WRFC

7th World Recreational Fishing Conference 2014

PROGRAM BOOK

September 1 – 4, 2014

Unicamp Convention Center

Campinas, SP, Brazil

7th World Recreational Fishing Conference

Change, transformation and adaptation in recreational fishing

PROGRAM BOOK

WRFC

7th World Recreational Fishing Conference 2014

September 01 – 04, 2014

State University of Campinas
Campinas, SP, Brazil

Cataloguing Data
Gildenir Carolino Santos (Librarian)

Print run
400 copies

Organizers
Ezequiel Theodoro da Silva
Ana Lucia Ferreira
Marilena Furlaneto

Editing and finishing
Edições Leitura Crítica
Rua Carlos Guimarães, 150 - Cambuí
13024-200 Campinas – SP
Email: emarthi@terra.com.br

Website:
http://www.7wrfc.com/

Publication cataloguing (CIP) developed by
Gildenir Carolino Santos – CRB-8ª/5447

W893c World Recreational Fishing Conference (7. : 2014 : Campinas, SP).
Change, transformation and adaptation in recreational fishing / Ezequiel Theodoro da Silva, Ana Lúcia Ferreira, Marilena Furlaneto (organizadores). – Campinas, SP: Edições Leitura Crítica; 2014.
108 p.

ISBN: 978-85-64440-22-7

1. Fishing - Congresses. 2 Fishing - Social aspects - Congress. 3 Recreation - Congresses. I. Silva, Ezequiel Theodoro da. II. Ferreira, Ana Lucia. III. Furlaneto, Marilena. IV. Title.

14-008 20ª CDD – 639.2

Printed in Brazil
1st edition - August - 2014
ISBN: 978-85-64440-22-7

Edições Leitura Crítica
www.leituracritica.com.br
Phone: (19) 3294-2540 - Campinas, SP - Brasil
Email: ezequiel@leituracritica.com.br

Contents

Welcome by Conference Chairman

As chairman and general coordinator for the 7th World Recreational Fishing Conference (Campinas, SP, Brazil), I want to welcome all participants of the event: authorities, sponsors, official guests, delegates and attendees.

The planning of this great event involved many hands - hands that were intertwined with the purpose of hosting the best possible the visitors from other lands, near and far.

Without the immense support of the members of the International Advisory Board, the Brazilian Scientific Committee, the Organizing Committee and all employees of Unicamp it would be very difficult to reach the level of excellence set for this Conference.

Now it is the time to move the event ahead, join all participants and check if everything that was carefully planned will take place successfully. It is important to remind that care has been taken of all details, but it is impossible to control all contingencies and unexpected factors that may happen during an event as big and complex as this one.

I would like to sincerely thank Congressman Carlos Sampaio that, through a parliamentary amendment, guaranteed economic support for most of the activities of this Conference. I also thank the sponsors who were able to assess the importance of the 7th Conference to leverage scientific research about recreational fisheries in the emerging countries and the third world.

My happiness is mixed with my apprehension of wondering if everything will be fine from today until the the 4th of September. We hope that the understanding and the cooperation of all participants come together so that we manage to achieve a critical, rigorous and, at the same time, joyful venue here in Campinas.

Sincerely grateful for your presence, help and cooperation,

Prof. Dr. Ezequiel Theodoro da Silva
Chair - 7th WRFC
Faculty of Education - Unicamp

Welcome by Sao Paulo Anglers Federation

We are very happy to host such distinguished people from abroad, especially the scientists that are carrying important investigations about the various aspects of recreational fishing.

Your cooperation and participation in this event of international magnitude, associated with the research projects carried out in the emergent countries will help our hard work of convincing and demonstrating to our governments the great and untapped treasure we hold in our hands.

Mainly with scientific knowledge and objective experiences it will be possible to establish sustainable management plans for the development of recreational fisheries in Brazil and all over the world.

Recreational fishing has a direct link with preservation and conservation of Nature; however, we must demonstrate that tie through concrete practices and actions.

The Paulista Federation of Sport Fishing, Tourism and Environment, a nonprofit organization, is engaged in this spirit of transforming Brazilian extractive fishing guides into recreational fishing guides committed with the preservation and conservation of fauna and flora.

