, in their opinion, the flying fish was chosen as the national fish of Barbados and they were allowed multiple responses. The majority of the responses (54) indicated that it was because of the species' abundance in Barbadian waters – which corresponds with the conclusion by the Ministry of Education. Twenty-one (21) responses suggested that it was chosen based of its local popularity, while the remaining answers were varied and indicated a lack of general awareness about the reasons for the selection of the flying fish as a national symbol, as well as a lack of knowledge about the species. For example, some persons erroneously stated that the flying fish is featured on the nation's coat of arms and that it is indigenous to Barbados' waters. This could indicate a need for greater public awareness of the various national emblems, and the meanings behind them. See Table 2.

Table 2: Reasons the flying fish was chosen as the national fish of Barbados

Response	Number of Respondents
The flying fish was found in abundance in Barbados' waters	54
The flying fish is popular among Barbadians	21
The flying fish is a component in the national dish	12
The affordability of the flying fish	7
The flying fish is tasty	6
The ability of the flying fish to glide above water	6
The flying fish is indigenous to Barbados' waters	4
The flying fish is featured on Barbados' coat of arms	3
The flying fish is an important fishery	3
The flying fish is mainly eaten in Barbados, as opposed to other Caribbean countries	2
Barbadians developed the technique of filleting the flying fish	2
As a child they were told the flying fish was the national fish	2
The flying fish is unique to Barbados	2
The flying fish has a beautiful appearance	1
The flying fish was first found in Barbados' waters	1
The flying fish is a healthy source of protein	1
The flying fish is culturally significant	1

When asked whether they agreed with the choice of the flying fish as the national fish of Barbados, 76% were in agreement, while 16% did not agree with the decision. The two main reasons for supporting the flying fish as a national icon were to *maintain the island's history, tradition and heritage*, and because of the fish's popularity. (Table 3) Interestingly, it would appear the view still holds that flying fish is found in abundance in local waters, despite considerable evidence in the press to the contrary.

Table 3: Reasons the flying fish should be the national fish of Barbados

Response	Number of Respondents
To maintain Barbadian history, traditions and heritage	22
The flying fish is popular among Barbadians	15
The flying fish is found in abundance in Barbados' waters	12
The flying fish is a component in the national dish	9
The flying fish is tasty	6
The flying fish is affordable	5
The flying fish is indigenous to Barbados' waters	4
The flying fish is an important fishery	4
There is no other alternative	2
Barbadians developed the technique of filleting the flying fish	1
The flying fish is inspirational	1

Those in opposition to the flying fish's status as a national icon pointed to the fact that Barbadian fishers enter Trinidad and Tobago's waters to harvest flying fish (five persons); and that flying fish is no longer the most abundant fish in Barbados' waters (four persons). Another four persons said that the flying fish is no longer the most popular fish; with three persons suggesting that Dolphin fish and other steak fish are more popular.

Further evidence of the decline of the iconic nature of the flying fish is found in the fact that the uniquely Barbadian ways of preparing and cooking the fish are becoming a dying art. In the survey, 49% of the respondents had experience filleting flying fish in the traditional way, while 49% did not (two participants did not respond). The majority of persons within the 12-18 age category (i.e. 83%) did not have any experience filleting flying fish; and overall, twice as many females could fillet flying fish as males. Most of the persons who had deboned flying fish learnt the technique from their mothers (twenty-nine persons), and grandmothers (eleven persons). These findings could imply that the art of filleting flying fish is not being conscientiously transmitted to younger generations; and that for the most part, deboning fish is a female oriented activity. [Plate 5]

However, given consumer preference for ready-filleted flying fish, it is unlikely that this technique will be lost (at the commercial level) because of the high market demand. What is in greater jeopardy of being lost is the more traditional and unique ways of preparing the flying fish and the parts that are consumed. For instance, the art of 'buckled' flying fish is now all but lost. In this dish the fish is sliced in the middle on its underside (with the

Plate 5
Fillets of flying fish. Photo: Hazel Oxenford, 2012.

head and tailfin still attached), and then folded in half by tucking the tailfin into the fish's mouth. Another traditional delicacy was flying fish roe (eggs of the female and milts of the male). Since in the past most persons filleted the flying fish themselves, they usually retained the roes to either steam or fry. Furthermore, in years gone by virtually no part of the flying fish was wasted, and so persons were in the practice of frying the fish's spine (which was considered a delicacy) and also making a type of broth with flying fish heads known as fish head soup. Such meals are hardly heard of today. What has become increasingly popular is the flying fish cutter where the filleted fish is placed in a bun and garnished with lettuce and pepper sauce. The fillet is more appropriate for a cutter than the buckled fish which would have retained the bones.

4. Status of the Barbadian flying fish industry

Factors that are presently, or could in the near future, affect the sustainability of the Barbadian flying fish fishery, and by extension its continued presence as part of national cuisine and traditions are: (i) variability in the availability and abundance of the flying fish stock; (ii) the maritime boundary dispute with Trinidad and Tobago; (iii) pricing policies; and (iv) low human recruitment to the fishing industry.

