INSTITUTE OF MARINE AFFAIRS

IMA NEWS

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IMA's Re-circulating Aquaculture System

ADAPTING TECHNOLOGIES FOR FOOD PRODUCTION: INTENSIVE PRODUCTION OF FISH IN RE-CIRCULATING SYSTEMS

Paul Gabbadon, Senior Research Officer
Fisheries and Aquaculture Research Programme

Much attention has been focused on adapting technologies in developing countries for aquaculture production and various strategies have been tried to fast track aquaculture development.

Traditional pond-based systems have not been successful in Trinidad and Tobago for a variety of reasons. However, increased demand for fish and fish products coupled with declining stocks as well as the need for diversification in the local economy has seen a renewed interest in aquaculture as a source for fish and as a potential business.

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INSIDE THIS ISSUE

BOARD MEMBER PROFILE

Garth Ottley

Mr. Ottley is the Acting Director of the Department of Marine Resources and Fisheries in the Division of Agriculture, Marine Affairs, Marketing and the Environment, Tobago House of Assembly (THA). His focus is to aggressively ensure the sustainable development, management and conservation of the marine resources and fisheries within the jurisdiction of the THA. As a Governor of the IMA Board, he intends to work closely with other Board Governors and staff of the IMA to make the organization a leading research institution thus improving the services provided by the IMA. Mr. Ottley holds a BSc. in Environmental and Natural Resource Management and Marine Biology from UWI, a Diploma in Forestry from the Eastern Caribbean Institute of Agriculture and Forestry and an Executive Diploma in Business Management from Arthur Lok Jack Graduate School of Business.

NEW APPOINTMENTS

Deena Ramsaran-Nanton

Mrs. Ramsaran-Nanton joined the IMA as the Information Technology Manager at the beginning of May 2012. She is responsible for the management of the Information Technology, Remote Sensing and Geographic Information Systems teams and is tasked with leading the IMA into an era of innovation and technological advances. Mrs. Ramsaran-Nanton has over 9 years of Information Technology experience gained in the Service Provider, Telecommunications and Finance sectors. She has a BSc. in Computer Science and Management, and a MSc. in Geoinformatics from the University of the West Indies. She is currently pursuing a General MBA at Heriot-Watt University. Mrs. Ramsaran-Nanton has considerable knowledge in Disaster Recovery, Project Management, IT strategy, Data Centre, Windows Server, and ITIL and COBIT best practices.

WELCOME TO THE IMA!

RUSSKIN CUMMINGS - *Launch Captain*

ARLENE JOHNSON - *Executive Assistant*

FAREWELL

After more than 22 years working at the IMA in various capacities, I still refer to the organization as 'we'. Getting it out of my blood will take some time. Apart from the scenic physical setting, I always felt proud that our small country had the foresight to conceptualise this type of organization; one that has made significant contributions to the development of Trinidad and Tobago and the region. I only recognised the potential of the IMA while at Dalhousie University doing a Masters in Marine Management under the aegis of the Canadian Government and the IMA. There, interdisciplinary and multidiscipline marine research was the buzz and focus; we were already living that at the IMA. Under 'one roof', researchers were working in the diverse fields of geology, law, remote sensing, ecology, chemistry and microbiology for the development of Trinidad and Tobago.

Patricia Barclay-Tobitt

The best part of being at the IMA? During the last five years as Head of the Information Centre, I could not have asked for a more dedicated and easy-to-work-with staff. Getting the organisation's work out to the various publics – the technocrats, students and the man in the street was a great source of joy for me.

April 30th 2012, my retirement date, felt right! I'm happy that I had the privilege of retiring from the IMA. What do I miss most? Standing outside B7, at the top of the hill, close to 6.00 p.m. on an evening, sometimes spotting a troop of howler monkeys or our newly-resident agouti, lush greenery at our backs, the sea which this organization is dedicated to, in front of me. It was good!