Welcome everyone to our home! We will be ready to dialog with you now, at every moment of this 7th World Recreational Fishing Conference, and in the future.

We do hope that all lights and good energies of the universe conspire in our favor during this big event in Campinas, Brazil.

Yours sincerely,

Betinho Oliveira

President of the Federation of Sport Fishing, Tourism and Environment

(Presidente da Federação Paulista de Pesca Esportiva, Turística e Ambiental)

General Conference Information

Registration

The registration office is located at the entrance, right side, of Unicamp Convention Center. Registrations will previously start on Sunday, August 31, 6:00 pm, at Campinas Tenis Club and they can be made during the welcome cocktail. Next day, Monday, the registration desk will function at the entrance of Convention Center and it will be open from 8:00 am to 5:00 pm all along with the Conference activities (September 1 – 4). Last minute registrations for the 7WRFC and dinner will be accepted until September 2, Tuesday, noontime, through cash payment of fees in US dollars.

Wireless Internet Connections & On Line Webcast

Complimentary wireless internet access is available in all areas of the Convention Center and Gymnasium. Please get local access to the wireless system and insert SSID/Rede = **Visitante** and Password/Senha = **wrfc2014**.

The four keynote speakers' speeches will be transmitted to the rest of the world through streaming. The viewer should access the link http://www.rtv.unicamp.br/?page_id=813 to attend to the lectures on line real-time:

September 1 – Nigel Lester, from 09:40 to 10:40 am
September 2 – Robert Arlinghaus, from 09:05 to 10:05 am
September 3 – Rubinho Almeida Prado, from 09:05 to 10:05 am
September 4 – Julian Pepperel, from 09:05 to 10:05 am
Attention to our time zone: BRT Brasilia Time.

Speaker Check-in and Presentation Upload

There are two alternatives for presentation upload (power point):

(1) Before the Conference opening until August 25th, by filling out an identification form and sending it to the Organizing Committee according to the instructions described on the website page and making sure the we have received and tested the file. Link - http://www.7wrfc.com/?page_id=1941

(2) Personally, on Sunday evening, August 31, during the welcome cocktail at Tenis Club. Alternatively, Monday morning before the official opening session. Of course, latecomers can upload their presentation(s) during the conference breaks.

Presenters should bring their presentations on a USB memory stick. A computer technician will be available in order to check if everything is all right with the file, testing it beforehand.

Important: **Speakers will not be allowed to upload their presentations immediately before or during the sessions, nor will they be allowed to use personal laptops.**

Poster Reception. Poster Session

Presenters should bring along their poster directly to the Conference registration on Monday morning, starting at 8:00 am and ending at 1:00 pm. The presenter should check this program book in order to see the number of his poster and the theme under which it was subsumed. Afterwards, each presenter will be guided to the exhibition area in the Gymnasium where he should display his poster with the help of a student monitor. The opening of the poster exhibition, with finger food and drinks, is Monday, September 1; it will end on Thursday, September 4, noontime.

Important - **There will be a prize for the three most beautiful and objective posters - the winners will be announced during the Conference Dinner on Wednesday evening, September 3.**

Local Information Desk. Lost & Found

For a variety of information regarding local tours, restaurants, events, airport transfers, taxi, etc. visit the Information Desk at the entrance of the Convention Center. Lost and found functions at the very same desk.

Security Advice

1. **No smoking policy** - Law prohibits smoking in all closed public or private places of the State of Sao Paulo (Anti-tobacco Law Nb. 13.541, May 7, 2009). Smoking is only permitted outside the Convention Center, Gymnasium, restaurants, etc. We advise participants to avoid smoking in closed areas because penalties are high and expensive in Sao Paulo State.
2. **Personal belongings** – Take care of your personal belongings, especially laptops, cell phones, wallets, purses, chains, etc.; unfortunately, petty theft is present on campus. Carefully – and always - keep your valuables with you or leave them in a secure place at your hotel.
3. **Water and food –** Never drink water directly from any tap! Eat the food from restaurants recommended by the Organizing Committee.

Neither the Conference team nor the State University of Campinas will be responsible for any theft and/or personal loss happening during the days of the Conference.