4.1 Variability in the availability and abundance of the flying fish stock

Fanning and Oxenford (2008) reported that the eastern Caribbean flying fish stock experiences a relatively low rate of fishing mortality, and that the existing fishery appears to be sustainable. However, while historical records suggest that flying fish were once very plentiful in the waters of Barbados, there is no denying that over the past two decades Barbadian fishers have found it necessary to venture 230 km into the waters off Tobago to meet local demand (Blake and Campbell: 2007). Offering an explanation for the availability and shortages in the stock, Hazel Oxenford [5] and Chris Parker[6] stated that since flying fish are a short lived species, it is normal for the stock to show significant inter-annual variations because there is no population buffering (ie. older cohorts) to support abundance. The amount of stock which is harvested in one year is the generation for that year; if the older cohorts were to be depleted it would affect the entire population. This is why in some years the flying fish harvest is plentiful while in other years the catches are poor.

With regards to the abundance of the stock in Barbadian waters, Parker stated that it is not so much a matter of the fish not being available, but rather where they are at any particular point in time. As the eastern Caribbean flying fish stock is a migratory and shared resource, during certain periods of the year the stock can be found mostly in the waters of Tobago, and at other times it would span out to enter the waters of Barbados and the other south-eastern Caribbean islands. However, it has been observed that the stock tends to be most abundant in the waters of Tobago throughout the flying fish season, but not as abundant in Barbados' waters for that length of time.

As it relates to the possibility that Barbadian fishermen are overexploiting the stock, Oxenford stated that it is probable that competition among fishermen for the same part of a larger resource could lead to localised depletion at any particular time. Therefore, while the impact of Barbadian fishers on the entire eastern Caribbean flying fish stock may be minimal, it is possible that they could deplete the resource that is available around the island at a particular time. This has certainly happened at least once in the island's history where the white sea urchin, *Tripneustes ventricosus,* another Barbadian delicacy, was overharvested to the point that the species has struggled to survive in the island's waters. Even though there was a known closed season for this fishery, there was rampant poaching. This led to a series of moratoria as the Fisheries Division tried to allow the stock to rebuild. However, despite the fact that the season has not re-opened since 2005, the sea urchin stocks remain very low.

4.2 Maritime boundaries and the fisheries dispute between Barbados and Trinidad and Tobago

As previously stated, declines in availability and abundance of flying fish in Barbados' waters have been observed. With over 2,000 fishermen in the fishery (Fisheries Division: 2004), competition for a portion of the available resource no doubt becomes stiff. Some local fishers have therefore adopted the practice of venturing into Tobagonian waters to harvest the flying fish.

However, this practice has been met with stringent opposition by the Government of Trinidad and Tobago; and from as early as 1988, several Barbadian fishers have been arrested for illegally fishing in that country's Economic Exclusive Zone (EEZ) (Griffin: 2007; United Nations: 2008). As recently as November 2011, ten Barbadian fishers (on four fishing vessels) were apprehended, jailed and charged by the Tobagonian authorities for illegal fishing (*Daily Nation*: 2011; *NationNews*: 2011). The fact that Barbadian fishers are willing to risk the legal repercussions of fishing in Tobagonian waters gives some indication of the difficulty they face in harvesting flying fish in sufficient quantities to safeguard their livelihood and to ensure the continued presence of the flying fish on Barbadian tables.

The signing of the *Treaty on the Delimitation of the Marine and Submarine Areas* (1990) between Trinidad and Tobago and Venezuela could be viewed as the catalyst for the maritime boundary dispute between Trinidad and Tobago and Barbados. Barbados challenged the Treaty on the grounds that it appropriated to Trinidad and Tobago and Venezuela a significant portion of its and Guyana's maritime territory, as well as excluded parts of an area which had long been used by Barbadian fishers (Joseph: 2007).

After more than a decade of failed bilateral negotiations, in 2004 Barbados initiated dispute settlement procedures under Article 286, Annex VII of the United Nations *Convention on the Law of the Sea* (UNCLOS: 1982) over the failure to broker a fishing agreement (Kwiatkowska: 2007; Joseph: 2007). However, while the fisheries issue was central to the charge, Griffin (2007) alluded to other opportunistic motives which included control of potential hydrocarbon resources.

In the end, the Tribunal found that it had no jurisdiction to modify the delimitation line so as to allow Barbadian fishers access to the flying fish stocks in Trinidad and Tobago's EEZ. It was also determined that, Barbadian fishers had not traditionally fished in the area concerned, but had only fished there since the late 1970s; nor would a loss of access to the area in question catastrophically impact the livelihoods of the fishers or the economy of Barbados (Churchill: 2007; United Nations: 2008). Instead, Trinidad and Tobago was reminded of its obligation under UNCLOS Article 63(1) and the 1995 United Nations *Fish Stocks Agreement,* to negotiate in good faith a new fisheries' agreement with Barbados that would allow Barbadian fishers access to the fisheries within its EEZ to ensure the conservation and good management of straddling stocks (Churchill: 2007; Dundas: 2007; Kwiatkowska: 2007; Tanaka: 2006).