IMA HOSTS NATIONAL CONSULTATION

Through the newly-established Marine Governance and Policy Department, the IMA hosted a National Consultation to Assess Research Gaps and Priorities in Marine Policy and Governance in Trinidad and Tobago on 27-28 June 2012 at Crews Inn Hotel and Yachting Centre. The objective of the Consultation was to assess research needs and priorities in marine policy and governance to inform programme activities within the IMA. Fifteen representatives from a number of governmental agencies, NGOs and private sector interests including the EMA, Buccoo Reef Trust, The Cropper Foundation, the TT Coast Guard, Fisheries Division and the Port Authority of Trinidad and Tobago participated.

Numerous research priorities were identified through this Consultation which are relevant to the issues and challenges faced in Trinidad and Tobago's marine environment. These research ideas, over the long and short term, will feed into the IMA's research programme with the view to improving management of the marine space. In general, research priorities were identified in the areas of governance, resource conflicts and management within the marine environment; one of the research needs was the 'Identification and Examination of the Legislative and Institutional Requirements to Operationalize Multilateral Environmental Agreements'.

Panellists (l-r) Dr. Avril Siung Chang, Scientific Advisor, IMA; Mr. Wayne Rajkumar, IMA Board Governor and Dr. Asha Singh, Principal Research Officer, Marine Governance and Policy, IMA

Dr. Floyd Homer, Ministry of the Environment and Water Resources (3rd from left) makes a point to the governance group

National Consultation participants

Participants in working groups

INAUGURAL ICZM MEETING AT IMA

The IMA hosted the inaugural meeting of the Cabinet-appointed Integrated Coastal Zone Management (ICZM) Steering Committee during 14-15 June. This multi-sectoral Steering Committee was appointed in April 2012 to develop an ICZM Policy Framework, Strategies and Action Plan for Trinidad and Tobago. The meeting was chaired by Dr. Rahanna Juman, Senior Research Officer, IMA, and facilitated in part by Dr. Clement Lewsey, NOAA. Stakeholder agencies included Maritime Services Division, Ministry of Tourism and Town and Country Planning Division, among others.

The objectives of this meeting were: to create a common understanding of the ICZM concept, processes and best practices; identify issues, challenges and stakeholders; define a preliminary vision and goal for the policy; identify thematic working groups; and develop a work plan for the Steering Committee.