Literature Sharing Table

Those wishing to distribute leaflets, CDs and posters about other events, institutions, services, products, etc. can bring them along and place them on a complimentary table available at the Convention Center entrance hall. All materials not removed until September 4, Thursday noon, will be discarded.

Transportation to Unicamp

Unicamp Convention Center Address:

Cidade Universitária Zeferino Vaz
Rua Érico Veríssimo, 1.011
Distrito de Barão Geraldo – Campinas / SP
Phone Nb. +55.19.3521-6500

Cidade Universitaria (University Town) Zeferino Vaz, which is the name of UNICAMP in Campinas, is located in the District of Barao Geraldo, about 12 miles from downtown Campinas and 110 km from São Paulo (1:30-hour drive).

By car:

From São Paulo-Capital:

- Bandeirantes Highway (SP-348) - Links the cities of Cordeiropolis, São Paulo, Campinas metropolitan region.
- Anhanguera Highway (SP-330) - Connects Sao Paulo-Capital to the rest of state and the Midwest region of the country.
- D. Pedro I Highway (Direction Jacarei, SJC), get access immediately after Don Pedro Shopping Center

From downtown Campinas:

By Don Pedro I Highway (Direction Jacarei, SJC), get access immediately after Don Pedro Shopping Center. Cross the bridge and follow the avenue, at the end turn left and follow the signs.

Coming by bus:

Bus Campinas-UNICAMP

Bus lines: 3:37 and 3:32 lines - there is a bus stop in front of the Convention Center.

- 3:31 - Bus Terminal - Barao Geraldo
- 3:33 - Central Terminal - Terminal Barao Geraldo

Central Terminal to Terminal Barao Geraldo Campinas. To arrive at Unicamp, you should get the line in Terminal 3:37 Barao Geraldo. You pay a single ticket.

- 3:32 - Bus - Unicamp
- 3:30 - Central Terminal - Unicamp
- 3:29 - Terminal Barao Geraldo - Campinas / Internal Transportation on Campus (shuttle bus)

An internal bus line (free of charge) circulates through the main points of Unicamp campus.

Important: **A new viaduct is being built near the main access to the Unicamp campus. There is great chance of traffic jams. We recommend that participants seriously consider that, plan their trips at least 1 hour ahead of time.**

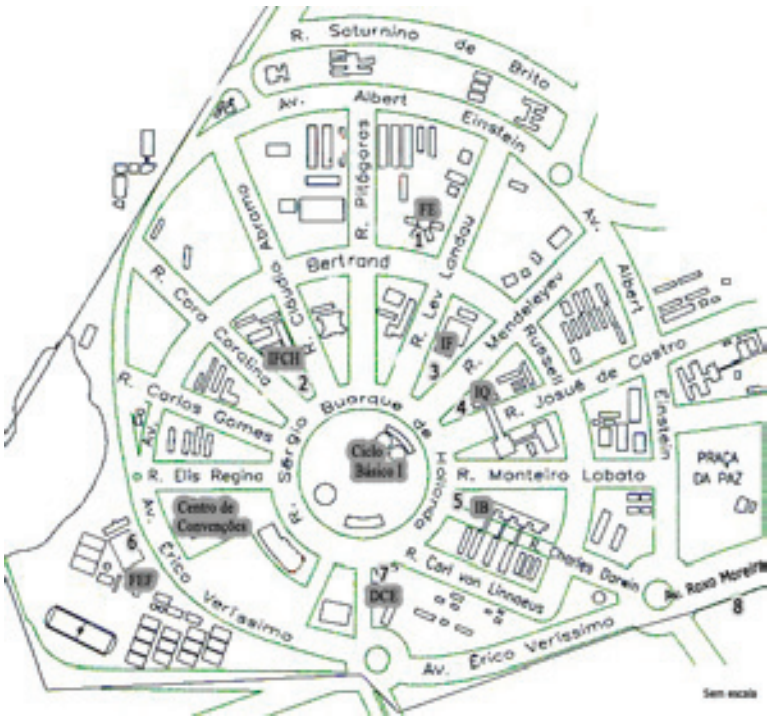
Transfer

A shuttle will be provided to make the transfer of the official guests from Vila Rica Hotel and Trip Hotel to UNICAMP Convention Center in the morning and back to the two hotels in the evening.

