Sub-Regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean

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Sub-Regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean

EXECUTIVE SUMMARY

The first draft of the Sub-regional fisheries management plan for flyingfish in the Eastern Caribbean (hereinafter referred to as the Draft Sub-regional FMP) was initiated in 2001 at the Second Meeting of the WECAFC Ad Hoc Working Group on Flyingfish in the Eastern Caribbean (FAO. 2002). Subsequently the WECAFC further developed and amended the plan in 2008 at the Third Meeting of the WECAFC Ad Hoc Flyingfish Working Group of the Eastern Caribbean (FAO. 2010). The 2008 version of the Sub-regional FMP has provided valuable guidance for the management and conservation of flyingfish resources in the Eastern Caribbean. Since 2008, a number of events have taken place that warrants an update of the 2008 management plan. These include the Ministerial Council's endorsement of a Common Fisheries Policy for CARICOM states, the establishment of a CRFM Ministerial Sub-committee on Flyingfish, the establishment of a joint CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean, along with scientific meetings and studies supported by the Caribbean Regional Fisheries Mechanism, WECAFC and the Global Environment Facility-funded Project on Sustainable Management of the Shared Living Marine Resources of the Caribbean Large Marine Ecosystem (CLME) and Adjacent Region.

Consequently, in 2012, the 2008 Draft Sub-regional FMP adopted at the Third Meeting of the WECAFC Ad Hoc Flyingfish Working Group of the Eastern Caribbean was amended at the First meeting of the CRFM/WECAFC Working Group on Flyingfish. The general management objectives underlying the update are: a) sustained flyingfish resources (biological objective), b) optimal use of the flyingfish resource for long-term benefits (socio-economic objective) and c) sustained ecosystem health (ecological objective).

Consistent with the participatory approach to fisheries management the Draft 2012 Sub-regional FMP was put forward for review by stakeholders at national and regional levels through consultative processes that included public hearings, public posting of management plans and comment periods in addition to reviews by national Fisheries Advisory Committees (FACs). Between August 2012 and March 2014 national stakeholder consultations were convened in Barbados, Grenada, St Lucia and Trinidad and Tobago. This recent 2014 update was informed by concerns and suggestions arising out of these consultations as well as further reviews of the 2012 version of the Sub-regional FMP by the CRFM/WECAFC Working Group at its Second and Third meetings held in June 2013 and March 2014 respectively.

Acknowledging the shortcomings in flyingfish data collection and analysis, as well as limitations in current national fisheries management frameworks and following the precautionary, ecosystem and participatory approaches to fisheries management, with the ultimate objective to safeguard the socio-economic well-being of the fishers, the flyingfish industry in the sub-region and the ecosystem that sustains the flyingfish fishery, the updated Sub-regional FMP proposes the following:

1. Development and implementation of national management plans for flyingfish fisheries, consistent with the sub-regional fisheries management plan, by the 2015/2016 flyingfish season, or as soon as is practically possible;
2. Annual reporting by States on progress made in development and implementation of national fisheries management plans and submission of data in an agreed, standardized format, to the respective Secretariats;
3. Establishment of an authorized national entry (license/permit) system for flyingfish fisheries, which enters into force for the flyingfish fisheries season 2015/2016, or as soon as is practically possible;
4. Conduct of an assessment to estimate stock abundance of flyingfish prior to any significant development in the fishery;
5. Adoption of a precautionary sub-regional total annual catch trigger point of 5000 tonnes;
6. Implementation of a precautionary sub-regional freeze on expansion of flyingfish fishing effort and/or fishing capacity applied to all authorised vessel types, should the agreed catch trigger point be realized, to be followed by reassessment of resource status and adaptive management;
7. Strengthen current national data collection systems to facilitate improved assessment and management of the resource as well as monitoring and evaluation of implementation of national and sub-regional fisheries management plans.

The updated Sub-regional FMP also recognizes that overall management of the flyingfish fisheries needs to be improved by taking the following actions:

1. improving and harmonizing data collection and analysis in the sub-region;
2. prioritising the development of a protocol on improving and harmonizing fisheries management legislation, to address specifically flyingfish vessel licensing and registration systems in the sub-region;
3. establishment of a sub-regional flyingfish catch and effort database[1] to be managed by the CRFM Secretariat;
4. establishment of a sub-regional flyingfish vessel registry database[2] to be managed by the CRFM Secretariat;
5. prioritising the development of a protocol on data and information sharing;
6. national monitoring of catch levels in real time, and timely reporting to the CRFM Secretariat;
7. formalizing the relationship between the CRFM and France to ensure France's involvement in the management process as far as the flyingfish fishery in the EEZs of its Departments in the region are concerned;
8. improved monitoring, control, surveillance and enforcement mechanisms for flyingfish fisheries and ending IUU fishing;
9. implementing national programmes to build stakeholder awareness on the management measures to be implemented and related legislation and enforcement measures;
10. institution of national training and public awareness programmes to strengthen fishers' participation in the management process;

[1] This database is envisioned as a component of a broader regional database pertaining to shared fisheries resources in the region.
[2] This database is envisioned along similar lines as above.

11. national reporting to the CRFM or WECAFC, whichever is relevant, so as to inform updates to resource assessments, proposed management measures and amendment of the sub-regional FMP; and
12. promotion of the principles and provisions enshrined in fisheries and related regional and international agreements to which countries are signatory.

This management approach demonstrates the commitment of the CRFM and the Eastern Caribbean sub-region towards the conservation of their common or shared fisheries resources and related ecosystems for the long term sustainability of the resources and socio-economic benefit of the people of the region.

This updated Sub-regional FMP further proposes a number of studies, which aim to: (i) generate information about the flyingfish industry that is needed to attract investments in sustainable harvesting and value-addition of flyingfish; (ii) further understand the health of the marine ecosystem, which supports the flyingfish fishery; and (iii) facilitate development of operational objectives, indicators and reference points, in consultation with stakeholders, so as to effectively monitor and evaluate implementation of the FMP at the national and regional levels, according to the agreed management priorities.

The updated Sub-regional FMP was endorsed by the Caribbean Fisheries Forum in April 2014 as well as the CRFM Ministerial Council in May 2014 and is now cleared for voluntary, regional implementation by CRFM Member States (the management resolution of the Ministerial Council is attached at Annex I). A consultative process will facilitate stakeholder involvement in all stages of implementation in CRFM Member States. Subsequent to the Ministerial Council's endorsement the amended draft will be submitted for endorsement at the level of WECAFC. It is anticipated that feedback will be provided to stakeholders on progress with the implementation of the plan, including information on catch and effort trends, number of licenses issued/renewed, results of stock assessments, industry performance evaluations. Thereafter, the management plan will be renewed or updated biennially, or as required, and inputs from stakeholders will be encouraged and given due regard.

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LIST OF ACRONYMS AND ABBREVIATIONS

CARICOM	Caribbean Community
CARICOM-IMPACS	Caribbean Community Implementation Agency for Crime and Security
CBD	Convention on Biological Diversity
CCCFP	Caribbean Community Common Fisheries Policy
CCRF	Code of Conduct for Responsible Fisheries
CFRAMP	CARICOM Fisheries Resource Assessment and Management Programme
CIA	Central Intelligence Agency
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLME	Caribbean Large Marine Ecosystem
CPUE	Catch Per Unit Effort
CRFM	Caribbean Regional Fisheries Mechanism
ECFFP	Eastern Caribbean Flyingfish Plan
EEZ	Exclusive Economic Zone
FAC	Fisheries Advisory Committee
FAD	Fish Aggregating Device
FAO	Food and Agriculture Organization of the United Nations
FMP	Fisheries Management Plan
HACCP	Hazard Analysis and Critical Control Points
IDRC	International Development Research Centre
ILO	International Labour Organization
ITCZ	Inter-tropical Convergence Zone
IUU	Illegal, Unreported and Unregulated fishing
LAPE	Lesser Antilles Pelagic Ecosystem
LOA	Letter of Agreement
MARPOL	International Convention on the Prevention of Marine Pollution from Ships
MCS	Monitoring, Control and Surveillance
MSY	Maximum Sustainable Yield
OECS	Organization of Eastern Caribbean States
SIDS	Small Islands Developing States
SPAW	Specially Protected Areas and Wildlife
UBN	Unsatisfied Basic Needs
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea

UNDP	United Nations Development Programme
USD	United States Dollar
UWI	University of the West Indies
WECAFC	Western Central Atlantic Fishery Commission
WSSD	World Summit on Sustainable Development
WTO	World Trade Organization

ACKNOWLEDGEMENTS

This sub-regional fisheries management plan for flyingfish in the eastern Caribbean is the first such plan to be developed and endorsed by the Ministerial Council of the Caribbean Regional Fisheries Mechanism for regional implementation with effect from June 2014. Truly a product of regional cooperation, collaboration and consultation, this version of the plan, has benefitted from the technical and financial inputs of several national and regional agencies and projects as well as individual consultants and interns to the Secretariat. In this regard, the CRFM Secretariat would like to express its gratitude to the following: the Western Central Atlantic Fishery Commission of the Food and Agriculture Organization of the United Nations; the Project – Sustainable Management of the Shared Living Marine Resources of the Caribbean Large Marine Ecosystem and Adjacent Regions funded by the Global Environment Facility; the Centre for Resource Management and Environmental Studies, University of the West Indies, Cave Hill Campus; the Caribbean Natural Resources Institute (CANARI); the Secretariat of the Organization of Eastern Caribbean States; the French Institute for Exploration of the Sea (IFREMER); the Ministries with responsibility for fisheries and for the environment in CRFM Member States and in particular the Fisheries Departments of Member States with a real interest in the flyingfish fishery; the WECAFC Ad-Hoc Working Group on Flyingfish in the Eastern Caribbean; the CRFM Small Coastal Pelagic Fish Working Group; the CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean; the Consultants Dr Hazel Oxenford; Dr Paul Medley, Dr Juan Carlos Seijo, Dr David Berry, Dr Uwe Tietze as well as Ms Keisha Sandy, Ms Loiza Rauzduel, Ms Neila Bobb-Prescott and Ms Celeste Chariandy of CANARI; Interns sponsored by the Canadian International Development Agency – Ms Elaine Ferrier and Ms Brooke Campbell. The Secretariat is also grateful for the inputs of the range of stakeholders both nationally and regionally which contributed to development and improvement of the plan. These stakeholders include fishers, representatives of fisherfolk associations, cooperatives and related-organizations, representatives of fish processors and related marketing agencies, other government agencies and non-governmental organizations in CRFM Member States as well as the Caribbean Network of Fisherfolk Organizations. The Secretariat also wishes to acknowledge the assistance of Ms Kemara Brackin, Graphic Artist, who designed the cover of the plan and Ms Pamela Gibson, of the Secretariat's eastern Caribbean office who formatted the document for publication.

1. PREFACE

This Sub-regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean represents the outcome of an extensive research process, which started in the late 1990s and involved numerous scientific studies, stock assessments, workshops and meetings.

The plan is the first management plan prepared that is consistent with the Draft Agreement on the Establishment of the Caribbean Community Common Fisheries Policy (CCCFP). The CCCFP has as one of its objectives to develop harmonized measures and operating procedures for sustainable fisheries management, post-harvest practices, fisheries research and fisheries trade and the administration of the fishing industry. The agreement is guided by the principle of applying internationally recognized standards and approaches, in particular the precautionary, ecosystem and participatory approaches to fisheries management.

The development and implementation of this sub-regional plan is among the agreed actions and measures to be taken by the members of the Western Central Atlantic Fishery Commission (WECAFC) under its 2012 "Resolution on strengthening the implementation of international fisheries instruments" and under its endorsed Programme of Work. Moreover, the plan addresses joint actions proposed in the 2010 Castries (St. Lucia) Declaration on Illegal, Unreported and Unregulated Fishing of the Caribbean Regional Fisheries Mechanism (CRFM).

A regionally coordinated scientific evaluation in 2008, using data, expertise and inputs from the Fisheries Divisions in Barbados, Dominica, Grenada, Martinique (France), Saint Lucia, Saint Vincent and the Grenadines and Trinidad and Tobago, as presented to the WECAFC, CRFM and to the Caribbean Large Marine Ecosystem (CLME) Project, indicate that the stock of flyingfish in the Eastern Caribbean is not overfished with respect to the objective of maximum sustainable yield. However, in view of significant gaps in data and information, especially highlighted by stakeholders, a precautionary approach is warranted. It is therefore appropriate to establish a multi-annual sub-regional plan with the objective of ensuring that the stock will be exploited under sustainable biological, economic, environmental and social conditions.

For this purpose, the sub-regional plan should aim at progressive implementation of an ecosystem-based approach to management of the flyingfish resource, and should contribute to efficient fishing activities within an economically viable and competitive small-scale fisheries sector, providing a fair standard of living[3] for those who depend on fishing flyingfish and taking the interests of consumers into account.

This Sub-regional Management Plan is not a legally binding instrument, which can form the basis of a legal challenge. The Sub-regional plan can be modified at any time and does not restrict the national authorities' discretionary powers set out in the national Fisheries Acts of the

[3] A fair standard of living pertains to the satisfaction of basic needs related to dwelling quality, access to services, education and economic capacity (CRFM, 2012c)

participating states. The national authorities can, for reasons of conservation or for any other valid reasons, propose modifications to any provision of this plan.

In order to ensure compliance with this sub-regional management plan, the participating states are requested to adhere to (at least) the following articles of the CCCFP:

- Article 12: Conservation and Management of Fisheries Resources
- Article 13: Registration and Licensing
- Article 14: Inspection, Enforcement and Sanctions

2. MISSION

This Sub-regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean aims to assist the flyingfish stakeholders to implement an ecosystem approach to fisheries management, and to contribute to efficient fishing activities of the flyingfish resource within an economically viable and competitive small-scale fisheries sector[4], providing a fair standard of living for those who depend on fishing flyingfish and taking the interests of consumers into account.

3. GUIDING PRINCIPLES AND VISION FOR THE FUTURE

This flyingfish management plan is guided by:

A. The principles as set out in the 1995 FAO Code of Conduct for Responsible Fisheries (CCRF), and particularly Article 6 of the Code on Fisheries Management.

B. The fundamental principles of the Draft Caribbean Community Common Fisheries Policy (CCCFP), as outlined in Article 5 of the Agreement establishing the CCCFP, which include many that have been adopted from the CCRF:

   (a) use of the best available scientific information in fisheries management decision-making, taking into consideration traditional knowledge concerning the resources and their habitats as well as environmental, economic and social factors;
   (b) application of internationally-recognized standards and approaches, in particular the precautionary approach to fisheries management and the ecosystem approach to fisheries management;
   (c) the principle that the level of fishing effort should not exceed that

[4] "Small-scale fisheries" are *"fisheries involving individuals, households, small fishing companies, or fisherfolk organizations using relatively small, unsophisticated fishing vessels, if any, under 20 m LOA, powered by engines not exceeding 300 hp, operating relatively close to shore, and producing fish for local consumption and/or for export" (Haughton, 2005)*

commensurate with the sustainable use of fisheries resources;

(d) the participatory approach, including consideration of the particular rights and special needs of traditional, subsistence, artisanal and small-scale fishers;

(e) principles of good governance, accountability and transparency, including the equitable allocation of rights, obligations, responsibilities and benefits; and

(f) the principle of subsidiarity, in particular, that the Competent Agency will only perform those tasks which cannot be more effectively achieved by individual Participating Parties.