In her 2004 article entitled *Island's Icon Up in the Air,* Carol Williams pondered the wisdom of Barbadians choosing a wandering species for a national mascot. She noted that the dispute and the sanctions enforced by Trinidad and Tobago not only left many Barbadian fishers idle, but had also bruised the national pride. After all, they were obliged to depend on the imported catches of Tobagonian fishermen – many of whom were trained by Barbadians and yet sadly *don't know how to fillet* [flying fish] *properly.*' Indeed, Williams' question remains relevant as, to date, no fisheries agreement has been negotiated between the two countries.

4.3 Price controls and the profitability of the flying fish fishery

Another challenge which the flying fish fishery faces is the low price at which catches are sold – regardless of rising operational costs (e.g. higher fuel prices). Parker explained that the main reason why the price of fish has remained relatively constant since the development of fisheries in Barbados is the Government's desire to ensure that the price of fish remains affordable to consumers. The initial development of fisheries in Barbados came as a recommendation of the Moyne Commission[7] (1939) as a means by which the Government could facilitate food security. It was also with the onset of World War II that the Government instituted a system of price controls on fisheries.[8]

It was not until 1972 that the price control system was lifted. However, by this time Barbadians had grown accustomed to paying a very affordable price for flying fish and were opposed to spending more on it. Till today the custom of paying a lower price for fish, relative to other forms of meat, appears embedded in the psyche of Barbadians (C. Parker, pers. comm.). Not surprisingly, five survey respondents believed the flying fish should be the national fish because of its affordability.

4.4 Low recruitment into the flying fish fishery

Low recruitment was put forward as one of the potential issues that could affect the sustainability of the

Barbadian flying fish fishery. Oxenford noted that from her interactions with fishers, a key motivator behind their work is to ensure their children receive the best education so that they may pursue careers other than fishing. She therefore questions how many people will continue to choose fishing as a profession in the next thirty to fifty years.

However, Parker does not necessarily share this concern. He stated that a fishery consists of resource users, and if there are fewer persons in the fishery, it does not mean that it will cease to exist, simply that it will be smaller. The main effect of a smaller fishery would be a reduction in the quantity of flying fish available to consumers. He did concede, however, that in many instances people are drawn into the profession through familial ties. Moreover, the flying fish fishery is characterised as senescent (fishermen tend to be in older age groups). For those reasons, the level of recruitment into the fisheries may be an issue to be considered as it could impact the availability of fish as a food source.

It is the opinion of the fisherfolk themselves that fishing will remain a viable career in Barbados. A meeting was held with thirty fisherfolk on May 2nd 2010[9] in one of the primary fishing communities in Barbados, Conset Bay in the parish of St. John. It was convened by the Ministry of Environment to discuss the issues facing the fishery, and to identify a way forward for ensuring a sustainable community in the area. One of the critical concerns raised was the future of the fishing industry and whether young people were moving away from it and seeking careers elsewhere. A local fish processer and the then President of the Barbados National Union of Fisherfolk Organisations (BARNUFO), Ms. Vernell Nicholls, indicated that BARNUFO was working to train young people and encourage them to get involved in the fishing industry. She said that they needed to understand the extent of the career spin offs from the industry, including diving and underwater photography which were very lucrative.

A former BARNUFO president, Ms. Angela Watson, pointed out that fishing in Conset Bay was inherited from their forefathers. She said that *people naturally migrate to the sea. They were born with sea water in their blood*. She further pointed out that many of the fishermen present represented third and fourth generation fishermen and emphasised that there was no fear of the Conset Bay area not having fishers in the future. While the researchers have not questioned representatives of other fishing villages, the continued presence of fishing communities across the island suggest that the Conset Bay experience is not unique.

5. Projected effects of climate change on tropical pelagic fisheries

Climate change can impact on fisheries directly and indirectly, and can have both physical and biological impacts on marine species (Cochrane et al.: 2009). Nurse (2009, p.12) further stated that:

While there is a need for considerably more research especially at the species level, there already exists a good generic understanding of the potential impacts of climate change and climate variability on key factors and processes that influence recruitment, abundance, migration, and the spatial and temporal distribution of many fish stocks.

Warmer oceans and changing bio-geochemistry could cause species to change their distribution patterns, driving tropical species towards the colder waters of the poles (Clark: 2006; Cambers et al.: 2008; Cheung et al.: 2009). Barange and Perry (2009) suggest that the most rapid changes in fish communities will be witnessed in pelagic species (eg. flying fish) which will move to deeper depths to counteract surface warming. Such an exodus could lead to local extinctions (species ceasing to exist in an area, but existing elsewhere) and invasions (the expansion of a species into an area it did not previously occupy) (Cheung et al.: 2009). It is assumed that with warmer temperatures, fish populations at the pole-ward extents of their ranges will increase in abundance, whereas populations in the more equator-ward parts of their ranges (like Barbadian waters) will decline in abundance (Barange and Perry: 2009,p.8). Salinification of shallower parts of tropical and subtropical oceans (eg. the Atlantic) has been observed. The combined effect of changes in temperature and salinity are expected to affect primary and secondary productivity and the structure of marine communities (IPCC: 2007). Also, the total inorganic carbon content of oceans has increased. This can have implications for planktonic and benthic organisms which rely on calcium carbonate to build their skeletons (eg.

phytoplankton). Calcifying organisms are important components of pelagic food webs for species like the flying fish (Clark: 2006; Cambers et al.: 2008). In addition, climate change could alter the spawning and reproduction patterns of fish species (Barange and Perry: 2009).