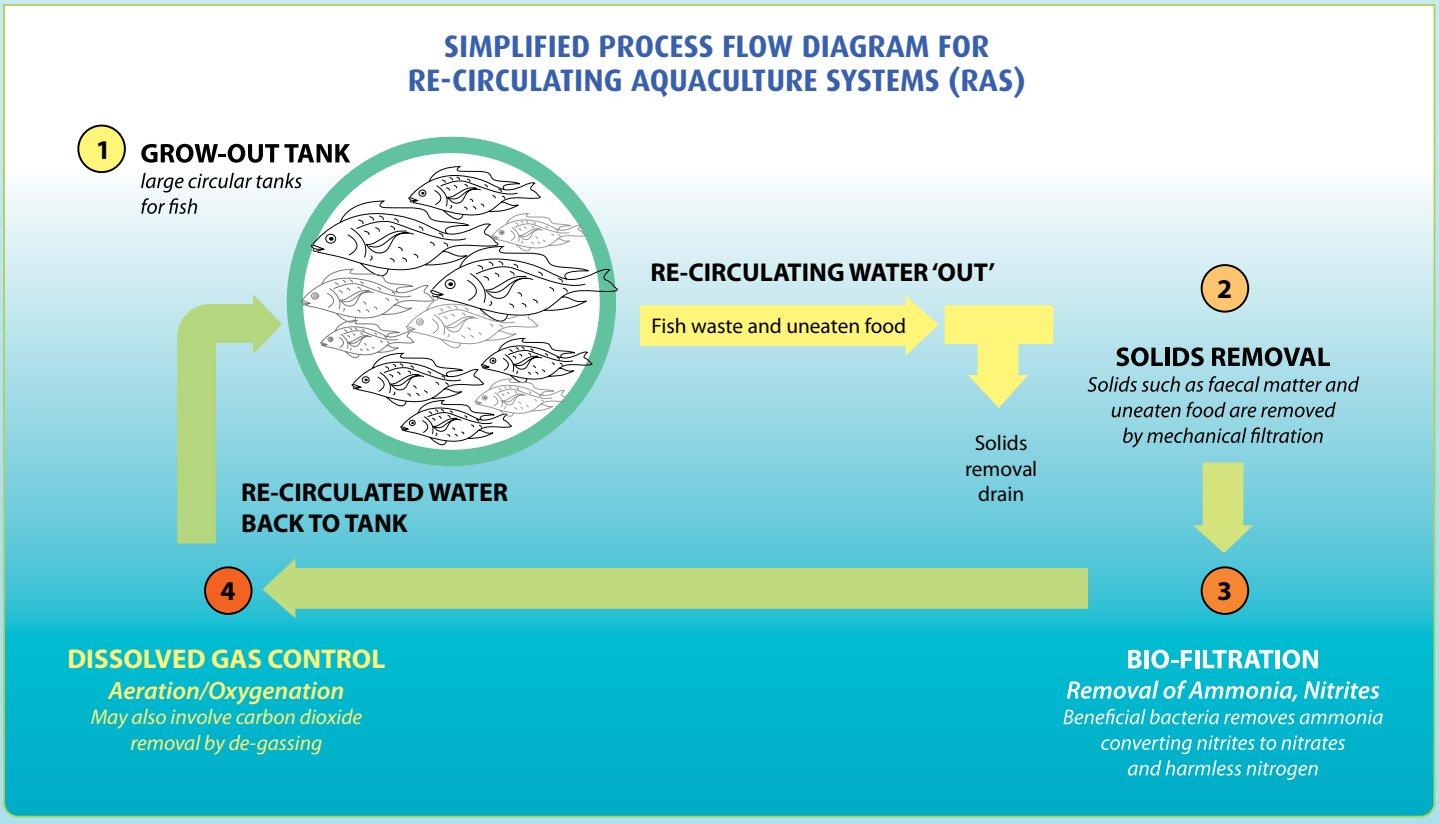
ADAPTING TECHNOLOGIES FOR FOOD PRODUCTION: INTENSIVE PRODUCTION OF FISH IN RE-CIRCULATING SYSTEMS *Cont'd from pg. 1*

Paul Gabbadon, Senior Research Officer
Fisheries and Aquaculture Research Programme

The increase in worldwide consumption of fish and increased regulatory pressure on effluent discharge to natural water bodies are forcing the aquaculture industry to develop more innovative approaches in production of aquatic organisms and management of the quality of effluents. The use of large volumes of water for maintaining good water quality for culture species and flushing out metabolic waste is no longer considered best management practice. Along with effluent, water is usually high in concentrations of nutrients as phosphates and nitrates, high sediment loads (silt, excess feed, and organic wastes) and escapees of sometimes non-indigenous aquatic organisms to the wild. Other challenges include increased cost and availability of land, problems in locating appropriate water resources and year round availability.

One of the growing fields in aquaculture both in terms of research and commercial activities is Re-circulating Aquaculture Systems (RAS). These systems reduce water usage, reuse water for continuous production, as well as recycle water for other production systems in agriculture. Re-circulating systems tend to have high stocking densities under very controlled environmental conditions. They can be used where suitable land is limited, water is scarce or when ambient environmental conditions are not suitable for the species being cultured. Due to the more intense farming approach as compared with ponds, cages or open systems, there are consequently higher risks and costs associated as well as the need for appropriate backup systems.

The RAS at the IMA was designed to grow genetically male tilapia (GMT) *Oreochromis niloticus* and red hybrid tilapia to serve as a model to potential farmers, entrepreneurs and investors and to establish technical and economic feasibility under local conditions. The RAS was selected as it is a closed production system reusing more than 85% of its water and provides a predictable, constant and manipulable environment for growing fish.