C. Recognition that National Authorities responsible for fisheries management in the participating states carry the main responsibility for implementing this sub-regional management plan within their national jurisdictions and for monitoring and evaluating the status of implementation against the objectives and indicators agreed upon.

The vision for the flyingfish fisheries is an effective cooperation and collaboration among participating states in the conservation, management and sustainable utilization of the flyingfish resource and related ecosystem in the Eastern Caribbean region in order to secure the optimal benefits from those resources for the people and for the Caribbean region as a whole. This vision is consistent with that of the Draft Caribbean Community Common Fisheries Policy.

4. GEOGRAPHY OF THE REGION

4.1 Physical Geography

Hydrography, currents and bathymetry:

The eastern Caribbean is characterised by a series of volcanic islands forming the Lesser Antilles island arc. This includes Grenada, St. Vincent and the Grenadines, St. Lucia, Martinique and Dominica. These islands typically have high relief and very limited island shelf area. There is a deep (6000 m) trough to the east of the islands, known as the Tobago Trough. Barbados, which is not volcanic, sits to the east of this trough on sedimentary material, has low relief, is capped by coral limestone and also has very limited shelf area. Trinidad and Tobago on the other hand is located on a relatively wide continental shelf associated with the South American mainland (see Table 1 for estimates of shelf area).

Circulation patterns in the Caribbean are complex and governed by fresh-water runoff, topography, sea-surface temperature, wind stress and primarily by the North Equatorial Current. Atlantic water enters the Caribbean through the passages between the eastern Caribbean islands, forming the westward flowing Caribbean Current (see Figure 1). Atlantic water also flows north westwards up the island chain, via the Antilles Current. These two currents ultimately converge to form the Gulf Stream. However, the relative strengths of the currents, and thus the water

supplying the North Equatorial Current, vary seasonally, as a result of the annual displacement of the Inter-tropical Convergence Zone (ITCZ). The ITCZ moves northwards to about 10°N by August-September and southwards to just south of the equator by January-March.

During summer through winter the North Equatorial Current is supplied by oligotropic (low nutrient) oceanic waters of the North Atlantic. However from around February to June, when the North Equatorial Counter-current weakens, the Guiana Current, flowing north-westwards along the South American mainland and fed by the South Atlantic Equatorial Current, brings eutrophic (high nutrient) waters influenced by the outflow of the Amazon and Orinoco Rivers to join the North Equatorial Current and enter the Caribbean via the eastern Caribbean island passages. As such the source and the primary productivity of the waters around the eastern Caribbean are variable with season.

Table 1. Country profiles for the eastern Caribbean providing basic statistics for geography, governance, demography, and economy. Primary data source: CIA (2009 & 2014) The World Factbook. Other data sources include: [1] Mahon (1993); [2] International Labour Organisation Caribbean Office (2009) @ www.ilocarib.org.tt/portal/index.php; [3] FAO (1993) Status of Caribbean Aquaculture; [4] FAO (2008) Yearbook; [5] Barbados 2010 Population and Housing Census; [6] Barbados 2012 Social and Economic Report.

Geography	**Barbados**	**Dominica**	**Grenada**	**Martinique**	**St. Lucia**	**St. Vincent & Grenadines**	**Trinidad & Tobago**
Location	13°10'N 59°35'W	15°25N 61°20'W	12°07 N 61°40W	14°30'N 61°00'W	13°53N60°58W	13°15'N 61°12'W	10°39'N 61°31'W
Land area (km^2)	432	754 751	344	1,100	616	389	5,128
Coastline (km)	92	148	121	350	158	84	362
Shelf area (km^2)[1]	320	303	1,595	1,013	522	1,800	?
Approx. EEZ area (km^2)[1]	48,800	10,200	7,700	13,000	4,700	9,500	80,000
Maritime claims (nmi)	EEZ 200 Territorial sea 12	EEZ 200 Contig. zone 24 Territorial sea 12	EEZ 200 Territorial sea 12	EEZ 200 Territorial sea 12	EEZ 200 Contig. Zone 24 Territorial sea 12	EEZ 200 Contig. Zone 24 Territorial sea 12	EEZ 200 Contig. Zone 24 Territorial sea 12
Climate (rainy season)	Tropical (June-October)	Tropical (June-October)	Tropical (June-October)	Tropical (June-October)	Tropical (May-August)	Tropical (May-December)	Tropical (June-December)
Terrain	Coralline and relatively flat	Volcanic and mountainous	Volcanic and mountainous	Volcanic and mountainous	Volcanic and mountainous	Volcanic and mountainous	Plains and low mountains
Elevation (m)	337	1,447	840	1,397	950	1,234	940
Governance							
Type	Parliamentary democracy, Independent Sovereign State in Commonwealth	Parliamentary democracy, Republic in Commonwealth	Parliamentary democracy, Independent Sovereign State in Commonwealth	Parliamentary democracy Overseas department of France	Parliamentary democracy, Independent Sovereign State in Commonwealth	Parliamentary democracy, Independent Sovereign State in Commonwealth	Parliamentary democracy
Capital	Bridgetown	Roseau	St. George's	Fort de France	Castries	Kingstown	Port of Spain
Administrative divisions	11 parishes	10 parishes	6 parishes, 1 dependency	0	11 quarters	6 parishes	9 regions, 3 boroughs, 1 ward, 2 cities

Geography	**Barbados**	**Dominica**	**Grenada**	**Martinique**	**St. Lucia**	**St. Vincent & Grenadines**	**Trinidad & Tobago**
Independence	30 Nov. 1966	3 Nov. 1978	7 Feb. 1974	None	22 Feb. 1979	27 Oct. 1979	31 Aug. 1962
Constitution	30 Nov. 1966	3 Nov. 1978	19 Dec. 1973	28 Sept. 1958	22 Feb. 1979	27 Oct. 1979	1 Aug. 1976
Legal system	English common law	English common law	English common law	French legal system	English common law	English common law	English common law
Demography	Barbados * 2010 Population and Housing census ** (2012 Social and Economic Report)	Dominica	Grenada	Martinique	St. Lucia	St. Vincent & Grenadines	Trinidad & Tobago
Population (year)	277,821 (2010 est.)*	73,449 (2014 est.)	110,152 (2014 est)	425,966 (2003 est.)	163,362 (2014 est.)	102,918 (2014 est.)	1,223,916 (2014 est.)
Population growth (annual %)	+0.33 (2010 est)*	0.22 (2014 est.)	0.5 (2014 est)	0.85 (2003)	0.35 (2014 est.)	-0.29 (2014 est.)	-0.11 (2014 est.)
Language	English	English French patois	English	French Creole patois	English French patois	English	English Hindi, French, Spanish, Chinese
Literacy (% over 15 yr)	99.7	94	96	93	90.1	96	98.8
Ethnicity	black 92.4%** mixed 3.1% white 2.7% Asian and Middle Eastern 1.7%	black 86.8% mixed 8.9% Amerindian 2.9% white 0.8%	black 82% mixed 18% Amerindian (trace)	black/mixed 90% white 5% others <5%	black 85.3% mixed 10.9% East Indian 2.-2% other 1.7%	black 66% mixed 19% East Indian 6% Amerindian 2% European 4% other 3%	black 34.2% Indian 35.4% Mixed-other 15.3% other 1.3% mixed African/East Indian 7.7% unspecified 6.2%
Labour force2 Male2 Female2 Fishers3 Other fishery related3	141,700 (2012)** 72,800** 68,900** 2,200 3,800	33,420 (1997) 18,120 15,300 1,500 (1983) ?	41,015 (1998) 23,171 17,844 1,500 (1991) 120	126,900 (2008) 62,500 64,400 ? ?	62,265 (2004) 34,838 27,428 2,500 (1983) ?	58,000 (2008 est.) 35,000 24,000 2,000 (1983) 2,500	621,000 (2013)

Geography	Barbados	Dominica	Grenada	Martinique	St. Lucia	St. Vincent & Grenadines	Trinidad & Tobago
Unemployment rate2 (%) Males2 Females2	11.6 (2012)** 10.9** 12.3**	11.0 (2001) 11.9 9.5	? ? ?	21.5(2008) 19.0 23.8	21 (2004) 17.5 25	22 (1997) ? ?	5.9 (2013)
Annual per capita fish consumption (kg) 4 (Average 2003-2005)	36.5	30.2	38.1	15.4	36.3	15.0	16.9
Economy							
Currency (exchange US$) (equivalency to 1 US$)	Barbados dollar (2 fixed)	Eastern Caribbean dollar (2.7 fixed)	Eastern Caribbean dollar (2.7 fixed)	Euro (0.68 floating)	Eastern Caribbean dollar (2.7 fixed)	Eastern Caribbean dollar (2.7 fixed)	Trinidad & Tobago dollar (6.29 floating)
GDP (purchasing power parity in billions US $)	7.056 (2012 est.)	1.015 (2013 est.)	1.458 (2013 est)	11.250 (2006)[2]	2.216 (2013 est.)	1.325 (2013 est.)	27.14 (2013 est.)
Per capita GDP (purchasing power parity in US $)	19,100 (2008 est.)	14,300 (2013 est.)	13,800 (2013 est.)	28,014 (2006)[2]	13,100 (2013 est.)	12,100 (2013 est.)	20,300 (2013 est.)
External debt (millions US $)[2]	4,490 (2013 est.)	274.9 (2010 est.)	538 (2010 est.	?	446.4 (2013 est.)	255.3 (2013)	4,823 (2013 est.)
Main sectors (% GDP)	Agriculture (including fish): 3.1 industry: 13.9% services: 83% (2013 est.)	agriculture/fish (15.7) ind. /commerce (15.6) services (68.7) (2013 est.)	services/tourism (78.5) light industry (15.8) agriculture/fish (5.6) (2013 est.)	services/tourism (83) industry (11) agriculture/fish (5) (1997)	services (79.5 industry (17.4) agriculture/fish (3.1) (2013 est.)	services (74.4) agriculture/fish (5.4) industry (20.3) (2013 est.)	services (42) industry (57.7) agriculture/fish (0.3) (2013 est.)

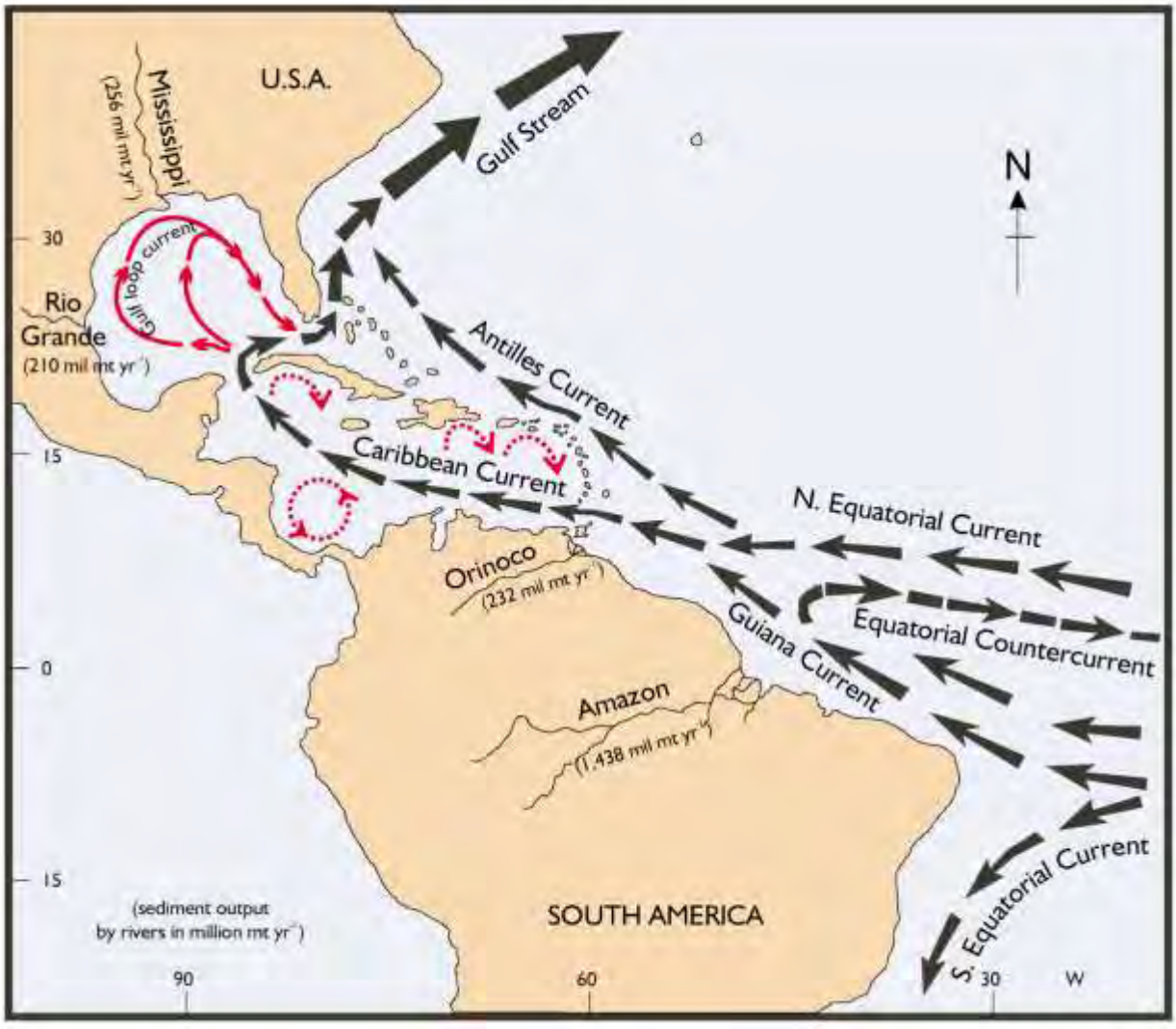

Figure 1. Major surface currents and river outflows affecting the wider Caribbean. Adapted from Oxenford (1985)

The influence of South American river outflow on the eastern Caribbean varies seasonally and among islands. Trinidad is heavily influenced by Orinoco outflow all year round. Tobago, Grenada and the Grenadine Islands are influenced by the Orinoco outflow to a lesser extent, and seasonally during the rainy period. The other eastern Caribbean islands are not usually affected by this water mass. However, Amazon water which sheds from the coast of Brazil in meso-scale eddies between October and March, is brought into the Caribbean via the Guiana Current, and tends to influence the eastern Caribbean islands as far north as St. Lucia. These approximate boundaries of influence are illustrated in the diagrammatic map (Mahon 1996; Figure 2).