Nurse (2009, p.16) has argued that any *objective assessment of small-scale fisheries in the Caribbean would conclude that exposure and sensitivity to the climate change threat are high, while adaptive capacity is low.* It is, however, the opinion of Oxenford and Parker that it is still too early to say whether any changes have occurred in the physiology or behaviour of the eastern Caribbean flying fish stock due to climate change, since the subject has not been extensively studied. Oxenford indicates that climate change is currently not a 'priority' concern for Barbadian fisheries' managers; while Parker asserts that it is a phenomenon which is gaining greater attention, and one which managers will have to consider as a possible explanation for environmentally-induced changes in local fisheries. It was highlighted that in recent years the Fisheries Division has observed changes in what is considered 'normal' weather and sea conditions (which could be attributed to climatic variability) that have impacted on the fishery. For example, 2005 was a year in which the region experienced a higher than usual number of tropical storms and hurricanes, comparably higher sea surface temperatures (SST), and a high occurrence of sediment loads in the water column (due to deforestation and heavy rainfall in South America). As a result, the decline in the abundance of flying fish observed in Tobagonian waters for that year was linked to those unfavourable conditions. Consequently, while the events in 2005 cannot conclusively be tied to climate change, it could be surmised that climatic changes can create abhorrent environmental conditions which can affect the abundance of flying fish stocks.

6. Strict guardians of our heritage?

Given the findings that segments of the Barbadian population are less convinced of the flying fish's appropriateness as a national icon, that some of the indigenous approaches to preparing and cooking the fish are dying, that the abundance of the species in local waters goes through periods of decline, that the dispute with Trinidad and Tobago remains unresolved, that the fishery is not as profitable as it could be, that fewer persons may be choosing fishing as a profession, and that climate change could potentially have a negative impact on the fishery, the question then becomes whether there are mechanisms in place to protect this historical representation of Barbadian identity. Sadly, there appear to be very few.

Currently, no single piece of legislation governs Barbadian culture and heritage. Instead, there are a few broad Acts and policies which protect particular components of the island's natural and cultural heritage. Of note is the Physical Development Plan 2003 which has as one of its goals *to maintain and conserve the cultural heritage of Barbados, including both the built heritage and areas of archaeological significance* (Government of Barbados: 2003). There is also the Preservation of Antiquities and Relics Bill (2011, pending) aimed at *the preservation of places, structures and relics or other objects of archaeological, historical and cultural interests* (Government of Barbados: 2011).

In terms of agents, Deane (2003) stated that some of the key players responsible for the island's natural and cultural heritage are:

- The Ministry of Education (interpreting UNESCO policy and guidelines)
- The Barbados National Commission for UNESCO
- The Ministry of Tourism and International Transport(developing strategies for sustainable cultural and heritage tourism)
- The Ministry of Foreign Affairs (interpreting the international nature of cultural heritage and membership for Barbados)
- The Ministry of Culture (formulating and implementing strategies leading to cultural development)
- The National Cultural Foundation (promoting and assisting cultural and creative activity, awareness and enterprise at the community, national and international level)
- The Archives Department (recorders and keepers of Barbados' oral, written, visual and audio history)
- The Barbados National Trust (historical preservation and protection)
- The Barbados Museum and Historical Society (principal custodian of Barbadian history and cultural artefacts) (Deane: 2003, pp.17-18).

To this list can be added the Natural Heritage Department (NHD) which executes the planning, promotion and implementation of projects related to the conservation of Barbados' natural heritage. (Natural Heritage Department: 2010)

However, interviews with representatives from the three key agencies charged with safeguarding the island's heritage revealed that the champions for the flying fish are few. For example, according to the representative[10] of the Division of Cultural Policy and Research, no direct steps have been taken to preserve cultural representations of the flying fish. However, the Division does consider the species to be an integral component of the island's history, folklore and cuisine.

The Director of the NHD[11] agrees that, given the island's strong cultural connection with its marine environment, the flying fish could be viewed as a key feature of Barbados' natural and cultural heritage. With this said, while the NHD considers the conservation of all species of plants and animals, they typically focus on those species that are most threatened and/or critically endangered. Therefore, as there is currently no scientific evidence to suggest that the flying fish might be threatened, the Department has not specifically included it in their conservation programmes.

The Barbados Museum and Historical Society[12] also sees the flying fish as an important component of Barbados' natural and cultural heritage. It was the only agency among those interviewed to have taken specific actions to address the iconic representation of the flying fish. For instance, the Museum has included a replica of the flying fish in their Natural History Gallery; and has showcased an exhibition of scientific drawings entitled *The New World: A Collection of Natural History Prints from the 16th Century to Today,* which included two prints of the flying fish. It has also documented the presence of flying fish bones in prehistoric archaeological sites on the island and maintains a natural history collection, as well as images and collections of artefacts relating to boatbuilding, fishing and related activities. [Plate 6]

The Museum's representative suggests that no single agency should be responsible for preserving the flying fish as a national icon, but rather it should be a collaborative effort between:

- The Fisheries Division - to ensure the sustainability of the flying fish fishery
- The Ministry of Education and the Barbados Museum and Historical Society - to educate the public about the heritage of the flying fish and
- The National Cultural Foundation and Ministry of Agriculture - to highlight the different ways in which the flying fish can be prepared and consumed.