Food and Drinks

Luncheon and snacks are sold by the restaurants and canteens inside and outside Unicamp campus. Follow the recommendations indicated to avoid problems. Be careful whenever walking along the streets outside campus!!

Restaurants and Canteens inside Campus



1 - Cantina da Faculdade de Educação - FE
Tel: 3521-5559
Dish made and self service

2 - Cantina do Instituto de Filosofia, Letras e Ciências Humanas - IFCH
Dish made and from the menu

3 - Cantina do Instituto de Física - IF
Tel: 3521-5549
Dish made and self service

4 - Cantina do Belo (Instituto de Química - IQ)
Tel: 3521-3263
Dish made

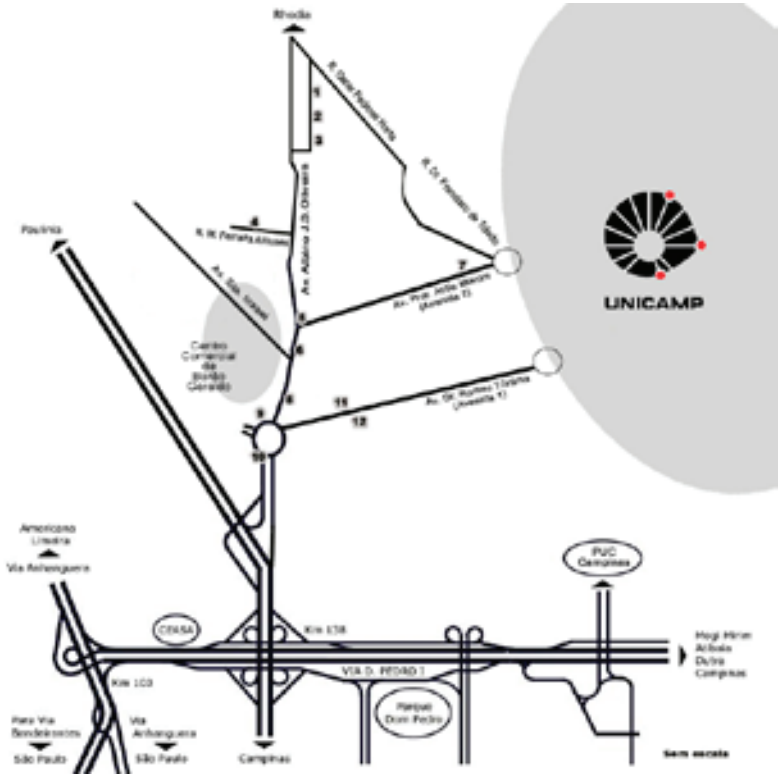
5 - Cantina Dona Gula (Instituto de Biologia - IB)
Dish made and self service

6 - Cantina da Faculdade de Educação Física - FEF
Tel: 3288-0522
Self service by kilo

7 - Cantina & Restaurante do Diretório Central dos Estudantes - DCE
Tel: 3288-0789
Self service

8 - Restaurante Del Sol
Av. Roxo Moreira, 1648
Tel: 3289-1446
Self service

Restaurants and Canteens outside Campus



1 - TBone Steak Bar
R. Maria Tereza Dias da Silva, 700 - Tel: 3289-0485
Barbecue à la carte & executive
2 - Panetteria Di Capri
R. Maria Tereza Dias da Silva, 530 - Tel: 3289-3338
Italian
3 - Tábua de Marés
R. Maria Tereza Dias da Silva, 288 - Tel: 3289-3261
Fish, meat and pasta
4 - Casa da Moqueca
Rua Maria Ferreira Antunes, 123 - Tel: 3289-3131
Fish and meat
5 - Subway
Av. Albino J. B. de Oliveira, 1556 - Tilli Center - Tel: 3201-8410
6 - Mc Donald´s
Av. Albino J. B. de Oliveira, 1430 - Tel: 3289-0318
7 - Aulus Videobar & Restaurant
Av. Prof. Atílio Martini, 939 - Tel: 3289-4453
Various types of food – pay per kilo
8 - Estância d´Oliveira
Av. Albino J. B. Oliveira, 576 - Tel: 3289-5369
Pasta and meat
9 - Supermercados Dalben
Av. Albino J. B. Oliveira, 511 - Tel: 3789-6300
Various dishes – pay per kiko
10 - Estância Grill Churrascaria
Av. J. B. Oliveira, 271 - Tel: 3289-1511
Barbecue
11 - Solar dos Pampas Restaurante e Churrascaria
Av. Dr. Romeu Tórtima, 165 - Tel: 3289-1484
Various dishes – pay per kilo
12 - Sumirê
Av. Dr. Romeu Tórtima, 304 - Tel: 3249-1264
Japanese