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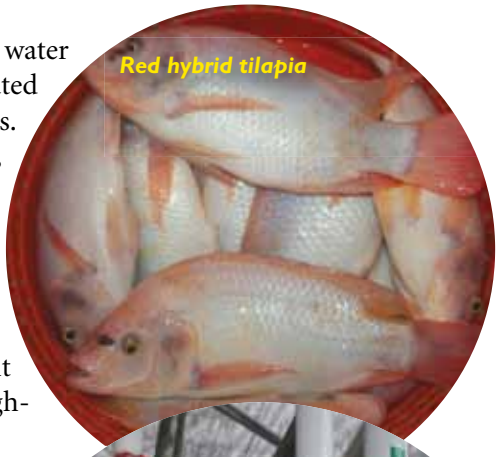
The RAS offers a number of potential advantages for aquaculture, including:

- Control of parameters that influence growth so fish farmers can better manage economic and production performance
- Production in locations where limited water is available and ability to manage waste to provide greater environmental sustainability than traditional aquaculture systems
- Bio-security and ability to locate the farm close to markets to reduce transport time and costs
- Reduced land area required when compared to pond-based systems

General Design Parameters

Careful consideration was given to the general design parameters that would allow for flexibility and ease of management of the system and would require minimum inputs of manual labour, except at times for sampling and harvesting. Aquaculture best management practices (BMPs) were considered for all phases of production. The treatment processes involved in RAS operation and management are not unique to aquaculture but are closely related to wastewater treatment systems used for domestic sewage treatment and a range of other industrial applications. The RAS is unique in the degree of water quality conditions required, the type of inputs and the characteristics of the waste products that require removal. Considerations must include the biological and behavioural characteristics of the selected culture species and the management processes to be employed while maintaining realistic and economically viable production costs.


Red hybrid tilapia

The first step for any successful aquaculture enterprise is the quantity and quality of the water to be used, its availability and suitability to the selected culture species. Contaminated sources of water will incur costs for pre-treatment as well as pose possible health risks. Typical contaminants may include sulphides, iron, heavy metals, high sediment loads, nutrients, coliform bacteria and other pathogens. Sources of freshwater include wells, streams and commercial supply. Small RAS may use domestic water supply but will require pre-treatment to remove chloramines. Estuarine and sea water are also used for marine systems but are now predominantly overshadowed by artificial compositions. Production tanks vary in size, shapes and configuration but most are made of concrete, plastic, fibreglass or plastic liners. The consistent criteria are a smooth interior, efficient drainage and height-width ratios that ensure good mixing and distribution of air throughout the tank as well as facilitating cleaning and solids removal.


Water and air supply to culture

The IMA system made use of good quality well water from the well used for our aquaculture wet laboratory and ponds. The facility is a covered shade-house of approximately 740 m^2 with ten 3,000-litre circular production tanks and other tanks serving as sumps for water treatment and recirculation. In addition, there are two mechanical filters (Polygeyser reactors) as well as eight 3,000-litre moving bed bio-filters for solids removal and nitrification. A secured control room to house pumps, blowers, feed timer, alarm system and data logger was constructed from a 6.09 m (20 ft) shipping container while another was retrofitted for feed storage. Food fish was depurated with clean well water for a minimum of 24 hours before final harvest. Approximately 17,000 kg (37,000 lbs) have been harvested from the RAS for sale to retailers, wholesalers and staff.

Efficient management of a Tilapia RAS can make the difference between profits and losses, success or failure. The RAS farm management is more than just feeding the fish and taking care of the biological processes involved, since close attention must be paid to the economic and financial measures of the RAS farm business as well. There is no single appropriate design for a tilapia RAS. It is, therefore, impossible to supply a readymade cost and returns spreadsheet that will be suitable for every system. However, best management practices and average conditions and results based on experience may be used to give a good approximation of expectations. Individual systems will have to be tailored to suit the site specifics, design and production systems used.