One of the ways, however, that the traditions of the flying fish, and indeed the entire local fishing industry is being perpetuated is through the Oistins Fish Festival. Held annually over the Easter weekend, this festival was

Plate 6
Tinted engraving of flying fish, Stewart, 1843. Source: courtesy of the Barbados Museum and Historical Society.

Plate 7
Fish processor at Oistins fish market. Photo: Dr. Patrick McConney, Barbados, 2013.

started in 1967 to celebrate the founding of the Charter of Barbados, which was signed in the fishing village of Oistins. Among the activities at this event is the flying fish boning competition. Here, fish processors compete to see who could fillet flying fish the fastest. The Oistins Fish Festival attracts thousands of locals and visitors and is one way in which the significance of the flying fish continues to be showcased. [Plate 7]

7. Whither the flying fish?

In the field of heritage, emphasis is placed on safeguarding those 'outstanding' features of the past for the use and enjoyment of present and future generations. However, this emphasis tends to focus on the reverence and promotion of cultural traditions, or the built and natural environments, and not on individual plant or animal species. It is this general lack of precedent for understanding and recognising the importance and influence that species can have on the societies around them that has prompted an interest in the concept of bio-cultural heritage.

According to IIED (2011), bio-cultural heritage reflects the long-standing traditions, practices and knowledge derived from the interaction of native people and their natural environment, which is passed on to future generations, while Cocks (2006) and Persic and Martin (2008) have advocated broadening the concept to include modern societies. By these definitions therefore, the flying fish would constitute a feature of Barbados' bio-cultural heritage. The finding of flying fish remains at archaeological sites is indicative of its use by the island's prehistoric, indigenous groups. The relative accessibility of the species in significant quantities has meant that settlers of the island from the 17th century onwards continued the practice of harvesting and consuming the flying fish. Indeed, so vital and influential has the flying fish been to Barbados that different methods of preparing the fish have been developed; it became the national fish, it gave rise to local idioms like *as Bajan as flying fish*, it became the mascot for the island's tourism industry and most recently fishers have been willing to brave foreign, and potentially hostile, waters to harvest it. While the old traditional ways of preparing and cooking the fish are in decline, the fillet fish cutter has gained popularity.

The underpinnings of bio-cultural heritage, particularly those which look at the adaptability of a society to changing environments, can be seen in the development of the Barbadian flying fish fishery. Given the migratory nature of the fish and its varying availability in Barbados' waters, fishers have designed boats (dayboats and iceboats) that would allow them to travel further and to remain at sea for longer periods with their catches. They have also developed devices for attracting flying fish, *screelers,* made from local materials (dried sugar cane leaves or coconut boughs). In addition, the finding that the flying fish fishery is currently supporting sustainable yields, satisfies the IIED's (2011) condition that activities should be conducive to the sustainable use of the resource. [Plate 8]

Arguably, the social conditions of present day Barbados are drastically different from those of seventy years ago – when, at the onset of the 1937 riots, Barbadians were some

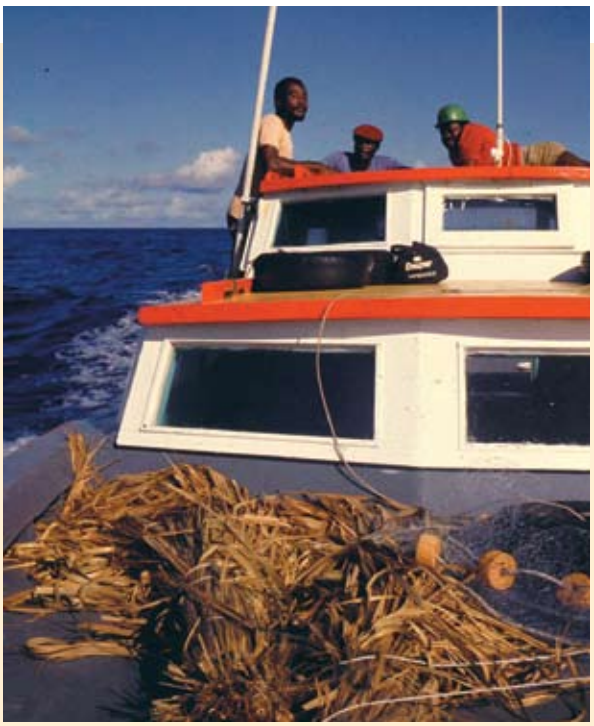


Plate 8
Boat with screelers and gill net. Photo: Hazel Oxenford, 2012.

the poorest and most disfranchised people of the Caribbean Commonwealth. Today, the island is one of the most economically and politically stable nations in the region, and therefore it would not be amiss if the society's tastes and values have changed. However, in the survey, the majority of the respondents (76%) believed that the flying fish should remain the national fish of Barbados, as this is one way of preserving the history, traditions and heritage of the island. For instance, one respondent stated that the flying fish is *a symbol we as Barbadians have grown to love and identify ourselves with. It is a reminder of the past and something to look forward to in the future.*

Alternatively, 16% of those surveyed felt that the flying fish should not be the national fish of Barbados. The main reasons for this were that Barbadian fishers were having to venture into Trinidad and Tobago's waters in order to harvest the fish, that the flying fish is no longer the most abundant species in Barbados' waters, and that dolphin fish and other forms of steak fish are now a more popular choice. One respondent also felt that because the *coat-of-arms* [features] *a dolphin fish... the national fish should reflect such symbols.*

From the survey it could therefore be concluded that, on the whole, the flying fish is still an integral feature of Barbados' bio-cultural heritage. However, the respondents are concerned about the ongoing dispute with Trinidad and Tobago and its potential impact on the availability of flying fish to local consumers – concerns which are not unfounded. In the five years since the arbitral ruling, no fisheries' agreement has been brokered between Barbados and Trinidad and Tobago.