Mesoscale current patterns in the eastern Caribbean are also extremely complex but not well documented. A series of mesoscale eddies, which eventually shed, are formed downstream of the

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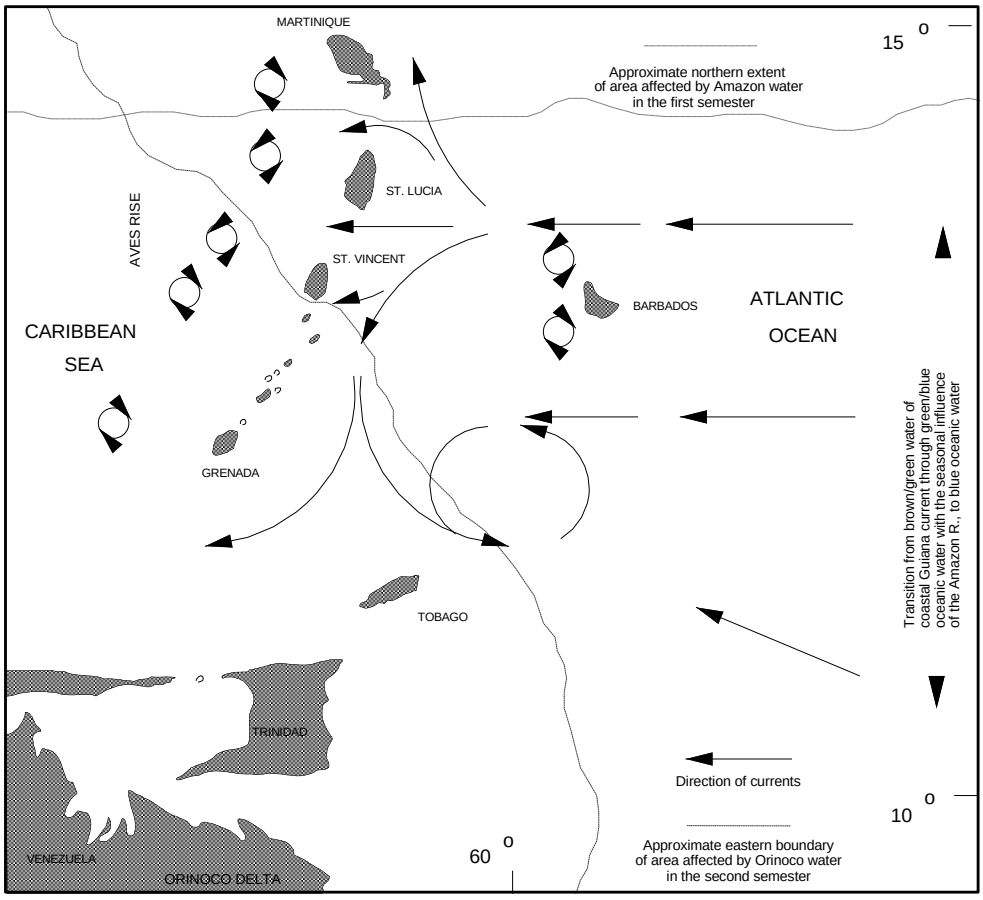

Figure 2. A synthesis of physical oceanographic characteristics of possible significance to fisheries in the eastern Caribbean. From Mahon (1996)FIGURE 7

Climate and weather:

The eastern Caribbean has a typical tropical maritime climate with relatively constant air temperatures throughout the year, and a diurnal range of between 24 and 34°C. The climate of the region does however have a seasonal cycle dominated by the displacement of the ITCZ. When the ITCZ is displaced to the south (December-April), the region is influenced by strong steady NE Trade winds, clear sky, low rainfall, high atmospheric pressure and strong surface water currents. When the ITCZ is displaced to the north (June-October) the region is influenced by low wind speed, high cloud cover, high rainfall, low atmospheric pressure and low current speeds. It is during this time that the region is also affected by tropical storms/hurricanes. Tropical storms generally follow the path of the major surface currents of the Caribbean and Gulf Stream System after spawning in the central Atlantic. Most tropical storms develop during the summer, when surface water temperatures are highest, with September being the month of greatest activity.

Hurricanes generate coastal sea level rise as high as 6 m, and storm waves that in coastal areas may have wave heights as great as 15 m at the time of breaking (Maul 1993).

4.2 Political Geography

The eastern Caribbean (Lesser Antilles) sub-region is one of the most compact multinational archipelagos in the world. The eastern Caribbean flyingfish (*Hirundichthys affinis*) stock is shared by seven different states (Barbados, Dominica, Grenada, Martinique (France), St. Lucia, St. Vincent and the Grenadines, Trinidad and Tobago), each with a national democratic government (see Table 1 for details of governance). With the exception of Martinique, which remains a department of France, the other islands are all independent, most belonging to the commonwealth (Table 1). Furthermore, membership to regional and international organisations with responsibility for fisheries management and development in the wider Caribbean varies amongst the countries or states (Table 2).

All of the eastern Caribbean countries have declared 200 nmi EEZs, although most boundaries between some neighbouring countries are still to be negotiated. Grenada, St. Vincent and the Grenadines, and Trinidad and Tobago have also been granted Archipelagic Status under UNCLOS (Figure 3.)

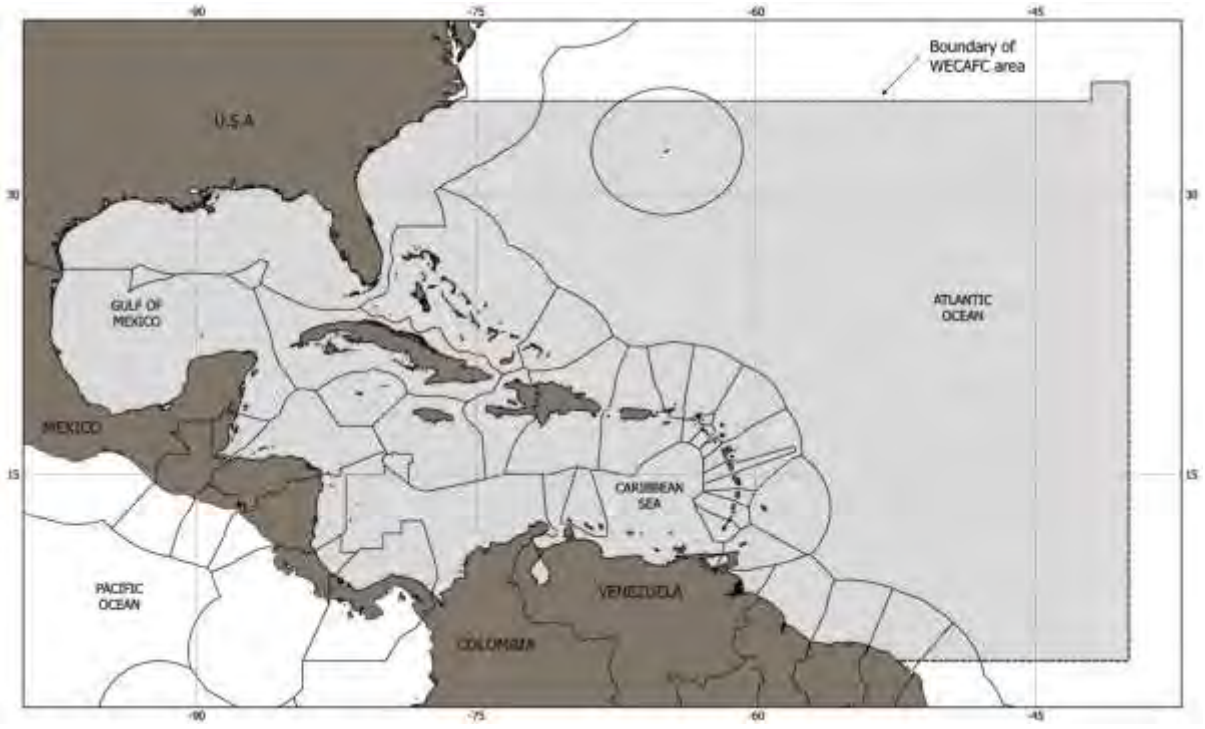

Figure 3. Map of wider Caribbean showing potential EEZs (VLIZ, 2012) (Note that not all countries have accepted the proposed boundaries)

4.3 Demography and Economy

The states of the eastern Caribbean are diverse in their demographic and economic characteristics as illustrated by the summary of key demographic indicators given in Table 1.

Table 2. Membership of countries in the eastern Caribbean to regional and international organisations with responsibility for fisheries management and development.

Country	ACS	WECAFC	CARIFORUM	CARICOM	CRFM	OECS	ICCAT
Barbados	Y	Y	Y	Y	Y	N	Y
Dominica	Y	Y	Y	Y	Y	Y	N
Grenada	Y	Y	Y	Y	Y	Y	N
Martinique (Department of France)	Y	Y	N	N	N	N	Y
St. Lucia	Y	Y	Y	Y	Y	Y	N
St. Vincent & Grenadines	Y	Y	Y	Y	Y	Y	Y
Trinidad & Tobago	Y	Y	Y	Y	Y	N	Y

5. BIOLOGY AND ECOLOGY

Most of the information presented in this section is drawn from the research conducted by the IDRC/UWI/McGill University Eastern Caribbean Flyingfish Project (ECFFP) (1987-1993) in collaboration with the Eastern Caribbean Fishery Departments of Barbados, Dominica, Grenada, Martinique, St. Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago. Subsequent postgraduate research at the University of the West Indies has further informed the genetic population structure of the four-wing flyingfish in the central western Atlantic. This body of research is widely published in the scientific literature, but appears under one cover with synopses of the biological characteristics and management options for the four-wing flyingfish in Oxenford *et al.* (2007a).

Other substantive ECFFP documents include the Proceedings of the Project Development Workshop in 1985 (Mahon *et al.* 1986); and the OECS Fishery Report 9 (Oxenford *et al.* 1993) which contains the Proceedings of the Interim and Final Project Workshops of 1987 and 1992, the two Flyingfish Research Cruise Reports of 1988 and 1989, and the six project News Bulletins published from May 1987 – Jan 1991.

Other research efforts that have focused on the biology and assessment of the eastern Caribbean four-wing flyingfish include some early studies by Hall (1955), Lewis *et al.* (1962) and Storey (1983), a preliminary stock assessment for the flyingfish fishery of Tobago conducted in 1991 under a

UNDP/FAO Project for the Establishment of Data Collection Systems and Assessment of the Fisheries Resources (Samlalsingh and Pandohee 1992) and various review papers and national reports produced under the Small Coastal Pelagics and Flyingfish Sub-project of the CARICOM Fisheries Resource Assessment and Management Program (CFRAMP) (e.g. CFRAMP 1996) and the WECAFC ad hoc flyingfish working group of the eastern Caribbean (FAO 1999, 2002, 2010).

5.1 Description and Distribution of the Species

Although around 13 species of flyingfish (Exocoetidae) occur in the eastern Caribbean region, only three species (*Hirundichthys affinis*, *Cypselurus cyanopterus* and *Parexocoetus brachypterus*) are known to be exploited. However, the target species of the offshore flyingfish fisheries of the eastern Caribbean (accounting for ~ 99% of all flyingfish landed) is the four-wing flyingfish (*Hirundichthys affinis*). *H. affinis* is a relatively small (maximum length around 25 cm standard length (SL), mean size taken by the fisheries is around 20-22 cm SL) epipelagic species, distributed throughout the western tropical Atlantic (Figure 4) where it supports important commercial fisheries seasonally in the eastern Caribbean, Curaçao and off northeast Brazil (Parin 2002). *H. affinis* is also reported from the eastern tropical Atlantic (Parin 2002).

H. affinis is seasonally available to the fishing gear (November to July), and is patchily distributed across the eastern Caribbean. A tagging study has demonstrated that individuals move freely between islands of the eastern Caribbean (Oxenford 1994). Results from a flyingfish abundance survey cruise conducted in the eastern Caribbean in 1988 suggest that *H. affinis* is likely to be available in commercially viable quantities beyond the present range of local fishing fleets (Oxenford *et al*. 1995).

Figure 4. Distribution of the four-wing flyingfish, *Hirundichthys affinis,* in the Western Central Atlantic, after Parin (2002).

5.2 Age, Growth and Longevity

H. affinis is a short-lived, essentially annual species with a maximum age of around 18 months (Campana *et al*. 1993). *H. affinis* grows relatively fast when immature, reaching around 19 cm fork length (FL) in the first six months. Thereafter growth rate is slow, with fish reaching around 22.5 cm FL at age one year and a maximum size of around 23 cm FL at 18 months (Oxenford *et al*. 1994).

Direct aging through counting daily growth checks is relatively straightforward in juvenile specimens (up to 150 days) and has been validated through laboratory rearing (Oxenford *et al.* 1994), but becomes problematic as growth rate slows down markedly as fish mature. Confirmation of longevity required radio-chemical dating of adult otolith cores (Campana *et al.* 1993).

Best estimates of standard von Bertalanffy growth parameters for *H. affinis* based on validated size-at-age and longevity data are: L_4 = 24.5 cm FL, k = 0.01 (daily basis), t_o = 2.85 days (Oxenford *et al.* 1994)[5] [6].

5.3 Reproductive characteristics

H. affinis may reach first maturity as small as 18.0 cm FL (around 5 months of age). The majority of fish are mature by 20.3 cm FL (around 7 months of age) (Storey 1983, Khokiattiwong *et al.* 2000)[7]. They have relatively high gonosomatic indices (GSI values of around 11.5% for females and 6.5% for males) and are batch spawners, with females laying around 7,000 relatively large eggs per batch (Storey 1983, Khokiattiwong *et al.* 2000). Individual fish are believed to spawn several times within the November to July spawning season. Furthermore, there appear to be two peaks in spawning activity during the spawning season, with a minor peak from November to January and a major one in April / May. This tends to be reflected in higher catches by the commercial fisheries at these times, and results from the fact that the fishing gear and methods target spawning fish (Hunte *et al.* 2007).

Eggs are non-buoyant and highly adhesive, and are spawned on floating materials including natural flotsam, and the FADs and gillnets used to catch adult flyingfish. The scarcity of flotsam in the eastern Caribbean may be constraining flyingfish population size, or flyingfish may alternatively be using submerged spawning substrates. This issue needs further investigation and may reveal preferred spawning areas for this species (Hunte *et al.* 2007).

5.4 Mortality

The average life span for *H. affinis* is around one year (maximum 18 months), so mortality rates must be high.

Several crude estimates are available for instantaneous natural mortality (M) on an annual basis, using empirical formulae after Pauly (1980) and Alagaraja (1984) (e.g. M = 4.4, Oxenford *et al.* 1993, Oxenford *et al.* 2007b; M = 1.8 to 3.1, Samlalsingh and Pandohee 1992), which translate to actual natural mortality rates of somewhere between 83.5% and 98.8% of the population dying per year.

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[5] These estimates were adjusted slightly by Oxenford *et al.* (2007) to give values (L_4 = 23.2 cm FL, k = 0.01, t_o = 4 days)

[6] Alternative estimates are available for Tobago caught flyingfish (L_4 = 25.7 cm FL, k = 0.141 (daily basis), t_o = -18.6 days) based on unvalidated size-at-age for 20 specimens (Samlalsingh and Pandohee 1992)

[7] These estimates are loosely corroborated by Samlalsingh and Pandohee (1992) reporting a wide size range for first maturity of between 10.3 – 17.5 cm FL or 2.9 – 7.2 months).