IMA EVENTS & ACTIVITIES

First National Sea Turtle Symposium

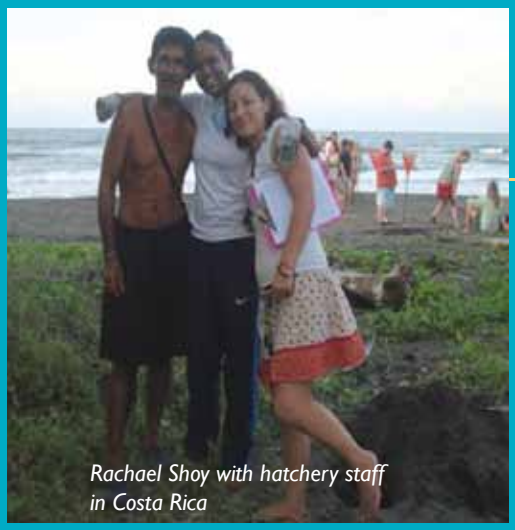
The IMA participated in the Environmental Management Authority's First National Sea Turtle Symposium on 28 May 2012 at the Hyatt Regency Hotel, Trinidad. Ms. Lori Lee Lum and Dr. Ann Marie Jobity represented the IMA on the Panels for Education and Public Awareness, and Research respectively.

The main objectives of the Symposium were to:

- inform and guide the designation process of sea turtles as Environmentally Sensitive Species;
- to initiate the launch of the Sea Turtle Support Network for Trinidad and Tobago
  and
- to plan for the implementation of the Sea Turtle Recovery and Action Plan (STRAP).

Lori Lee Lum (2nd from left) Community Education Officer, IMA and other members of the Education and Public Awareness Panel

The STRAP was developed by the Forestry Division and the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) with input from IMA and other stakeholders in turtle conservation. This document seeks to harmonise national research, conservation and management practices in Trinidad and Tobago. Dr. Roodal Moonilal, Minister of Housing and the Environment and Minister Vasant Bharath, Ministry of Food Production, Land and Marine Affairs addressed the participants at the Symposium.



Rachael Shoy with hatchery staff in Costa Rica

Nest exhumation after hatchlings emerge

Sea Turtle Hatchery Training in Costa Rica

Rachael Shoy, Research Officer, Fisheries and Aquaculture Research Programme, attended a training session entitled 'In-situ Leatherback Turtle Hatchery' from 20-26 June 2012. The session was facilitated by Dr. Didiher Chacon, Director of WIDECAST, Costa Rica at Pacuare Sea Turtle Rescue and Rehabilitation Centre on the Caribbean coast of Costa Rica.

Protection and conservation activities were already being done at Pacuare Beach when this remote area was declared a Biological Reserve in 2004. The main threats are from human poachers and beach erosion. The Rescue and Rehabilitation Centre was opened in January 2012 to help injured, sick or confiscated turtles to be nursed back to health.

Ms. Shoy received training to facilitate a proposed hatchery project by the IMA. This training included sea turtle egg collection and reburial, hatchery monitoring, nest exhumation and determination of hatch success rate, and collection of temperature and rainfall data. Ms. Shoy was also briefed on general design considerations and hatchery operations around the world.

First Meeting of the Scientific, Technical and Advisory Committee to the LBS Protocol

Dr. Amoy Lum Kong (left) and Dr. Darryl Banjoo at the first STAC meeting

Dr. Amoy Lum Kong, Director, IMA and Dr. Darryl Banjoo, Principal Research Officer, Marine Chemistry Department, IMA attended the first meeting of the Scientific, Technical and Advisory Committee (STAC) to the Protocol Concerning Pollution from Land-based Sources and Activities in the Wider Caribbean Region (LBS Protocol) from 5-7 June 2012 in Oranjestad, Aruba.

At the meeting, Dr. Lum Kong, Director of the Regional Activity Centre (RAC)-IMA presented on the activities of the RAC and indicated that it was involved in three main activities during the past two years. These activities included participation in the Interim Technical Working group on Environmental Monitoring and Assessment; participation in Regional Experts Workshop on Environmental Monitoring and Assessment and; the production and dissemination of promotional material.

Dr. Banjoo presented on the 'Environmental Monitoring and Assessment Considerations for Small Island Developing States (SIDS)'.