The seasonal variability in the availability and abundance of the flying fish in Barbados' waters is likely to continue, for as Oxenford and Parker pointed out, fluctuating patterns of distribution and abundance are quite normal for a migratory species with the flying fish's type of life history. Unfortunately, it is this variability which has led some Barbadians to believe that the *flying fish is no longer the most abundant fish in Barbados' waters,* and as a consequence should not be the country's national fish. [Plate 9]

Plate 9
Flying fish sculpture at the Grantley Adams International Airport. Photo: Hazel Oxenford, 2012.

Although the persistently low prices at which fish catches are sold in Barbados are a concern for fishermen and fishery managers, it is the cheapness of flying fish, as compared to other proteins, which seems to have engendered the loyalty of Barbadians. In the survey, seven respondents stated that it was the *affordability of the flying fish* which both led to it being chosen as the national fish (fourth highest response) and the reason why it should remain so (sixth highest response). Therefore, while the price controls enforced by Government in the early developmental phases of the fishery are credited with contributing to its unprofitability, respondents suggested that price controls *should* be imposed on the fishery to ensure flying fish remains affordable and retains its status as a national icon.

While in the long-run low recruitment into the fishing industry could have implications for the amount of flying fish available to consumers, at present it does not appear to be hindering productivity. As indicated, flying fish is the most important catch for Barbadian fishers and accounts for about two-thirds of the total landings.

In terms of climate change, Clark (2006) and McConney et al. (2009) suggest that the uncertainties surrounding the phenomenon means that the possible implications for Barbados' small, pelagic fisheries are not yet a priority. It is generally accepted that the projected increase in SST could result in a change in the distribution of the eastern Caribbean flying fish stock, with the species migrating to cooler waters (Oxenford and Parker, interviews). This could eventually lead to the localised extinction of flying fish, thereby resulting in a loss to livelihood and requiring Barbados to import the fish from elsewhere to meet local demand.

So while the flying fish is still perceived to be an important feature of the island's heritage, that is not to say that there are not a few areas which could be improved upon in terms of safeguarding the intangible heritage and strengthening the cultural traditions. Creating more public awareness of the importance of the flying fish to Barbadian customs is imperative as it would appear that the island is in danger of losing some of the more traditional methods of preparing and consuming the flying fish. (K. Farmer, interview.)

To ensure Barbadians gain a greater appreciation of the cultural significance of the flying fish, and to preserve and promote its culinary and fishing traditions, a few strategies can be employed. These include:

- Educating the general public on the various emblems, insignia, and icons of Barbados, and the meanings or rationale attached to them.
- Raising public awareness of the flying fish at various cultural events and festivities (eg. the Oistins Fish Festival).
- Familiarising the general public with the biological status of the flying fish fishery, and highlighting some of the issues which it currently faces, or could face in the future (eg. unprofitable pricing structures and climate change).
- Introducing the technique of filleting flying fish and other traditional preparatory techniques into the school curriculum (ie. in Home Economics/Food and Nutrition).
- Engaging in research into the potential impact of climate change on the eastern Caribbean flying fish fishery, and the possible shift in the stock's distribution.

8. Further areas of research

Despite societal and cultural changes, the flying fish remains a prized feature of Barbados' bio-cultural heritage. Nevertheless, while the flying fish's status as a Barbadian icon does not appear to be in any immediate danger, outside of losing some of the more traditional culinary practices, there are still a few issues that should be considered if Barbados' is to remain the undisputed 'Land of the Flying fish':

- Since only 12% of the respondents felt that the flying fish was the best representative of Barbados' natural and cultural heritage, does this signify that its symbolism is waning?
- With higher prices, will Barbadians continue to consume the same quantity of flying fish?
- What are the long term implications of reduced recruitment to Barbadian fisheries?
- What arrangements will have to be made in order to facilitate the timely negotiation of a Barbados/Trinidad and Tobago fisheries agreement?
- How will climate change impact on the eastern Caribbean flying fish fishery?
- Can a species which has become scarce, or locally extinct, still be considered a national icon?