A crude catch curve estimate of instantaneous total mortality (Z = 5.8) on an annual basis is reported by Samlalsingh and Pandohee (1992), translating to an actual mortality of 99.7% of the population per year. This parameter is equivalent to the production/biomass ratio and was used in the trophic model of the Lesser Antilles pelagic ecosystem by Mohammed *et al*. (2008), although they recognised that the value was very high and probably represented a combination of both mortality and migration.

A crude estimate of the instantaneous fishing mortality (F = 3.3) on an annual basis is also given by Samlalsingh and Pandohee (1992) using Z = M + F. Again they recognise that this is probably a significant over-estimate.

5.5 Recruitment

H. affinis becomes vulnerable (recruits) to the commercial fishing gear (gillnets and dipnets) at first sexual maturity (from around age 5 months, i.e. about 18.0 cm FL). The population is considered fully vulnerable at age 7 months (20.3 cm FL) when the majority of flyingfish are mature (Mahon *et al*. 2000).

The relationship between recruitment and the adult stock that produces those recruits (i.e. the stock recruitment relationship) for *H. affinis* has been investigated in a preliminary manner (Mahon 1989). Results indicate that *H. affinis* has a stock recruitment relationship typical of short-lived pelagic species, in which the number of recruits is more strongly influenced by the abiotic and biotic environment (including predation and food supply), than by adult population size, at least over a wide range of adult population sizes. Over the range of spawning stock sizes so far investigated for *H. affinis* in the eastern Caribbean (i.e. those occurring over the years 1958 – 1984 as indicated by CPUE data from the Speightstown, Barbados fishing fleet) the average recruitment has been fairly constant, although inter-annual fluctuations are high. As such, the eastern Caribbean flyingfish stock seems to be characterised by a high degree of inter-annual variation in abundance (with adult fish biomass fluctuating by a factor of +/- 60% from year to year). This variability is believed to be primarily due to the physical environment (rather than adult population size) and is therefore largely unpredictable. Indications are however, that if flyingfish harvest levels increase by more than 40% over the average harvest levels in the 1980s, this may well lead to a decline in recruitment (recruitment overfishing) (Mahon 1989).

5.6 Species interactions

The diet of *H. affinis* comprises largely zooplankton (particularly pteropods/copepods) and nekton (larval fish) (Hall 1955, Lewis *et al*. 1962), indicating that they are relatively low down in the food web. They are believed to occupy a trophic level of 3.8 (www.fishbase.org; Froese and Pauly 2009). Predators of juvenile and adult *H. affinis* include many of the large oceanic pelagic species (e.g. dolphinfish, wahoo, large tunas, billfishes) (Oxenford and Hunte 1999, Heileman *et al.* 2008). As such, *H. affinis* is an important baitfish for fisheries targeting these large pelagic species.

The strong trophic dependence of dolphinfishes on flyingfishes has been demonstrated using an Ecopath with Ecosim (EwE) model of the Lesser Antilles pelagic ecosystem (LAPE) (Mohammed *et al*. 2008), and is further explained in Fanning and Oxenford (2011).

5.7 Critical habitat

Critical habitat for adult *H. affinis* is clearly open ocean with availability of floating objects to use as spawning substrate. Preferred spawning areas are likely to be present but not well defined at the present time.

A tagging study of *H. affinis* off Tobago has indicated retention of spawning adults in the area (Oxenford 1994). This information, together with anecdotal information from fishers suggests that the shelf area off the northwest coast of Tobago may be a preferred spawning area. An abundance survey of *H. affinis* juveniles across the eastern Caribbean indicated a greater density in the area to the northwest of Trinidad and Tobago (Oxenford *et al*. 1995b); however, this could not be corroborated by the relative distribution of *H. affinis* eggs and larvae (Hunte *et al*. 1995).

5.8 Carrying capacity

New estimates of carrying capacity were developed during the 2011 bioeconomic assessment of the Eastern Caribbean flyingfish fishery (CRFM, 2011). These are: a base carrying capacity(k) of 44 302 tonnes; an intrinsic growth rate (r) of 0.28/year; - amplitude of k fluctuation (s_k) of 4276 tonnes; and an environmental cycle of carrying capacity of 44 years.

6. LEGAL CONTEXT

6.1 International law and agreements

Internationally agreed fisheries instruments of direct relevance to flyingfish fisheries in the Eastern Caribbean include the following legally binding treaties and agreements:

- 1982 United Nations Convention on the Law of the Sea (UNCLOS), which came into force in 1994;
- 1993 FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (FAO Compliance Agreement), which came into force in 2003;
- 1995 United Nations Agreement for the Implementation of the Provisions of the UN Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement), which came into force in 2001;

Other significant international instruments include the following non-binding declarations/codes:

- 1992 UN Agenda 21: Programme of Action for Sustainable Development, Chapter 17: Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas and coastal areas, and the protection, rational use and development of their living resources. This action plan was agreed to at the 1992 United Nations Conference on Environment and Development (UNCED).
- 1994 Declaration of Barbados on the Sustainable Development of Small Island Developing States (SIDS) and its related Programme of Action for the Sustainable Development of Small Island Developing States.

- 1995 FAO Code of Conduct for Responsible Fisheries, which although largely voluntary, has certain provisions that are already, or may become, legally binding. The code covers all aspects of fisheries, including harvest, fishing operations, management, post-harvest, trade and research, and gives particular attention to Small Island Developing States and small-scale fisheries.
- 2001 Reykjavik Declaration, representing a voluntary commitment to adopt an ecosystem-based approach to fisheries management.
- 2005 Rome Declaration on IUU Fishing, recognizing the impacts of IUU fishing on small-scale fisheries, and calling for improved national and regional monitoring, control and surveillance of unauthorized, illegal fishing and implementation of severe punitive measures.
- 2010 United Nations General Assembly Resolution "Towards the Sustainable Development of the Caribbean Sea for Present and Future Generations" (UNGA 65/155, adopted on 20 December 2010)

Other relevant international considerations include the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the 1992 Convention on Biological Diversity (CBD), the 1973/78 International Convention on the Prevention of Marine Pollution from Ships (MARPOL), the 2002 World Summit on Sustainable Development (WSSD) Johannesburg Plan of Implementation and the International Labour Organization Work in Fishing Convention of 2007 (ILO Convention No. 188).

The 2009 FAO Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (Port State Measures Agreement), will in the coming years become an important international instrument for fisheries management in the Caribbean region. Membership to these conventions and treaties among the eastern Caribbean states is shown in Table 3.

Table 3: Membership to international and regional conventions and treaties of relevance to fisheries (as of March 2014)

Country	UNCLOS	UN Fish Stocks Agreement	FAO Compliance Agreement	CITES	CBD	MARPOL IMO	Cartagena Convention	SPAW Protocol	FAO Port States Measures Agreement
Barbados	√	√	√	√	√	√	√	√	-
Dominica	√	-	-	√	√	√	√	-	-
Grenada	√	-	-	√	√	-	√	√	-
Martinique (France/ EU)	√	√	√	√	√	√	√	√	-
Saint Lucia	√	√	√	√	√	√	√	√	-

Country	UNCLOS	UN Fish Stocks Agreement	FAO Compliance Agreement	CITES	CBD	MARPOL IMO	Cartagena Convention	SPAW Protocol	FAO Port States Measures Agreement
Saint Vincent & the Grenadines	√	√	-	√	√	√	√	√	-
Trinidad & Tobago	√	√	-	√	√	√	√	√	-

6.2 Regional and bilateral arrangements

Three regional agreements and arrangements govern and support flyingfish fisheries and management in the Eastern Caribbean. These include the following:

1) The Agreement on the establishment of the Caribbean Regional Fisheries Mechanism (CRFM) under the Caribbean Community (CARICOM) was signed in February 2002. The mission of this inter-governmental organization is "To promote and facilitate the responsible utilization of the region's fisheries and other aquatic resources for the economic and social benefits of the current and future population of the region" and as such its three bodies – the Ministerial Council; the Caribbean Fisheries Forum; and the CRFM Secretariat, aim to further the objectives of CRFM. Barbados, Dominica, Grenada, Saint Lucia, Saint Vincent and the Grenadines and Trinidad and Tobago are all active members of the CRFM.
2) The Draft Agreement on the Establishment of the Caribbean Community Common Fisheries Policy (CCCFP) was endorsed by the CRFM Ministerial Council in 2011. It will (once ratified) govern the fisheries through establishment of measures for conservation, management, sustainable utilization and development of fisheries resources and related ecosystems; the building of capacity amongst fishers and the optimisation of the social and economic returns from their fisheries and the promotion of competitive trade and stable market conditions.
3) The Western Central Atlantic Fishery Commission (WECAFC) was established by the FAO Council in 1973 as a Regional Fishery Body under Article VI of the FAO constitution. All above CRFM member countries are members of WECAFC as well as France (Martinique). WECAFC aims to promote the effective conservation, management and development of the living marine resources in FAO Area 31, in accordance with the FAO Code of Conduct for Responsible Fisheries, and to address common problems of fisheries management and development faced by members of the Commission.

The members of CRFM and WECAFC have established the CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean through a decision by the 14th session of WECAFC (Panama, February 2012). Initially the Working Group was charged with the responsibility of updating the proposed draft Sub-regional Fisheries Management Plan (FMP) for Flyingfish in the Eastern Caribbean and the Draft Resolution on the FMP. The scope of the Working Group is to facilitate

the achievement of management objectives as outlined in this FMP, through the application of international best practices consistent with the precautionary, ecosystem and participatory approaches to fisheries management. Specifically, the Working Group is required to monitor, evaluate and advise on the status of implementation of the Sub-regional FMP; advise on the status of the fishery and provide technical support to national implementation of the management measures agreed under the Sub-regional FMP.

Also of particular relevance in the region are the 1983 Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (i.e. the Cartagena Convention), which entered into force in 1986, and the associated 1990 Protocol for Specially Protected Areas and Wildlife (SPAW), which entered into force in 2000. Membership to these is also shown in Table 4above.

The following declarations and resolutions are also of importance for the management of flying fish fisheries in the Eastern Caribbean:

- 2010 Castries (St. Lucia) Declaration on Illegal, Unreported and Unregulated Fishing of the Caribbean Regional Fisheries Mechanism;
- 2012 Resolution of the members of the Western Central Atlantic Fishery Commission on Strengthening the Implementation of International Fisheries Instruments.

None of the above regional arrangements and agreements has at present any specific jurisdiction over flyingfish resources and their management in the Eastern Caribbean. Therefore the Sub-regional Management Plan is not a legally binding instrument, which can form the basis of a legal challenge. The sub-regional plan, however, harmonizes the fisheries management and conservation of the flyingfish resources in the Eastern Caribbean. The national authorities' regulatory powers (under the national Fisheries Acts of the participating countries) will enable implementation of the management plan corresponding with the provisions of the international and regional arrangements and instruments.

6.3 National policies, laws and regulations

In terms of fisheries legislation, all of the Commonwealth Caribbean countries have Fisheries Acts, and those of the Eastern Caribbean countries (Dominica, Grenada, St. Lucia and St. Vincent and the Grenadines) are nearly identical, because they were based in large part upon OECS model laws (CRFM 2012b). The Commonwealth Caribbean fisheries statutes are generic in nature in the sense that they do not tend to have provisions specific to particular fisheries, such as those for flyingfish, but rather contain provisions applicable to all forms of fishing.

While none of the Fishing Acts currently in force expressly requires fisheries authorities to follow the ecosystem approach and fisheries-related principles such as the precautionary principle, in most of the current Acts there are references to key concepts such as conservation, management, sustainability and use of scientific information.

Like the fisheries statutes, most existing national fisheries management plans and policies are of a more generic and general nature, some still in draft form and in the process and need of being

revised and updated. They do not contain specific provisions for the management and conservation of flyingfish with the exception of, in some cases, meshsize regulations for gillnets.

7. MANAGEMENT UNIT

To date, three genetically discrete sub-regional stocks of *H. affinis* have been identified in the Western Central Atlantic. These are located in the eastern Caribbean, the southern Netherlands Antilles and off northeast Brazil. As such, the eastern Caribbean *H. affinis* may be considered as a unit stock, shared by the countries of the eastern Caribbean, with distribution extending both eastward and westward, beyond the EEZs of the respective countries. There is also considerable movement of adult flyingfish between the eastern Caribbean countries, particularly prior to spawning. This suggests that the minimum appropriate management unit for *H. affinis* should be the combined EEZs of the Eastern Caribbean states, from Dominica south to Tobago (FAO 2010).

8. FISHERY CHARACTERISTICS

8.1 Ecosystem services of the pelagic ecosystem

Flyingfish fisheries in the eastern Caribbean are part of the pelagic ecosystem. The pelagic ecosystem provides a range of ecosystem services, which can be divided into provisioning, regulating, cultural and supporting services. The provisioning services include the provision of fish for food and for commercial, recreational and subsistence fishing; the generation of wave energy, oxygen provision, and the provision of a medium for transportation, i.e. shipping and pharmaceutical products. The prominent regulatory service of the pelagic ecosystem is climate regulation. Cultural ecosystem services include recreational and tourism services and values, knowledge systems and educational values as well as spiritual and inspirational values. Supporting ecosystem services of the pelagic ecosystem include habitat for a variety of marine plant and animal life, including critical habitat for eggs and larval stages of fish and shellfish, transport of eggs and larvae to feeding and recruitment grounds as well as biodiversity functions related to sea turtles, sea birds and marine mammals (CRFM, 2012b).

8.2 Flyingfish fisheries in the Eastern Caribbean

In the central western Atlantic, the four-wing flyingfish supports commercially important fisheries in three geographically separate areas: the eastern Caribbean islands, the southern Netherlands Antilles and northeast Brazil. Tagging and genetic studies suggest that there is a single stock of four-wing flyingfish (*Hirundichthys affinis*) within the southeastern Caribbean area extending from Dominica to Trinidad and Tobago.

The four-wing flyingfish is essentially an annual species. The strong seasonal variation in catches is probably due to combination of:

- peak seasonal spawning behaviour (flyingfish being much more readily caught when spawning), and

- their variable abundance resulting from high post spawning mortality and a one-year lifespan, such that there is a gap in between successive adult cohorts occurring between July and October when adults are dead and juveniles have not yet grown into the fishery (recruited).

Flyingfishes are an important prey group for a number of large pelagic predators such as bigeye tuna, dolphinfishes, billfishes, blackfin tuna as well as squids.

The four-wing flyingfish supports important small-scale fisheries in the region in terms of employment generation, food security and supply of bait for fisheries targeting large pelagic fish species. Like other small-scale fishers in the Caribbean, fishers involved in flyingfish fisheries often belong to the lower socio-economic strata of society (CRFM, 2012c).

Flyingfish fisheries are concentrated in the southern end of the Lesser Antilles chain. Barbados, Tobago, Martinique and Saint Lucia all have large flyingfish fisheries and to a lesser extent Dominica and Grenada. Barbados accounts for about two thirds of the regional catch. Compared to other countries in the region, Barbados also adds more value to flyingfish catches through processing and sale to the tourism sector. Altogether 1700 boats of small to medium size are engaged in flyingfish fisheries. The annual value of the flyingfish catch in Barbados alone is estimated at USD 15 million (Mahon *et al*., 2007).