IMA continues its SEA & ME Programme

Point Cumana Government Primary at IMA

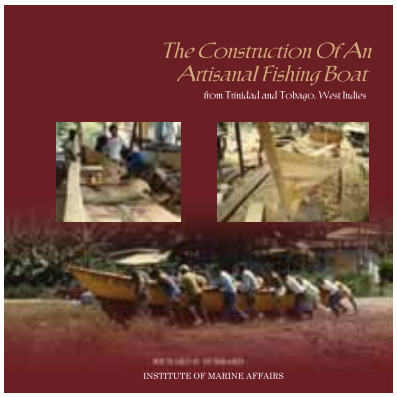
The 2012 Sea & Me Programme aimed at Standard 5 students of the Carenage and Point Cumana schools, was conducted during 17-31 May 2012 by staff of the Information Centre and the Fisheries and Aquaculture Research Programme (F&ARP). Students were given presentations on sensitive ecosystems such as Mangroves and Coral Reefs and taken on a tour of IMA's Aquaculture facilities. In the Library, they enjoyed a lively IMA version of the game, Environmental Jeopardy. This is the tenth year the IMA has carried out the Sea & Me Programme with these neighbouring communities.

Carenage Boys' Government students learn about rearing tilapia from Tyronne Walters, F&ARP

Workshop on Marine Mammal Management

Dr. Asha Singh, *Principal Research Officer, Marine Governance and Policy*, IMA attended the 'Inter-Regional Workshop on Broad Scale Planning and Transboundary Marine Mammal Management' held from 21-24 May 2012 in Panama. This was a follow up to a meeting held in Dominican Republic in March 2012, and part of the 2 ½ year project financed by the Government of Spain in partnership with various branches of the UN. The overall goal of the project is to aid in the implementation of the Programme of Work on Protected Areas and by extension the SPAW Protocol under the Cartagena Convention for the Wider Caribbean Region. It was beneficial in fostering a greater understanding of the importance of marine mammals' conservation and the efforts required to protect highly migratory species from a governance standpoint.

IMA Publications

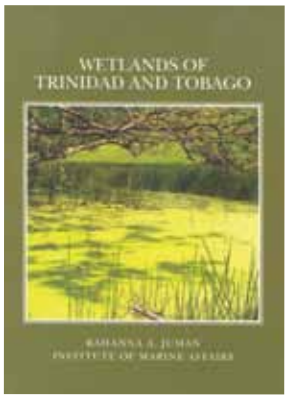


The Construction Of An Artisanal Fishing Boat

TT$150

Available at:

- Institute of Marine Affairs, *Chaguaramas*
- Nigel R. Khan Bookseller
- Paper Based Bookstore- *Normandie Hotel, St. Ann's*
- UWI Bookshop *St. Augustine*
- Rainy Days *Ellerslie Plaza, Maraval*
- Metropolitan Book Suppliers Ltd. *Capital Plaza, Port of Spain*



Wetlands of Trinidad and Tobago

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- Rainy Days *Ellerslie Plaza, Maraval*
- Metropolitan Book Suppliers Ltd. *Capital Plaza, Port of Spain*
- R.I.K Services Ltd. (Trinidad Book World)
- Mohammed's Bookstore & Associates Ltd.

THE BLUE CORNER

Little drops of water, little grains of sand, make the mighty ocean, and the pleasant land. So the little minutes, humble though they be, make the mighty ages of eternity.
Julia Carney

Slipper Lobster *Scyllarides aequinoctialis*

- The Slipper Lobster, commonly known as the 'Shovel-nosed Lobster', inhabits coral reefs.
- They feed on mussels and oysters in addition to crustaceans, polychaetes and echinoderms.
- They hide during the day in crevices among the corals and forage in the open at night.
- Like other crustaceans, slipper lobsters moult in order to grow.

Slipper lobsters are a family of crustaceans found in all warm oceans and seas. They are instantly recognizable by their enlarged antennae, which project forward from the head as wide plates.

Sources:
Humann . P (1992) Reef Creature Identification Florida, Caribbean, Bahamas. Jacksonville, FL: New World Publications, Inc.
www.allenhost.com/gallery/v/album317/Tobago/aad.jpg.html

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