NOTES

1. A French clergyman, 1664-1738. *Source:* Smith, I., 1910. 'Jean-Baptiste Labat', *The Catholic Encyclopedia.* Robert Appleton Company, New York. http://www.newadvent.org/cathen/08718a.htm (accessed 24 November 2011).
2. Marshall, T., Barbados Community College – Historian, Lecturer. (August 26, 2011).
3. Watson, K.,- Historian. (September 26, 2011).
4. Also known as mahi-mahi.
5. Oxenford, H., Centre for Resource Management and Environmental Studies –Fisheries Biologist, Lecturer. (September 07, 2011).
6. Parker, C., The Fisheries Division – Fisheries Biologist. (September 12, 2011).
7. Formally known as the West India Royal Commission, the Moyne Commission was appointed in 1938 to investigate the root causes of the 1930s riots which swept through a number of the British Caribbean territories, including Barbados, in 1937.
8. See: Parker, C., 2003. *Developments in the flying fish fishery in Barbados.* FAO Corporate Document Repository.
9. Report of a Sustainable Fishing Roundtable Conset Bay, Barbados June 02, 2010. Ministry of Environment. Unpublished.
10. Johnson, S., Division of Cultural Policy and Research in the Ministry of Family, Culture, Sports and Youth – Senior Cultural Policy Officer. (September 23, 2011).
11. Devenish, S., Natural Heritage Department – Director. (September 27, 2011).
12. Farmer, K., Barbados Museum and Historical Society – Deputy Director. (Interview: September 28, 2011).

REFERENCES

- Barange, M. and Perry, R.I., 2009. 'Physical and ecological impacts of climate change relevant to marine and inland capture fisheries and aquaculture' in Cochrane, K., De Young, C., D. Soto, and T. Bahri, T. (eds.) *Climate change implications for fisheries and aquaculture: Overview of current scientific knowledge.* FAO Fisheries and Aquaculture Technical Paper No. 530. FAO, Rome, pp. 7-106.
- Blake, A. and Campbell, G.A., 2007. 'Conflict over flying fish: The dispute between Trinidad & Tobago and Barbados' in *Marine Policy* 31: pp. 327-335.
- Cambers, G., Claro, R., Juman, R. and Scott, S., 2008. *Climate change impacts on coastal and marine biodiversity in the insular Caribbean: Report of Working Group II, Climate Change and Biodiversity in the Insular Caribbean.* CANARI Technical Report No. 382. pp. 87 http://www.canari.org/CCBIC%20WG%20II%20-%20final.pdf (accessed 19 July 2011).
- Cheung, W.W.L., Lam, V.W.Y., Sarmiento, J.L., Kearney, K., Watson, R. and Pauly, D., 2009. 'Projecting global marine biodiversity impacts under climate change scenarios' in *Fish and Fisheries* 10: pp. 235-251.
- Churchill, R., 2007. 'Dispute settlement under the UN Convention on the Law of the Sea: Survey for 2006' in *International Journal of Marine and Coastal Law* 22(4): pp. 463-483.
- Clark, B.M. 2006. 'Climate change: A looming challenge for fisheries management in southern Africa' in *Marine Policy* 30: pp. 84-95.
- Cochrane, K., De Young, C., Soto, D. and Bahri, T. (eds.), 2009. *Climate change implications for fisheries and aquaculture: Overview of current scientific knowledge.* FAO Fisheries and Aquaculture Technical Paper No. 530. FAO, Rome.
- Cocks, M., 2006. 'Biocultural diversity: Moving beyond the realm of 'indigenous' and 'local' people' in *Human Ecology* 34(2): pp. 185-200.