The flyingfish fishery is of particular importance to Barbados, employing 2000 fishers, 500 vendors as well as 325 persons employed as de-boners or workers in fish processing plants (FAO, 2012). In 1952 there were 400 boats involved in this fishery, 18 of which were mechanized with average engine size of 23 hp (Rose, 1954). Iceboats were introduced in the 1970s, the fleet size increasing to 61 vessels in addition to 442 dayboats by 1988 (Willoughby *et al*., 1988). In 2007 there were 167 iceboats and 242 dayboats (Parker, 2010). The total annual recorded catch of flyingfish in Barbados was 2292 tonnes in 2009 (CRFM, 2012a). The average annual recorded catch of flyingfish between 1997 and 2009 was 1736 tonnes, fluctuating from a low of 922 tonnes in 2006 to a high of 2680 tonnes in 1998. In the case of Barbados, flyingfish accounted for approximately 62 percent of fish landings over the period 1998-2007. More than 90 percent of the catch is landed by the ice-boat and day boat fleets.

Other countries in the area also have important flyingfish fisheries. In Trinidad and Tobago, the flyingfish fishery is located on the Caribbean Sea coast of the island of Tobago. The fishery began with the introduction of appropriate fishing technology in the 1950s, there being only one boat utilising gillnets in 1957 (King-Webster, 1957). By the early 1990s there were 75 pirogues and one iceboat operating in the fishery (Samlalsingh and Pandohee, 1992) and by 2008 there were 51 pirogues and eight iceboats (Caesar *et al*., 2010). The main fishing craft currently used is the fiberglass pirogue, ranging from 6.7–9.8 m. The number of boats involved in the fishery between 1988 and 2008 averaged 50 boats per season (FAO. 2010). In Saint Lucia, 331 vessels were engaged in the flyingfish fishery in 2007 (FAO. 2010). According to figures provided by the department of fisheries, the total flyingfish catch of Saint Lucia was 109.35 tonnes in 2010.The total annual catch of flyingfish in Martinique was 47.6 tonnes in 2009 and 64.6 mt in 2010. There are no targeted flyingfish fisheries in Saint Vincent and the Grenadines. In the case of Dominica there has been a shift from the flyingfish fishery to the large pelagic fishery within the last eight years due to the

increased use of FADs. The annual flyingfish landings in Dominica were reported to be 54.22 tonnes in 2011 (Commonwealth of Dominica. 2012, p. 11). [8]

The fishing effort for flyingfish is highly seasonal (December – June), driven by the seasonal availability of both flyingfish and the large pelagic species, particularly dolphinfish. The most recent estimates of fishing effort in the sub-region, in terms of the number of fishing trips during which flyingfish were caught, were assembled by Medley *et al*. (2010) for Barbados, Tobago and St. Lucia for the period 1988-2008. The monthly mean fishing effort over this period is shown in Figure 5 and demonstrates the very low fishing effort during the summer (July – November). The mean total number of flyingfish fishing trips conducted per year by the fleets of these three countries over this period is in excess of 78,200. Barbados day boats account for the majority of fishing trips averaging 43 300 per year, followed by Barbados ice boats averaging around 21 800. Tobago day boats contribute on average 10 800, while Saint Lucia day boats make some 2 300 trips per year.

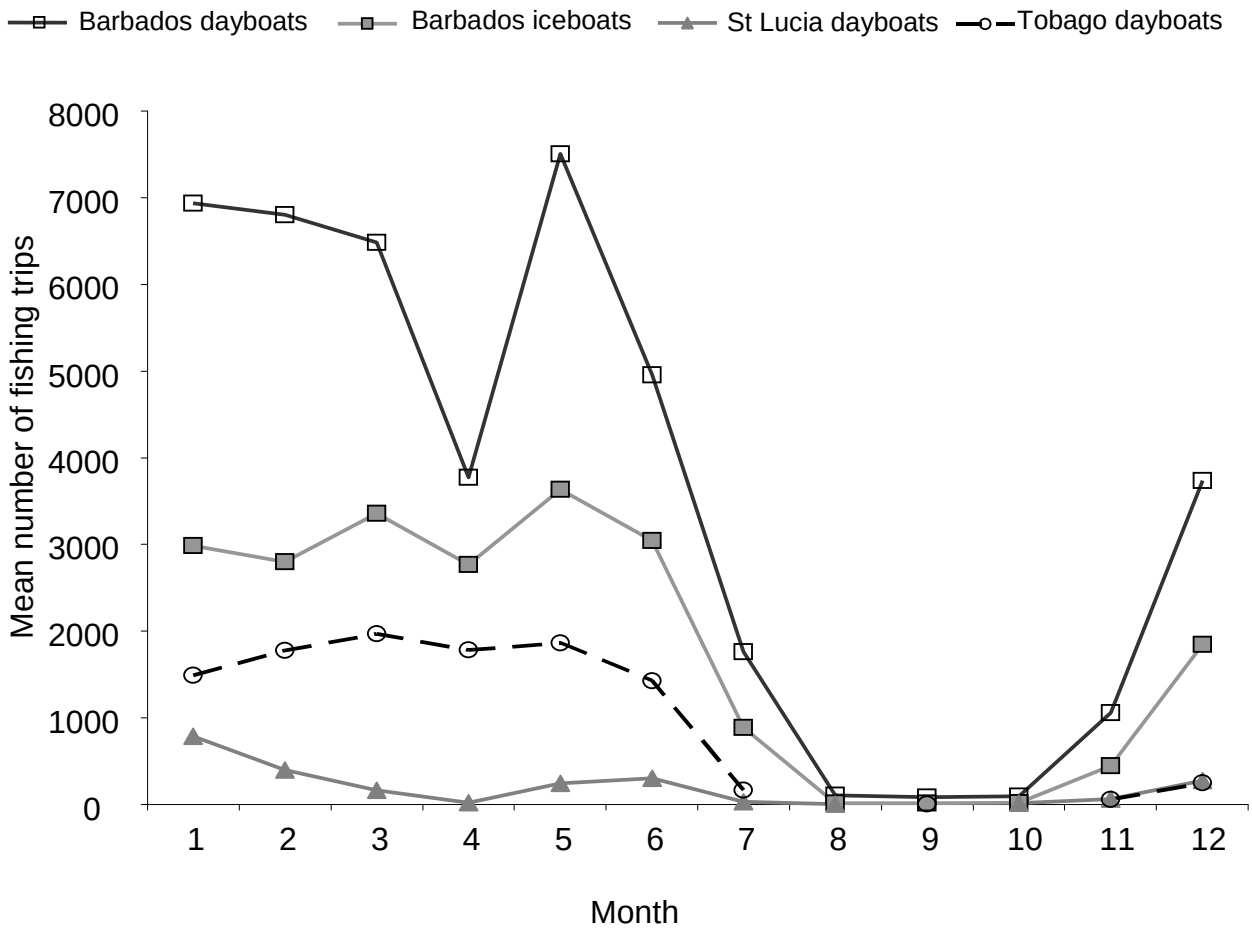

Figure 5. Seasonality of fishing effort shown as monthly mean number of recorded fishing trips (1988-2008) by the flyingfish fishing fleets of Barbados, Tobago and St. Lucia (FAO, 2010)

[8] Additional information on social and economic indicators of the importance of flyingfish fisheries in the Eastern Caribbean is provided by FAO (2010, p. 71) and in country reports.

A further complication, when examining the regional fishing effort database, is the difference in fishing power among the different boat types and national fleets. This is particularly problematic when using catch per effort (catch per fishing trip) as an index to examine trends in flyingfish abundance over time. Medley *et al*. (2010) attempted to standardise the catch per unit effort data of Barbados, Tobago and St. Lucia for the last two decades (1988-2008) against the January catches of the dayboat fleet in Barbados each year. The resulting catch per unit effort time series is shown in (Figure 6) and suggests that flyingfish abundance has remained stable over the long term.

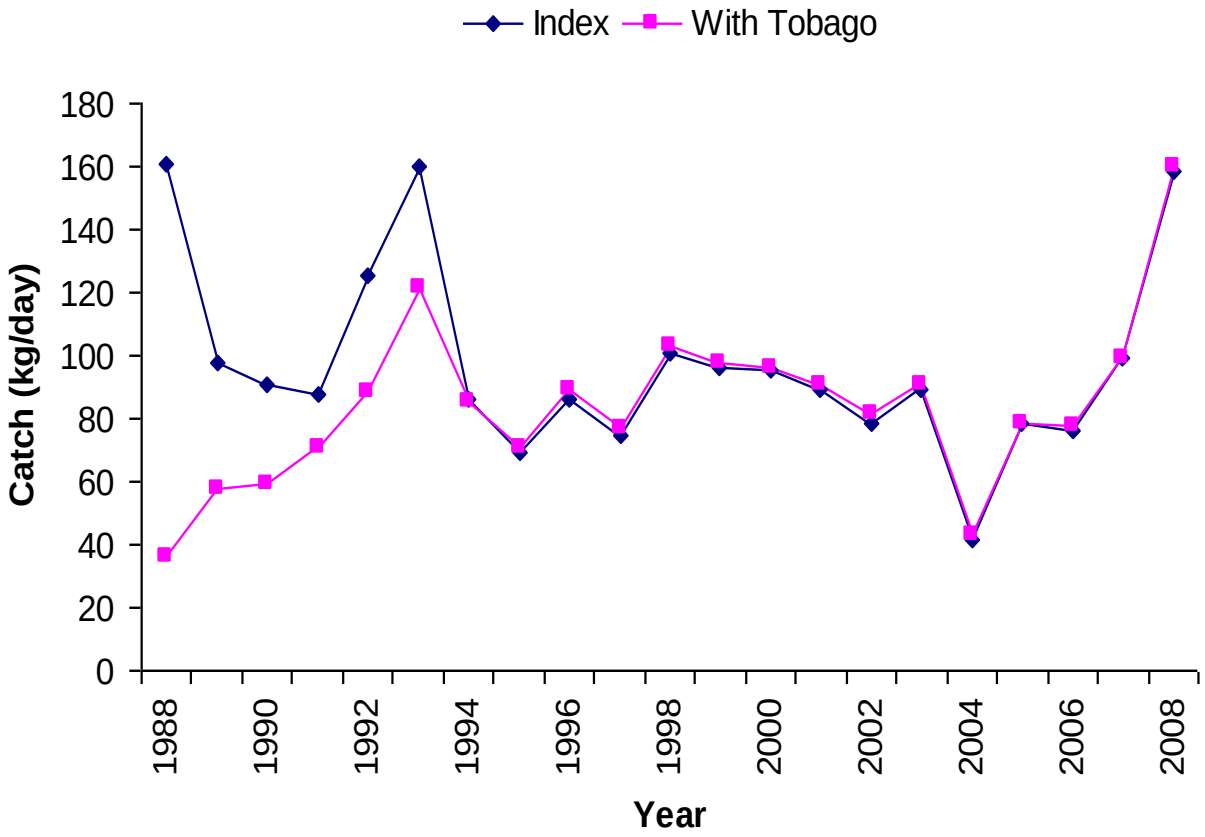

Figure 6. Standardised index of abundance for eastern Caribbean flyingfish representing catch per unit effort data for Barbados, St Lucia and Tobago, standardized annually to Barbados January dayboat effort (trips) (FAO, 2010).

The flyingfish fishery targets the four-wing flyingfish (*Hirundichthys affinis*) although small catches of other flyingfish species, as well as catches of large pelagic species are also reported. Flyingfishes are caught as they form large schools and aggregate to spawn around floating objects on which they deposit their sticky eggs to maintain buoyancy. The fishing gears employed consist primarily of: (i) floating surface gillnets (or driftnets) attached to the boat; (ii) mats of floating

palm fronds or sugarcane leaves prepared for attracting flyingfish in search of suitable floating spawning substrate, and hence which serve as FADs (called 'screelers' in Barbados); and (iii) handheld dip nets. While the flyingfish fishery is a directed fishery, it is at the same time part of a multi-species, multi-gear fishery, which also targets regional large pelagic species. When travelling to the fishing ground and while gillnets are soaking, stationary or trolled, hooks and lines are used for regional large pelagic species such as dolphinfish, wahoo and other species. Flyingfish is also used as bait to catch these species.

An important ecosystem linkage of flyingfish concerns the growing longline fisheries for large pelagics in the region. These fisheries depend to an unknown degree on flyingfish fisheries for bait. Beach seine fisheries also provide bait for longlining. This seems to be particularly important in Trinidad and Tobago and Grenada with their growing longline fisheries.

The high demand for flyingfish and other small pelagic fish catches of beach seines to be used as bait for longlining has a negative impact on the food security of local populations. Flyingfish and beach seine catches have traditionally been a source of low cost food and protein in rural areas. The increased demand for these species as bait in the longline fisheries has resulted in increased prices and in some cases removed some coastal pelagics altogether from local food supplies.

8.3 Trophic interactions, food web and habitat

The four-wing flyingfish is one of thirteen species of flyingfishes (*exocoetids*) that have been reported in the Eastern Caribbean. As far as their role in the ecosystem is concerned, flyingfishes are an important component of the pelagic food web as shown by a recently completed study of the Lesser Antilles Pelagic Ecosystem Project of the Food and Agriculture Organization of the United Nations regarding the four-wing flyingfish (Heileman *et al*., 2008).

The findings of the study confirm the previously known trophic dependence of dolphinfishes (*coryphaenids*) on flyingfishes in the eastern Caribbean (Mohammed *et al*., 2008). The findings highlight the vulnerability of dolphinfishes to any substantial decrease in the abundance of flyingfish, even without any change in fishing pressure on dolphinfish.

Four-wing flyingfish are relatively low in the food web. Their diet largely comprises zooplankton (particularly pteropods/copepods) and nekton (larval fish). While critical habitat for adult four-wing flyingfish is the open ocean with availability of floating objects to use as substrate, spawning areas can be in coastal waters, such as the shelf area off the northwest coast of Tobago, which are impacted by land based human activities. Anecdotal information suggests that sea-based, human activities such as oil and gas exploration and shipping can have negative impacts on the abundance of flyingfish.

9. STATUS OF THE FISHERY

9.1 State of the stock

Based on quantitative assessments completed in 2008 (FAO, 2010) and in 2011 (CRFM, 2011), there is no immediate action required by management to conserve the stock, unless there is a significant increase in catches.

Estimates of annual total flyingfish landings for the eastern Caribbean are available in FAO (2010). The landings, estimated for Barbados, Trinidad and Tobago, St Lucia, Grenada, St Vincent and the Grenadines, Dominica and Martinique vary considerably from year to year. These estimated landings ranged from 1,025 to 2,523 tonnes per year between 1950 and 1979 and appeared to have increased thereafter, ranging from 2,121 to 4,725 tonnes per year between 1980 and 2007. The estimated average annual landing between 2002 and 2007 was 2,512 tonnes.

These data, however, are to be treated cautiously as they are likely underestimates of the true catches in the sub-region. In the case of bait fisheries the catches have not been well documented. There are also gaps in available data, which required interpolation to estimate landings for years without data. Generally, several countries lack a clear methodology for estimating total catches from recorded data. Consequently, there is tremendous uncertainty in the level of historical catches of flyingfish for the Eastern Caribbean. Estimates of fishing effort are also uncertain.

The 2008 assessment identified that an annual catch trigger reference point of 5,000 t should be established when action may be taken to ensure the stock does not become overfished. This trigger point therefore defines when further management action should be undertaken. The maximum recorded annual catch to date is 4,700 t. The 2008 assessment indicated that any fisheries development exceeding 5,000 t per year would have unpredictable consequences. Among the actions that should be taken if catches rise to, or above, the trigger point, are a freeze on further fishery development until a full scientific re-assessment of the stock has been completed. An improved stock assessment may lead to further international fishing controls.

The 2011 assessment explored the bio-economic dynamic impacts of managing the multi-fleet and multispecies flyingfish fishery and undertook risk analysis of alternative fishery management decisions (CRFM 2011).

The results of this preliminary dynamic bio-economic analysis were, among other things, that under open access, harvest rates in the neighbourhood of 5000 ton /year could result in collapse of this pelagic fishery. According to CRFM (2011) this could be prevented with catch quotas, or effort controls to reduce exploitation rates by 30% to allow the resource to recover its natural fluctuations over time.

The multi-species nature of this fishery involves additions to the flows of revenues to the fishery over time coming from the harvest of valuable large pelagic species like dolphinfish, tunas, and wahoo, among others. Therefore, under open access, fishermen will not react by reducing their effort when encountering lower biomass levels of flyingfish because the other species harvested

will tend to cover the variable costs of the fishing trip. Also, it was pointed out that the price of flyingfish has been very seasonally sensitive to supply (harvest rates over time), tending to reach substantial increases in price with low catch rates. This effect not explored in the quantitative analysis will tend to accentuate the need for managing the fishery with the input and output control measures mentioned above.

The most significant uncertainty in the 2008 and 2011 assessments stem from the poor data available on catches and effort. Improved data collection and monitoring is required to ensure sustainable use of this and other fishery resources.

9.2 Social status of fishers

A recently completed general diagnostic study to determine poverty and vulnerability levels in CARICOM fishing communities (CRFM, 2012c) covered Barbados, Grenada, Saint Vincent and the Grenadines and Trinidad and Tobago (other countries with flyingfish fisheries were not included). The study included capture fisheries, aquaculture and fish processing. Poverty and vulnerability were identified with reference to unsatisfied basic needs (UBN). Households with more than one UBN were classified as poor households. Households with one UBN were classified as vulnerable.

In the case of Grenada and Saint Vincent and the Grenadines, more than 5 percent of the households in the fisheries/aquaculture sectors were classified as being poor; 6.61 and 5.41 percent, respectively (CRFM, 2012c). In both countries, these households were involved in capture fisheries. In Trinidad and Tobago, the percentage of fisheries households living in poverty was 1.32 percent. Poverty in fisheries households was not an issue in Barbados.

Compared to poverty, vulnerability was found to be a much more important issue in all four countries covered by the study. Grenada topped the list with 25.62 percent of fisheries households being vulnerable, followed by Trinidad and Tobago with 15.23 percent, Saint Vincent and the Grenadines with 10.81 percent and Barbados with 7.37 percent. [9]

Any approach to the management of flyingfish fisheries must, as far as is reasonably practicable, seek to ensure that fishers enjoy decent conditions of work[10]. In addition, such an approach must also ensure that other users also do their share to restore and conserve fishery resources. This includes efforts to efficiently regulate fishing fleets, efforts to end IUU fishing, the reduction and prevention of water pollution and coastal erosion caused by housing, quarries, removal of sand

[9] The main components of poverty and vulnerability were lack of access to services, poor quality of dwellings, semi-illiteracy and low levels of education as well as low economic capacity and productivity. Large household and family sizes as well as high illiteracy and semi-illiteracy levels figured prominently among the demographic characteristics of poor and vulnerable households. Another characteristic, poor and vulnerable fisheries households had in common, was that they depended more strongly on fisheries for their income as compared to other households.

[10] The ILO Work in Fishing Convention, 2007 (No. 188) – specifies decent conditions of work on board fishing vessels in terms of meeting minimum requirements with regard to work on board, conditions of service, accommodation and food, occupational safety and health protection, medical care and social security.

and industrial development, and the proper management of other factors, which have an impact on fisheries resources and the aquatic habitat.

9.3 Issues and constraints

A number of problems currently exist which are constraining the development and management of the flyingfish fishery in the eastern Caribbean. Some of the key issues and constraints are listed below (not in any order of importance):

Ecological issues:

1. negative impacts of sea and land based human activities such as oil and gas exploration, shipping, pollution, shoreline erosion, runoff, etc. on the marine ecosystems;
2. unsustainable fishing practices; and
3. evaluation of risks due to global environmental change.

Socio-economic issues:

1. constrained access for far-ranging vessels (e.g. Barbadian ice-boat fleet) and other near-ranging fleets (e.g. French boats) to fishing areas occupied by the shared *H. affinis* stock;
2. market gluts occurring as a result of bunched landings and inadequate distribution leads to lowered incentive to harvest flyingfish when plentiful;
3. marked seasonality in availability of *H. affinis* leads to discontinuous market supply and seasonal fishing effort;
4. high energy costs in the processing sub-sector;
5. inadequate post-harvest technology to ensure a good quality product and reduce fish wastage, i.e. poor quality of landed fish from improper bulk storage at sea and ashore;
6. some eastern Caribbean countries have significant difficulties with producing cost-competitive local exports of fresh flyingfish or fish products as a result of very different national economies;
7. labour shortage and lack of adequate blast freezing facilities for processing plants;
8. vulnerability and poverty of fishers and their families and household members;
9. lack of, or inadequate, safety equipment and navigational training of crew for some boat types;
10. difficulties with accessing credit and insurance in the fisheries sector.

Governance issues:

1. lack of a regional mechanism for managing shared resources;
2. inadequate fishery information and statistics (particularly socio-economic data) for planning and management;
3. inadequate human capacity in fishery departments to conduct required level of research and data analysis;
4. inadequate development of participatory management with all stakeholders at national and sub-regional levels;
5. limited facilities for disposal or use of fish offal at landing sites;
6. limited landing site and marketing facilities in some countries;
7. IUU fishing;
8. lack of, or inadequate, monitoring, surveillance and enforcement;
9. competition for use of the coastal zone (landing and launching areas).

9.4 Opportunities

A number of expansion and development opportunities exist within the flyingfish fisheries of the sub-region. Some of these opportunities are created by current regional and international instruments such as: the Draft Caribbean Community Common Fisheries Policy (upon endorsement of CARICOM Heads of Government); the 2010 Castries (St. Lucia) Declaration on Illegal, Unreported and Unregulated Fishing of the Caribbean Regional Fisheries Mechanism; the FAO Port State Measures agreement and the ILO Work in Fishing Convention of 2007.

Current opportunities include:

1. availability of international support for the ecosystem, approach to fisheries management initiatives, and food security through fisheries;
2. international support for the provision of decent working conditions onboard fishing vessels and protection of the rights of fishers;
3. assistance to develop and strengthen fisherfolk cooperatives/associations/networks to facilitate improved collection and sharing of data and information and greater involvement in the fisheries management process;
4. development of local value-added flyingfish products of competitive quality;
5. accessing specialised niche markets in North America and the United Kingdom of Great Britain and Northern Ireland;
6. expanding frozen fish storage facilities to meet market demands during the flyingfish 'off-season';
7. expanding range of current fishing fleets into geographic range of the eastern Caribbean *H. affinis* unit stock;
8. development of products utilizing fish offal;
9. development of flyingfish deboning skills in all eastern Caribbean countries to increase value of fresh fish;
10. development of better fish distribution mechanisms for marketing fresh fish in rural areas;
11. increasing interest of stakeholders in information and management measures.

10. MANAGEMENT OBJECTIVES

The management objective is to ensure the long-term sustainability of the resource through implementation of best fishing practices in accordance with the FAO Code of Conduct for Responsible Fishing, such that the *H. affinis* resource in the waters of the eastern Caribbean is optimally utilized for the long-term benefit of all people in the eastern Caribbean region. Responsible management in the face of uncertain information on the true status of the flyingfish stock requires a precautionary approach.

The significant trophic, technical and economic linkages between the flyingfish fisheries and the fisheries targeting large oceanic pelagic species (e.g. dolphinfish, wahoo, tunas, billfishes) provide strong justification for an ecosystem approach to the management of these fisheries. The flyingfish stock is shared among the eastern Caribbean States and as such under UNCLOS Article 63[9] these States are legally obligated to collaborate in its management. An institutional arrangement allowing for sub-regional collaborative management is therefore critical.

Management of flyingfish in the Eastern Caribbean is to be guided by three management goals, which are further sub-divided into general objectives. These are shown in Table 5 together with their assessment criteria and descriptions based on Campbell and Singh-Renton (2012).

10.1 Stakeholder contributions

Two recent studies, carried out under the guidance of the Caribbean Large Marine Ecosystem Project, documented the management priorities for stakeholders participating the Eastern Caribbean flyingfish fishery (Ferrier and Singh-Renton, 2012; Campbell and Singh-Renton, 2012). These studies showed that stakeholders overwhelmingly supported sustaining the flyingfish resource as the foundational management objective, to be supported by accurate information and monitoring systems and effective management strategies. Another management priority of equal concern to stakeholders was the optimal use of the fishery for social benefits. Ecological objectives and criteria tend to be given a comparatively lower priority (Campbell and Singh-Renton, 2012), although stakeholders acknowledge their support for an ecosystem approach to fisheries management.

The findings of these two studies were used to develop an initial practical working set of fishery management goals and objectives, and to propose an initial set of suitable operational objectives, indicators and reference points for evaluating fishery performance, relative to the priority objectives identified. These are provided in table 5. It is intended that the objectives, indicators and reference points would be further developed through a participatory approach and used to inform the management process and to guide monitoring and evaluation of implementation of the plan.

Table 5: Updated management objectives, general objectives, operational objectives, indicators and reference points.

Management Goals (category)	**General objectives (sub category)**	**Operational Objectives**	**Indicators**	**Suggested reference points**
1.Sustained fishery resource - biological	**1.1 Sustained resource** Ensuring that there are flyingfish available for future generations. Preventing overfishing to maintain a healthy stock	Current average catch rates sustained over the long-term and throughout the area of distribution Stock biomass is maintained at or above MSY level	National CPUEs (spatial) Total national landings	Long-term average catch rate Total subregional annual landings (catch trigger point of 5000 tonnes

Management Goals (category)	General objectives (sub category)	Operational Objectives	Indicators	Suggested reference points
	1.2 Accurate information Ensuring that an effective data collection system is in place to provide accurate information and knowledge about the state of the fishery	National data collection improved and gaps filled	Sampling coverage Sampling design	Adequate coverage of landing sites Adequate sampling design
	1.3 Effective management Ensuring that there is an effective system for adaptive and responsive management and enforcement	Establish a harmonized sub-regional database	Sub-regional database operational	Harmonized sub-regional database established and maintained
		Timely submission of data and information to CRFM	Annual submission of data	Current data in database
		Establish authorized access to fishery	License/permit system specifically for flyingfish	All sub-regional flyingfish fleets licensed
		Establish precautionary measures as required	Variety of indicators as required (e.g. fleet size)	Adjustment of related reference points
		Ensure ability to make and enforce management decisions.	Legislation and regulations in place Compliance levels	Laws and regulations in place and enforced Established level of compliance
		Ensure ability to collaborate effectively with stakeholders and other countries and organizations both vertically and horizontally	Level of stakeholder engagement (consultation and feedback) Stakeholder network indicators	Adequate level of stakeholder engagement
		Adaptation to external drivers/ perturbations	Invasive species (sargassum)	

Management Goals (category)	General objectives (sub category)	Operational Objectives	Indicators	Suggested reference points
2. Optimal use of fishery for long-term benefit - socio–economic	**2.1 Social benefits and economic/ financial returns** Optimal social, economic and financial benefits for all involved in the fishery	Optimize social, economic and financial benefits derived from the fishery	Employment level Income level Return on investment Credit access	Adequate levels of: Employment Income Return on investment Credit access
	2.2 Affordable food source	Ensure that flying fish remains an affordable and available source of food for the future	Per capita (fish) consumption Percentage of population consuming flyingfish Market price of flying fish Relative market price	Preferred levels of consumption (health, dietary aspects) Average market prices of flying fish
	2.3 Fair access to fishing grounds	Ensure fair access to fishing grounds Minimize conflict/competition with other resource sectors/users.	Access indicators (e.g. number of vessels, fishers and licenses/permits) Bilateral/multilateral access agreements Number of conflicts with other resource users	Degree of fair access to fishing grounds Degree of competition from other resource sectors. Resource sharing between countries.
	2.4 Optimal utilization/ processing for domestic and export markets	Promote fish quality and safety for consumers Develop value addition for the post-harvest sector for domestic and export markets	Fish and fishery products related SPS standards (e.g. HACCP) Value of post-harvest production Export value	Quality and safety standards and requirements met Adequate level of post harvest processing

Management Goals (category)	General objectives (sub category)	Operational Objectives	Indicators	Suggested reference points
				Fish and fishery products trade balance
3. Sustained ecosystem health – ecological	**3.1 Healthy habitat** Healthy habitat with minimal degradation and minimal impact from pollution or other negative effects	Maintain off-shore pelagic habitat health Minimize habitat degradation	Water quality parameters Marine debris/pollution occurrence	
	3.2 Healthy and resilient ecosystem (with balanced trophic levels)	Maintain aquatic biodiversity and balanced ecosystem Adaptation to climate change and weather extremes	Species composition of catches (including size) Trophic levels (predator –prey composition) Adaptation and vulnerability indicators	

10.2 Reference points

Under the 2008 Draft Sub-regional Fisheries Management Plan for flyingfish in the Eastern Caribbean, a trigger point of 5000 tonnes annual catch had been established (FAO 2010) relative to the agreed biological objective. The assessment stated that sustained catches at or above this level are expected to bring about an unacceptable risk of overfishing. The assessment further stated that either catches are maintained below this level, or further research, data collection and stock assessment work is required to enable a new higher limit to be set while still ensuring that the limit is safe. In comparison, a bio-economic analysis (CRFM, 2011) suggests that in a fishery targeting an annual species, which reacts rapidly to environmental changes, biomass and catch target reference points and limit reference points (TRP and LRP, respectively) would have to be determined and adjusted over time because there is no equilibrium biomass or constant maximum sustainable yield.

Since these two recent assessments, the underreporting of flyingfish catches and data quality concerns have not been addressed, and some stakeholders have expressed concern about the impact of this on the accuracy of the available stock assessments. However, the 2008 assessment used the best available data, and as data are improved in the future, this will facilitate improved estimation of stock status.

11. DATA, MONITORING AND RESEARCH REQUIREMENTS

The statistical system needs to be developed to capture the range of indicator variables identified in Table 5. At present, only certain types of data are typically collected, e.g. catch and effort. However, in view of the range of management priorities identified by stakeholders, which was noted earlier and also reflected in table 5, the statistical systems will need to be expanded to incorporate collection and storage of other types of data, e.g. price, consumption, export value, data on water quality, etc.