- Daily Nation, 2011. *Held again – Four Barbadian fishermen to reappear before Tobago court* (29 November 2011), p. 40. The Nation Publishing Co. Ltd., Fontabelle, Barbados. p. 40.
- Deane, L.M., 2003. *Path to a heritage strategy for Barbados.* Ministry of Education and Youth Affairs.
- Drewett, P.L. and Oliver, J.R., 1997. 'Prehistoric settlements in the Caribbean' in *Archaeology International* 1: pp. 43-46.
- Dundas, C., 2007. 'Border and maritime issues'in Hall, K. and Sang, M.C.A., (eds) *Intervention, Border and Maritime Issues in CARICOM.* Ian Randle Publishers, Kingston, Jamaica: pp. 203-77.
- Fanning, L.P. and Oxenford, H.A., 2008. *Ecosystem issues pertaining to the flying fish fisheries of the eastern Caribbean.* Dalhousie University – Marine Affairs Program. http://marineaffairsprogram.dal.ca/Files/Fanning_Ecosystem_issues_pertaining_to_the_flying fish.doc (accessed 22 July 2011).
- Fishbase. 2010. *Hirundichthys affinis* (Gunter, 1866) – *Fourwing flying fish.* http://www.fishbase.org/summary/speciessummary.php?id=7457 (accessed 22 July 2011).
- Fisheries Division, 2004. *Barbados fisheries management plan 2004-2006: Schemes for the management of fisheries in the waters of Barbados.* Ministry of Agriculture and Rural Development, Barbados.
- Government of Barbados, 2003. *Physical Development Plan Amended 2003.* Bridgetown, Barbados.
- Government of Barbados, 2011. *Preservation of Antiquities and Relics Bill, 2011.* http://barbadosparliament.com/htmlarea/uploaded/File/Act/2011/Preservation%20of%20Antiquities%20and%20Relics%20Act,%202011.pdf (accessed 13 December 2011).
- Griffin, C., 2007. 'Friends versus interests: Strategic rationality in the Barbados-Trinidad and Tobago maritime dispute' in Hall, K. and Sang, M.C.A. (eds) *Intervention, Border and Maritime Issues* in CARICOM. Ian Randle Publishers, Kingston, Jamaica: pp. 185-202.
- IIED, 2011. *Bio-cultural heritage,* International Institute for Environment and Development. http://biocultural.iied.org/about/about-biocultural-heritage (accessed 6 July 2011).
- IPCC, 2007. *Climate change 2007: The physical science basis.* Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K.B., Tignor, M. and Miller, H.L. (eds.)]. Cambridge University Press, Cambridge, United Kingdom.
- Joseph, C., 2007. 'Border controversies and their implications for stability and security of the Caribbean community'in Hall, K. and Sang, M.C.A. (eds) in *Intervention, Border and Maritime Issues* in CARICOM. Ian Randle Publishers, Kingston, Jamaica: pp. 243-258.
- Kwiatkowska, B., 2007. 'The 2006 Barbados/Trinidad and Tobago Award: A landmark in compulsory jurisdiction and equitable maritime boundary delimitation' in *International Journal of Marine and Coastal Law* 22(1): pp. 7-60.
- Mahon, R., Khokiattiwong, S. and Oxenford, H.A.,2000. 'Selectivity of experimental gillnets for fourwing flying fish, *Hirundichthys affinis,* off Barbados' in *Environmental Biology of Fishes* 59: pp.459-463.
- McConney, P., Nurse, L. and P. James, P., 2009. *Impacts of climate change on small-scale fisheries in the Eastern Caribbean: a final report to IUCN.* CERMES Technical Report No 18. Centre for Resource Management and Environmental studies (CERMES), University of the West Indies, Cave Hill Campus, Barbados.
- Ministry of Education and Human Resource Development, 2010. *Independence resource booklet: The fishing industry – the sea around us.* The Media Resource Department, St. Michael, Barbados.
- NationNews, 2011. *Charged for fishing in Tobago* (27 November 2011). NationNews Barbados – Local, Regional and International News. http://www.nationnews.com/index.php/articles/view/charged-for-fishing-in-tobago/ (accessed 15 December 2011).
- Natural Heritage Department, 2010. *About the Natural Heritage Department. Ministry of Environment, Water Resources and Drainage.* Government of Barbados. http://heritage.gov.bb/about_nhd.html (accessed 22 July 2011).
- Nurse, L.A., 2009. 'Incorporating climate change projections into Caribbean fisheries management' in McConney, P., Nurse, L. and James, P. in *Impacts of Climate Change on Small-scale Fisheries in the Eastern Caribbean: a final report to IUCN.* CERMES Technical Report No 18. Centre for Resource Management and Environmental studies (CERMES), University of the West Indies, Cave Hill Campus, Barbados: pp. 12-21.
- Parker, C., 2003. *Developments in the flying fish fishery in Barbados.* FAO Corporate Document Repository. http://www.fao.org/DOCREP/005/Y3856E/y3856e0b.htm (accessed 22 July 2011).

- Persic, A. and Martin, G. (eds)., 2008. *Link between biological and cultural diversity – Concepts, methods and experiences*. Report of an International Workshop, UNESCO, Paris 2008. Imprimerie Watelet-Arbelot, Pantin, France. http://unesdoc.unesco.org/images/0015/001592/159255e.pdf (accessed 19 July 2011).
- Schomburgk, R.H., 1848. *The history of Barbados: Comprising a geographical and statistical description of the island; a sketch of the historical events since the settlement; and an account of its geology and natural productions. Longman, Brown, Green and Longmans,* Paternoster Row, London. http://www.archive.org/details/historybarbados00schogoog (accessed 13 August 2011).
- Skeete, M., 1988. 'Fashioning a cuisine the Bajan way' in: NCF, *Banja: A magazine of Barbadian life & culture,* Issue No. 2. National Cultural Foundation, West Terrace, St. James: pp. 25-27.
- Sobers, R.H., 2010. *Bioeconomic analysis of the flying fish fishery in Barbados*. The United Nations University – Fisheries Training Programme, Reykjavik, Iceland. pp. 41 http://www.caricom-fisheries.com/LinkClick.aspx?fileticket=Rdv3gTgePEw%3D&tabid=86 (accessed 25 July 2011).
- Tanaka, Y., 2006. 'Arbitral Tribunal Award, Annex VII LOSC Barbados v Trinidad and Tobago' in *International Journal of Marine and Coastal Law* 21(4): pp. 523-534.
- The Graphic., 1897. *The flying-fish industry of Barbados* (27 February 1897). p. 264.
- United Nations, 2008. 'Arbitration between Barbados and the Republic of Trinidad and Tobago, relating to the delimitation of the exclusive economic zone and the continental shelf between them, decision of 11 April 2006' *Reports of International Arbitral Awards,* Volume XXVII. United Nations, Office of Legal Affairs. p. 104. http://untreaty.un.org/cod/riaa/cases/vol_XXVII/147-251.pdf (accessed 18 August 2011).
- Williams, C.J., 2004. 'Island's icon up in the air' in *Los Angeles Times*. http://articles.latimes.com/2004/dec/13/world/fg-flying fish13 (accessed 22 July 2011).