11.1 Catch/effort and vessel data

The most important shortcoming is the incompleteness of statistics on flyingfish catch/landings in the region due to poor data collection systems and under-reporting.

Under this sub-regional flyingfish management plan, the following steps will be taken to address this shortcoming:

1. Expansion of coverage of data collection systems to systematically include flyingfish caught for bait. The Fisheries Authorities, in collaboration with other stakeholders (such as flyingfish fishers, buyers of flyingfish to be used as bait, fisherfolk associations and other stakeholders) should identify a suitable data collection system and support interpretation and use of data collected.
2. Improvement of collection of statistics on flyingfish catches and effort in the sub-region as part of ongoing efforts to improve fisheries statistical systems.
3. Fisheries Authorities, in collaboration with stakeholders (such as flyingfish fishers, buyers of flyingfish to be used as bait, fisherfolk associations and other stakeholders), should be involved in interpretation and use of data collected.
4. Allocation of sufficient and appropriately skilled staff and sufficient resources for the collection, recording and analysis of fisheries statistics. This should include adequate training, orientation and involvement of staff dealing with the collection, analysis and sharing of flyingfish and other fisheries statistics.
5. Establishment of a sub-regional database for catch and effort data of the Eastern Caribbean flyingfish, which should eventually also encompass biological, ecological, oceanographic, economic and social data. The database should be managed by the CRFM Secretariat in cooperation with the CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean. It should draw on regional data sets assembled at the 3rd Meeting of the WECAFC Ad Hoc Working Group on Flyingfish in the Eastern Caribbean and the 7th CRFM Annual Scientific Meeting for the assessment of the Eastern Caribbean flyingfish stock. The database should also include flyingfish catches and effort from Martinique and Guadeloupe.
6. Harmonization and improvement of national vessel registration and licensing systems and expansion of the use of suitable software to clearly identify vessels fishing for flyingfish. The registration and licensing systems should track the change of ownership, base of operation and use of vessels. This information on licensed/registered flyingfish vessels should be provided to CRFM Secretariat to be incorporated in any future regional registration and licensing database of CRFM in the context of the implementation of the Draft Caribbean Community Common Fisheries Policy.

11.2 Economic, social and ecological information

The sub-regional fisheries management plan further encourages investigations/research which aims at strengthening the flyingfish fishing industry including: utilization and trade, the social and economic status of industry participants, the contribution of flyingfish fisheries to food security/nutrition and to poverty alleviation. These investigations will lead to a better understanding of the ecosystem which supports the flyingfish fishery, and of the threats to the health of that ecosystem.

The proposed studies ultimately aim to generate information about the flyingfish fishing industry which is needed to attract investments in sustainable harvesting and value addition, and to facilitate application of the ecosystem approach to management of the flyingfish fishery.

11.3 Research needs

The following studies are proposed:

Economic and Social Evaluations of Flyingfish Fisheries

1. Conduct a sub-regional cost and earnings study and comparison of the economic and financial performance of flyingfish fisheries and flyingfish value addition in selected countries of the Eastern Caribbean.
2. Conduct of a socio-economic study of flyingfish fishers, to include an examination of their conditions of work, and processors in selected countries of the Eastern Caribbean.

Studies on Ecosystems and Trophic Interactions

1. Conduct study on the impact of sea and land based human activities on habits, life cycles and food webs of flyingfish and the productivity of related marine ecosystems.
2. Conduct studies to improve understanding and estimation of the risks associated with climate change, extreme weather events, and other aspects of global environmental change.

Bio-economic research

In addition to the cost and earnings, socio-economic and ecological studies suggested above, future bio-economic research for this important fishery of the CLME, should consider the following (CRFM 2011):

1. Long-term stock fluctuations associated with changes in the abundance of predators (i.e. dolphinfish, and other large pelagic species) and competitors (other small pelagic) targeted by other fleets.

2. The cycle of long-term fluctuating stocks within a changing environment and the associated adequate vessel capacity.

Governance research

Monitoring and evaluation of implementation of the plan are critical in determining whether or not the plan is contributing to achievement of the general objectives for the fishery and to informing any adaptations to the management measures if it is not. However, details of the

operational objectives, indicators and reference points are not yet fully developed. Consequently it is proposed that priority be given to identifying with stakeholders, appropriate operational objectives, indicators and reference points to be applied in monitoring and evaluation of the performance of the agreed management priorities included for implementation under this management plan.

12. MANAGEMENT ADVICE AND IMPLEMENTATION OF THE PLAN

12.1 Management advice

Taking into consideration shortcomings in data collection and analysis, following the precautionary approach to fisheries management, and with the ultimate view to safeguard the socio-economic well-being of the flyingfish industry in the sub-region and the health of the ecosystem that sustains the flyingfish fishery, this updated sub-regional management plan proposes the following management measures:

1. Development and implementation of national management plans for flyingfish fisheries, consistent with the sub-regional fisheries management plan, by the 2015/2016 flyingfish season, or as soon as is practically possible;
2. Annual reporting, by CRFM Member States with a real interest in the flyingfish fishery to the CRFM and, similarly, non-CRFM Member States to the WECAFC, on progress made in development and implementation of national fisheries management plans (including associated proposed management measures) and submission of catch and effort data for flyingfish fisheries in an agreed, standardized format, to the respective Secretariats;
3. Establishment of an authorized national entry (license/permit) system for flyingfish fisheries, which enters into force for the flyingfish fisheries season 2015/2016, or as soon as is practically possible. Such a system would facilitate an estimation of existing fishing effort[11] and/or fishing capacity[12] and provide a mechanism for controlling fishing effort and/or fishing capacity should the need arise in future;
4. Conduct of an assessment to estimate stock abundance of flyingfish, such as a regional synoptic survey, prior to any significant development in the fishery;
5. Adoption of a precautionary sub-regional total annual catch trigger point of 5000 tonnes, at which point further action shall be taken to ensure the stock does not become overfished;
6. Implementation of a precautionary sub-regional freeze on expansion of flyingfish fishing effort and/or fishing capacity applied to all authorised vessel types, should the agreed catch trigger point be realized, and timely reassessment of the resource status and identification of any required changes to the management measures;
7. Strengthen current national data collection systems to facilitate:

[11] Fishing effort is the level of fishing, as may be defined, *inter alia*, by the number of fishing vessels, the number of fishers, the amount of fishing gear and technology that may enhance catchability and the time spent on fishing or searching for fish (Source: Caribbean Community Common Fisheries Policy)

[12] Fishing capacity is the ability to take the maximum amount of fish over a period of time (year, season) by a fishing fleet that is fully utilized, given the biomass and age structure of the fish stock and the present state of the technology (Source: FAO Glossary of Terms - online)

a. assessment of the resource status and establishment of improved management target and reference points;
b. estimation of existing levels of fishing effort and fishing capacity; and
c. monitoring and evaluation of the status of implementation of the national and sub-regional fisheries management plans against the objectives and indicators agreed upon.

The overall management of the flyingfish fisheries needs to be improved by taking the following actions:

1. improving and harmonizing data collection and analysis in the sub-region;
2. prioritising the development of a protocol on improving and harmonizing fisheries management legislation, to address specifically flyingfish vessel licensing and registration systems in the sub-region;
3. establishment of a sub-regional flyingfish catch and effort database[13] to be managed by the CRFM Secretariat;
4. establishment of a sub-regional flyingfish vessel registry database[14] to be managed by the CRFM Secretariat;
5. prioritising the development of a protocol on data and information sharing;
6. national monitoring of catch levels in real time, and timely reporting to the CRFM Secretariat which will keep check on overall catches in relation to the agreed trigger point, and advise accordingly;
7. formalizing the relationship between the CRFM and France to ensure France's involvement in the management process as far as the flyingfish fishery in the EEZs of its Departments in the region are concerned;
8. improved monitoring, control, surveillance and enforcement mechanisms for flyingfish fisheries and ending IUU fishing;
9. implementing national programmes to build stakeholder awareness on the management measures to be implemented and related legislation and enforcement measures;
10. institution of national training and public awareness programmes to strengthen fishers' participation in the management process;
11. national reporting to the CRFM or WECAFC, whichever is relevant, on any intended increases in fishing effort and/or fishing capacity, or any development likely to impact on fishing effort and/or fishing capacity, so as to inform updates to resource assessments, proposed management measures and amendment of the sub-regional FMP, as well as to allow a determination as to whether or not another form of stock assessment or a synoptic survey should be conducted;
12. promotion of the principles and provisions enshrined in fisheries and related regional and international agreements to which countries are signatory.

[13] This database is envisioned as a component of a broader regional database pertaining to shared fisheries resources in the region.
[14] This database is envisioned along similar lines as above.

12.2 Institutional and legal arrangements

The CRFM is the appropriate regional advisory authority in respect of flyingfish management to be tasked with the implementation, review and evaluation of the 2014 Sub-regional Flyingfish Fisheries Management Plan. The task will be carried out with technical advice from the CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean in cooperation with Fisheries Authorities, fishers' organizations and the fishing industry at large. The management functions to be carried out by CRFM Member States will be along the lines of the ones adopted by the recently established CRFM Ministerial Sub-committee on Flyingfish. They are summarized in the Terms of Reference of the Sub-Committee provided in Annex II.

In countries, where present laws and regulations do not provide for limiting entry into a fishery or where no management plan is currently in force, legislation and regulations will need to be changed/implemented or management plans created and brought into force to allow for application of the proposed management measures. The following general steps are envisaged for the implementation of the management plan.

During implementation of the updated sub-regional flyingfish management plan, consultative processes will be used to facilitate participation of stakeholders in the monitoring and adjustment of the management plan. Feedback will be provided to stakeholders on results of the implementation of the plan including information of catch and effort trends, number of licenses issued/renewed, results of stock assessments, industry performance evaluations, etc. The updated management plan will be renewed/updated on a regular basis and inputs from stakeholders will be encouraged and given due regard.

12.3 Co-management

The present structure and functions of national Fisheries Advisory Committees (FACs) should be revised to assure participation of all fisheries sub-sectors. Stakeholders from sectors other than fisheries, who have an impact or interest in flyingfish fisheries and its ecosystem, should also be represented. This could be facilitated through national inter-sectoral committees that are established under the CLME project for promoting the ecosystem approach to fisheries. The selection process for members of Fisheries Advisory Committees should be made transparent and carried out in close consultation with the groups which are to be represented on the FAC. The structure and functions of the FACs should be more clearly defined and operational ensuring, among other things, that the chairperson of the committees has sufficient time and resources to fulfil her/his task.

Impact and outcomes of management decisions on flyingfish stocks, stakeholders and marine ecosystem should be regularly reviewed at the national and regional levels and evaluated together with concerned stakeholders who should be representative of the entire ecosystem affecting flyingfish fisheries. Depending on the outcome of these evaluations, management plans and measures should be adjusted on a regular basis consistent with an ecosystem approach to fisheries management.

12.4 Monitoring, Control, Surveillance and Enforcement

Monitoring, control and surveillance of flyingfish fisheries will be carried out by the national law enforcement agencies, in close cooperation with the respective national fisheries authorities, as well as any specialized fisheries MCS entities established for this purpose; and guided by the technical and policy directions provided by the Caribbean Fisheries Forum and the CRFM Ministerial Council as well as related Ministerial Sub-committee on Flyingfish. At the regional level, the Regional Security System and the CARICOM Implementation Agency for Crime and Security (CARICOM IMPACS) will play critical roles.

The functions of CRFM will include the development of harmonized control and inspection schemes to ensure compliance with management and conservation measures, to review compliance with adopted conservation and management measures and to implement adopted control, surveillance and enforcement measures.

12.5 Institutional Strengthening

National fisheries authorities as well as national monitoring, control, surveillance and enforcement agencies will have to be provided with the requisite resources to facilitate effective implementation of the plan. At the regional level, the CRFM Secretariat is also to be provided with the requisite resources to facilitate establishment, management and reporting on the respective sub-regional flyingfish catch and effort and vessel registry databases.

12.6 Financing

Financing the implementation of this sub-regional flyingfish fisheries management plan will largely be done at the national level. However, additional funding will be required for database management as well as for carrying out regional management functions of an advisory and MCS nature. This funding will be secured by the CRFM Secretariat with support of multi- and bilateral donor agencies and funds. The CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean may also advise the CRFM Secretariat on the required funding to facilitate execution of its Terms of Reference, the most recent being those developed by the Executive Committee of the Caribbean Fisheries Forum and subsequently approved by the 15th Session of WECAFC for the period 2014 to 2016 (Annex III).

12.7 Monitoring and Evaluation of Implementation of the Plan

Monitoring and evaluation of implementation of the Plan and performance of the proposed management measures, at the national level, will be undertaken by the respective fisheries authorities and progress reported annually to the CRFM or WECAFC, whichever is relevant. At the regional level similar monitoring and evaluation will be coordinated by the CRFM-WECAFC Working Group that comprises those States having a real interest in the Eastern Caribbean flyingfish fishery, together with scientific observers and representatives of both the CRFM and WECAFC Secretariats. The national reports to CRFM and WECAFC would be used as the basis for monitoring and evaluation at the regional level. The CRFM-WECAFC Working Group, in its turn, will be responsible for reporting to both the CRFM and WECAFC decision-making bodies on the implementation of the agreed plan and performance of the respective management measures at the regional level.

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ANNEXES

ANNEX I: Resolution on the Sub-Regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean

ANNEX II: Ministerial Sub-Committee on Flyingfish Fisheries – Terms of Reference

CARIBBEAN REGIONAL FISHERIES MECHANISM

Ministerial Sub-Committee on Flyingfish Fisheries
Terms of Reference

The four-wing flyingfish *(Hirundichthys affinis)* fishery is the single most important small pelagic fishery in the southern Lesser Antilles. It is a shared resource, which is exploited by seven different States (Barbados, Dominica, Martinique, Grenada, St. Vincent and the Grenadines, St. Lucia, and Trinidad and Tobago) producing annual landings of about 3000-4000 metric tons[15]. With expanding fleet capacity and limited cooperation among the States exploiting the flyingfish, there is concern that the resource may become overfished. The States participating in the Caribbean Large Marine Ecosystem (CLME) Project agreed that strengthening governance and management arrangements for the flyingfish should be undertaken as one of the case studies under the Project. The CRFM was therefore contracted to implement this Case Study which will, firstly, review and complete the trans-boundary diagnostic analysis (TDA) for the fishery, and secondly, prepare a SAP which should identify the policy, legal and institutional reforms and investments needed to address the priority trans-boundary problems identified.

The purpose of this initiative is to establish a Ministerial Sub-Committee to provide policy direction and supervise the development of cooperative arrangements for improved governance and management of the flyingfish fishery to achieve optimum sustainable social and economic benefits for the people of the region.

Establishment of Sub-Committee

The Ministerial Council hereby establishes a Sub-Committee on Flyingfish pursuant to Rule 10(l) of the CRFM Rules of Procedure. The Terms of Reference, including, *inter alia,* objective, members, and functions of the Sub-committee are provided below.

Objective

The objective of the Sub-committee is to contribute, through cooperation and consultation, to the long-term conservation, management and sustainable use of the shared flyingfish resources, and protect and safeguard the ecosystems in which they are found in the Eastern Caribbean.

Membership

The Ministerial Sub-Committee on Flyingfish shall consist of:

(a) CRFM Member States with a real interest in the flyingfish fishery[16]; and
(b) Any other Caribbean States or Territories having a real interest in the flyingfish fishery[17], subject to the agreement of the CRFM Ministerial Council.

[15] See paragraph 51, page 18 of the UNDP, UNOPS, Project Document, PIMS 2193 – Sustainable Management of the Shared Living Marine Resources of the Caribbean Large Marine Ecosystem (CLME) and Adjacent Regions.
[16] The CRFM Member States with real interest in the flyingfish are: Barbados, Trinidad and Tobago, Grenada, Saint Lucia, Saint Vincent and the Grenadines, Dominica (See CLME Flyingfish Research Proposal)

Functions

1. The functions of the Flyingfish Sub-Committee shall be to make recommendations for policy decisions to ensure long-term conservation, management and sustainable use of the shared flyingfish resources, and protect and safeguard the ecosystems in which they are found in the Eastern Caribbean.

2. The Sub-Committee shall make recommendations for policy decisions mentioned at paragraph (1) above on the basis of scientific advice provided by the Forum, CRFM/FAO/WECAFC Working Group, UWI, or other competent technical or scientific body.

3. Without prejudice to the generality of paragraphs 1 and 2, the Sub-Committee shall:

   (1) Review proposals and make recommendations for joint action by Member States and other Cooperating States or Territories in the Caribbean designed to achieve sustainable use of the flyingfish resources;

   (2) Regularly review reports and recommendations submitted to it regarding the status of the flyingfish stocks and actions required for their conservation and management;

   (3) Provide a forum for Member States and other Cooperating States or Territories in the Caribbean to discuss and make recommendations on proposed joint conservation and management measures to ensure long-term sustainable use of the flyingfish resources;

   (4) Provide a forum for Member States and other Cooperating States or Territories in the Caribbean to discuss and propose harmonized monitoring, control and inspection scheme to ensure compliance with conservation and management measures;

   (5) Review compliance with conservation and management measures adopted by the Ministerial Council or Member States and make such recommendations to the Member States and to take action as may be necessary to ensure their effectiveness;

   (6) Review the implementation of measures for monitoring, control, surveillance and enforcement adopted by the Ministerial Council or Member States and make such recommendations to Member States or take action as may be appropriate to ensure their effectiveness;

   (7) Monitor and review information pertaining to IUU fishing and recommend actions to be taken by Member States and other Cooperating States or Territories in the Caribbean to discourage and eliminate such activities;

   (8) Refer to the Secretariat, Forum, Scientific Meeting (including the Small Coastal Pelagic Working Group and other bodies), or other competent bodies such as FAO/WECAFC or UWI, as may be necessary from time to time, in order to achieve its objectives.

[17] In addition to the six (6) CRFM Members mentioned above, Martinique is also deemed to have a real interest in the fisheries. The intention is, therefore, to provide an opportunity for Martinique to participate in the deliberations of the Sub-Committee if it so desires, subject to the negotiations of a cooperation agreement between the French Islands and the CRFM.

(9) Receive and consider reports, proposals and recommendations from the Forum or CRFM Secretariat (or other competent bodies);

(10) Perform such other tasks as it may consider necessary or as directed by the Ministerial Council or Member States to ensure sustainable development, conservation and effective management of the flyingfish fishery; and (11) Submit reports of its work to the Ministerial Council.

4. In carrying out its functions, the Sub-Committee shall be guided by the CRFM Agreement 2002, Revised Treaty of Chaguaramas 2001, and relevant principles of international fisheries law found in the 1982 UN Law of the Sea Convention, the 1995 UN Fish Stocks Agreement, the 1995 FAO Code of Conduct on responsible fisheries and associated instruments and any other relevant agreement to which the Member States are signatories.

Meetings

The Sub-Committee may meet during the Annual Meeting of the CRFM Ministerial Council or on other occasions as deemed necessary to fulfil its mandate.

Rules of Procedures

The Rules of Procedure of the CRFM Ministerial Council shall apply to the Flyingfish Sub-Committee pursuant to Rule 10(2) of the CRFM Rules of Procedure.

ANNEX III: CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean – Terms of Reference

CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean

Conveners: CRFM/WECAFC

TERMS OF REFERENCE

1. BACKGROUND AND RATIONALE[18]

The four-wing flyingfish supports important small-scale fisheries in the region in terms of employment generation, food security and supply of bait for fisheries targeting large pelagic fish species. Like other small-scale fishers in the Caribbean, fishers involved in flyingfish fisheries often belong to the lower socio-economic strata of society.

Flyingfish fisheries are concentrated in the southern end of the Lesser Antilles chain. Barbados, Tobago, Martinique and Saint Lucia all have large flyingfish fisheries and to a lesser extent Dominica and Grenada. Barbados accounts for about two thirds of the regional catch. In 2009 the total annual recorded catch in Barbados was 2292 tonnes. There were about 167 ice boats, which account for more than 90% of the catch, and 242 registered day boats in 2007. Compared to other countries in the region, Barbados also adds more value to flyingfish catches through processing and sale to the tourism sector. The annual value of the flyingfish catch in Barbados alone is estimated at USD 15 million. The flyingfish fishery is the most important fishery in Barbados employing 2000 fishers, 500 vendors as well as 325 persons employed as de-boners or workers in fish processing plants.

Other countries in the area also have important flyingfish fisheries. In Trinidad and Tobago, the flyingfish fishery is located on the Caribbean Sea coast of the island of Tobago. The number of boats involved in the fishery between 1988 and 2008 averaged 50 boats per season while in Saint Lucia, 331 vessels were engaged in the flyingfish fishery in 2007. According to figures provided by the department of fisheries, the total flyingfish catch of Saint Lucia was 109.35 tonnes in 2010.The total annual catch of flyingfish in Martinique was 47.6 tonnes in 2009 and 64.6 mt in 2010. There are no targeted flyingfish fisheries in Saint Vincent and the Grenadines. In the case of Dominica there has been a shift from the flyingfish fishery to the large pelagic fishery within the last eight years due to the increased use of FADs. The annual flyingfish landings in Dominica were reported to be 54.22 tonnes in 2011.

Unlike many other commercial species in the region the flyingfish, and in particular the four-wing flyingfish, *Hirudichthys affinis*, which comprises the majority of the flyingfish catch, has been extensively studied. There is a rich information-base on its stock delineation, distribution and biology. Less has been documented however, on the socio-economic, bio-economic and, ecological aspects of the fishery and resource, including the impacts on the population and risks associated with climate change, extreme weather events, and other aspects of global environmental change. Although the stock has been

[18] Information taken from the 2012 Draft Sub-Regional Management Plan for Flyingfish in the Eastern Caribbean which should be consulted for the references to information sources.

assessed in 2008, the capacity in terms of the maximum number of fishing vessels that should be allowed in the fishery without jeopardizing its long term sustainability has not yet been estimated.

Results of the 2008 stock assessment suggested that the stock of flyingfish in the Eastern Caribbean is not experiencing overfishing, that catch rates have remained fairly stable even with increased overall catches, and it is unlikely that catches have ever exceeded MSY for this stock. The study identified an annual catch trigger reference point of 5,000 t at which further management action should be taken to ensure the stock does not become overfished, since development beyond this level would have unpredictable consequences. The maximum recorded annual catch to date is 4,700 t. A 2011 preliminary assessment explored the bio-economic dynamic impacts of managing the multi-fleet and multispecies flyingfish fishery and undertook risk analysis of alternative fishery management decisions. Results indicated that, among other things, under open access, harvest rates in the neighbourhood of 5000 ton /year could result in collapse of this pelagic fishery but that this could be averted with catch quotas, or effort controls to reduce exploitation rates by 30% to allow the resource to recover its natural fluctuations over time. The most significant uncertainty in the 2008 and 2011 assessments stem from the poor data available on catches and effort. Improved data collection and monitoring is required to ensure sustainable use of this and other fishery resources.

Under the CLME Project a Flyingfish Case Study was completed by the CRFM. The study included a bio-economic assessment of the fishery (mentioned above); a Multi-Criteria Analysis; a Stakeholder Analysis; a review of existing policies and legislation and establishment of a CRFM Ministerial Sub-Committee on flyingfish.

At the Fourteenth Session of WECAFC, convened in Panama City, Panama from 06 to 09 February 2012, the Commission agreed *to continue all Working Groups (Spiny Lobster, Flying Fish, FADs, Queen Conch, Nassau Grouper/Spawning Aggregations) as joint working groups of WECAFC with partner organizations. It was considered that a leading role could be played by these partners as well.* The Terms of Reference for the CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean, among other joint regional Working Groups, was also agreed upon. Between March 2013 and February 2014 two joint meetings of the CRFM Small Coastal Pelagic Fish Resource Working Group and the CRFM-WECAFC Working Group on Flyingfish in the Eastern Caribbean were convened. The joint meetings focused on review of the Draft Sub-Regional Fisheries Management Plan (FMP) for Flyingfish in the Eastern Caribbean, initially drafted in 2002 by Dr Hazel Oxenford and updated in 2008 by Dr Paul Medley (WECAFC Consultants) under the previous WECAFC Ad-Hoc Working Group on Flyingfish, and subsequently updated again in 2012 by Dr Uwe Tietze (CRFM Consultant) under the Caribbean Large Marine Ecosystem Project (CLME Project). The joint meetings also gave direction in respect of national consultations to review the Draft Sub-Regional FMP and associated Draft Resolution of the respective CRFM Ministerial Sub-Committee. As at February 2014, national consultations were convened in four CRFM Member States and the reports made available to the Working Group to continue its work.

The Sixth Session of the WECAFC Scientific Advisory Group, which was convened in Corpus Christi, Texas on 03 November 2013, discussed the TORs of the various Working Groups and made recommendations for their improvement and harmonization. This revised version of the Terms of Reference for the Working Group on Flyingfish in the Eastern Caribbean gives consideration to the SAG recommendations and supports the Caribbean Community Common Fisheries Policy (awaiting endorsement of Heads of Government), the Draft Sub-Regional Fisheries Management Plan for the Eastern Caribbean Flyingfish (to be amended following Member State review and feedback and endorsed by the Caribbean Fisheries Forum and CRFM Ministerial Council Ministerial Sub-Committee on

Flyingfish) while giving due cognisance for maintaining transparency and accountability in the operations of the Working Group.

2. ROLE OF THE WORKING GROUP

2.1 Scope

The scope of the Working Group is to facilitate the achievement of management objectives as outlined in the respective sub-regional management plan for flyingfish in the Eastern Caribbean, through the application of international best practices consistent with the precautionary, ecosystem and participatory approaches to fisheries management. These management objectives are: a) sustained flyingfish resources (biological objective), b) optimal use of the flyingfish resource for long-term benefit (socio- economic objective) and c) sustained ecosystem health (ecological objective). The Working Group is to function in a technical and advisory capacity over the period April 2014 to March 2016.

2.2 Specific Terms of Reference for the period 2014 to 2016

a. Finalize and implement the [2012] Sub-Regional Management Plan for Flyingfish in the Eastern Caribbean;
b. Finalize and seek adoption by CRFM and WECAFC of a Management Resolution on Eastern Caribbean Flyingfish based on the best available scientific information;
c. Monitor and evaluate implementation of the [2012] Sub-Regional Management Plan for Flyingfish in the Eastern Caribbean;
d. Provide advice on the status of the fishery and its management to the CRFM Ministerial Sub-Committee on Eastern Caribbean Flyingfish and to WECAFC;
e. Consider options for integrating environmental variables in assessment of the status of the resource;
f. Support the regional and national level implementation of activities outlined under the CLME + (Implementation of Strategic Action Programme) that are aligned with the above Terms of Reference; and
g. Take other necessary actions on emerging issues pertaining to the sustainable use of Eastern Caribbean flyingfish.

2.3 Mode of Operation

2.3.1 Membership of the Working Group

Membership shall consist of all Member States of CRFM and WECAFC, including Overseas Territories and Departments, with a real interest in the flyingfish fishery. Membership may also include representatives of key flyingfish stakeholders of Member States as well as relevant regional organizations and experts.

2.3.2 Election of Chair of the Working Group

The Working Group shall elect a Chair from among its Members States to serve over the two-year period.

2.3.3 Role of Member States and other Collaborating Countries

a. To develop or update national fisheries management plans, based on the agreed Sub-Regional Fisheries Management Plan (FMP) for Flyingfish in the Eastern Caribbean;

b. To implement national fisheries management plans;

c. To monitor and evaluate implementation of the FMP at the national level;

d. To report annually to the CRFM/WECAFC Working Group on the progress made in implementation of national FMPs;

f. To improve the coverage and quality of data nationally to facilitate assessment of the fishery and associated stock as well as monitoring and evaluation of the FMP at the regional level; and

To support the national level implementation of activities outlined under the CLME + (Implementation of Strategic Action Programme) that are aligned with the specific Terms of Reference.

2.3.4 Role of the CRFM Secretariat

a. To assist with coordination of activities of the Working Group, at the regional level;

b. To assist with procurement of funds for the activities of the Working Group;

c. To assist with convening of meetings of the Working Group;

d. To continue efforts to formalize the relationship between France and the CRFM to facilitate involvement of Guadeloupe and Martinique in the management process;

e. To promote training in assessment methodologies and other relevant areas of interest identified;

f. To promote technical assistance and support to research and resource assessment through collaboration with regional and international research partners; and

g. To coordinate the formulation and adoption of recommendations by the Working Group so as to facilitate the decision-making process at the sub-regional level.

2.3.5 Role of WECAFC Secretariat

a. To coordinate activities of the Working Group, among CRFM and Non-CRFM Members, at the wider regional level;

b. To assist with procurement of funds for the activities of the Working Group;

c. To assist with convening of meetings of the Working Group;

d. To promote training in assessment methodologies and other relevant areas of interest identified; and

e. To promote technical assistance and support to research and resource assessment through collaboration with regional and international research partners;

f. To coordinate the formulation and adoption of recommendations by the Working Group so as to facilitate the decision-making process at the level of WECAFC Area 31.

2.3.6 Communication

Communication is critical to the efficient execution of the work programme of the Working Group, particularly during the inter-sessional periods so as to maximize the quality of outputs. Consequently, each country should designate a National Focal Point for this purpose. The National Focal Point is to liaise with the Convener/ Chair of the Working Group as well as the CRFM and WECAFC Secretariats to facilitate effective implementation of the Terms of Reference and communication among all entities. Available ICT tools, such as the CRFM DGroup and GoToMeeting, should be utilized for this purpose as far as possible. The outputs of the Working Group will be communicated through the CRFM and WECAFC Secretariats to the respective Member States.

2.3.7 Working Group Meetings

Face-to-face meetings of the Working Group should be convened at least once every two years, or as required, if resources are available. Where possible the use of available ICT tools to facilitate electronic meetings should be maximized. Meetings shall be chaired by the Chair of the Working Group.

3. AMENDMENTS TO THE TERMS OF REFERENCE

The Terms of Reference may be amended as required by Member States at the level of CRFM and WECAFC, following each two-year period coinciding with meetings of the WECAFC.