Contact Conference Team

For any further information you need, please contact the conference team. The Information Desk will be open from 08:30 am to 17:30 – Monday until Thursday.

Ezequiel Theodoro da Silva: +55.19.9-8114.8940
Ana Lucia Ferreira: +55.19.9-9120.1814
Marina: +55.19.9-8228.2620
7WRFC Secretary: +55.19.3521-6500
BomSenso Turismo Travel Agency: +55.19.3255.2045
Email - ana.ferreira@intermediaeventos.com.br

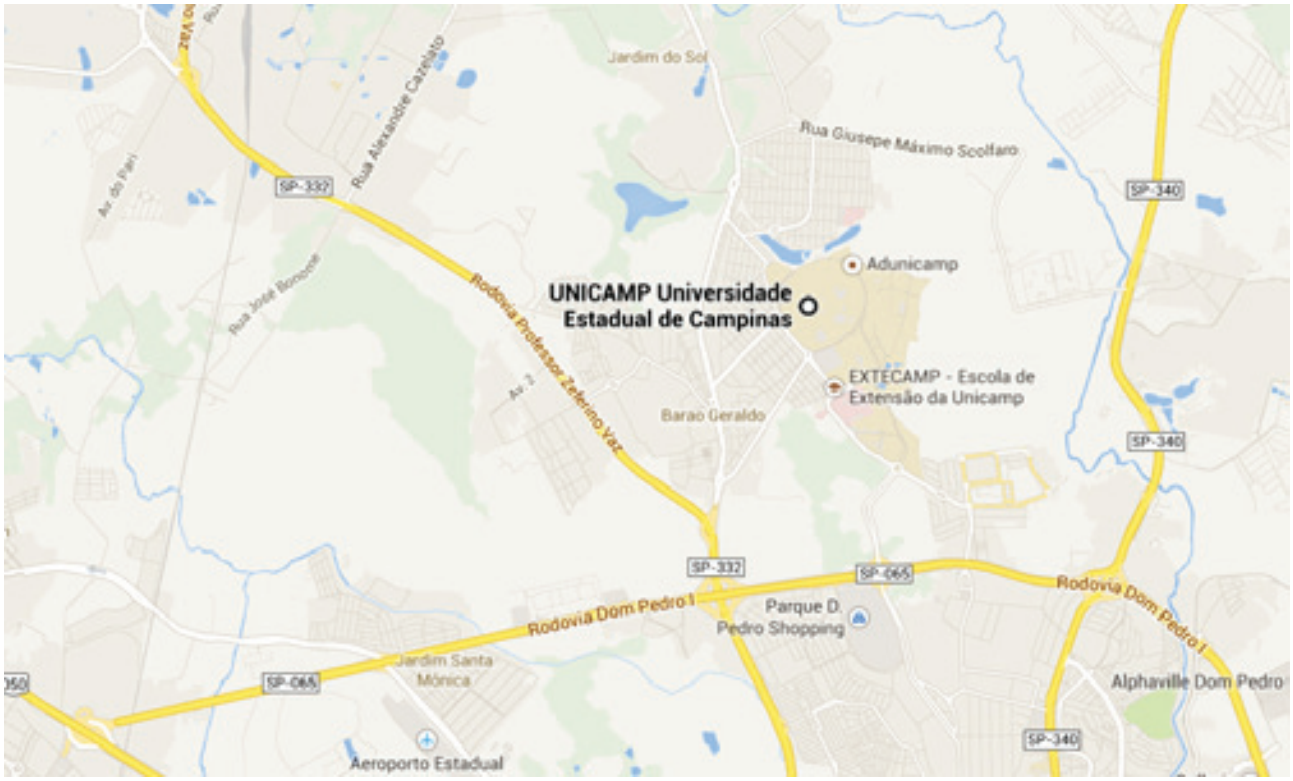
Emergency telephone numbers

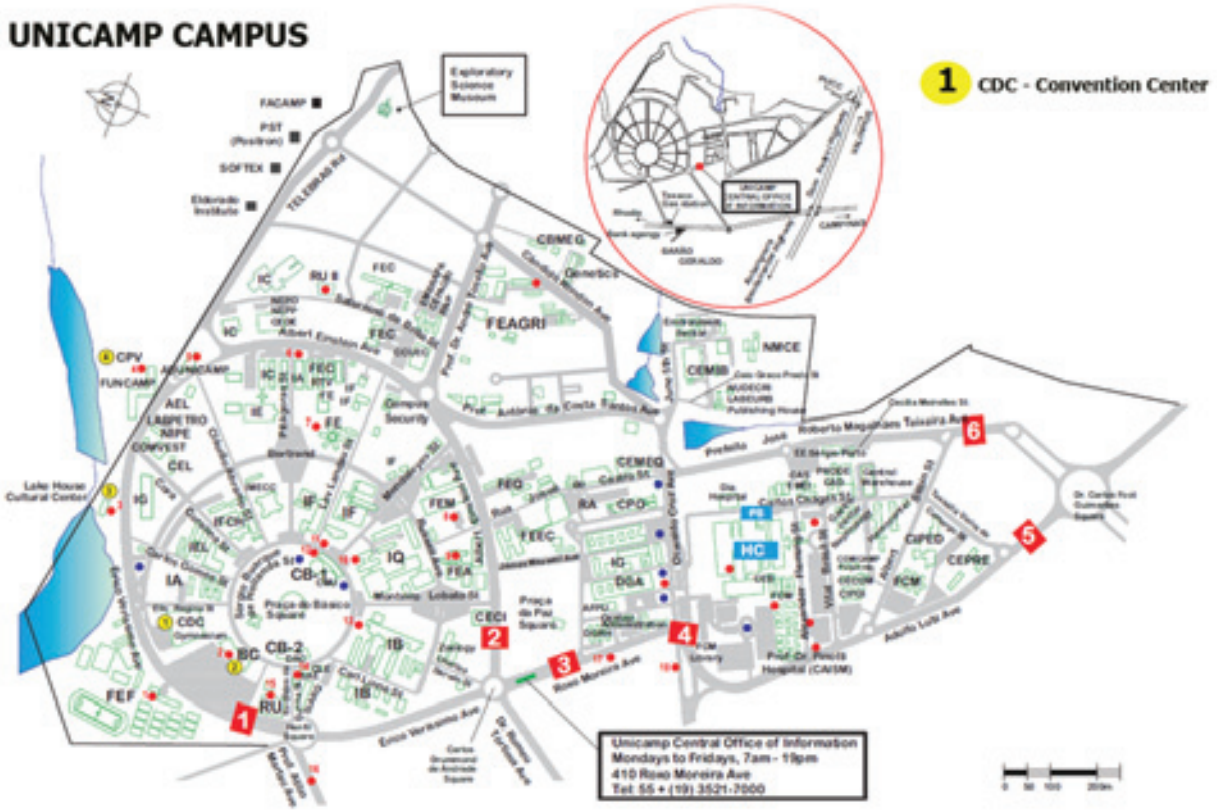
Emergency: 192 (fire and ambulance)
Police: 190
Drugstore: +55.19.3262.0075
Taxi: +55.19.3289.3300

Conference Location

All Conference activities – academic and extra scientific - will take place at Unicamp Multidisciplinary Gymnasium and the Unicamp Convention Center, both located in one single building (just one art exhibition will take place at Museu do Lago). It takes a 3-minute walk to move from one area to another. Signposts will be placed in various points to indicate the three places.

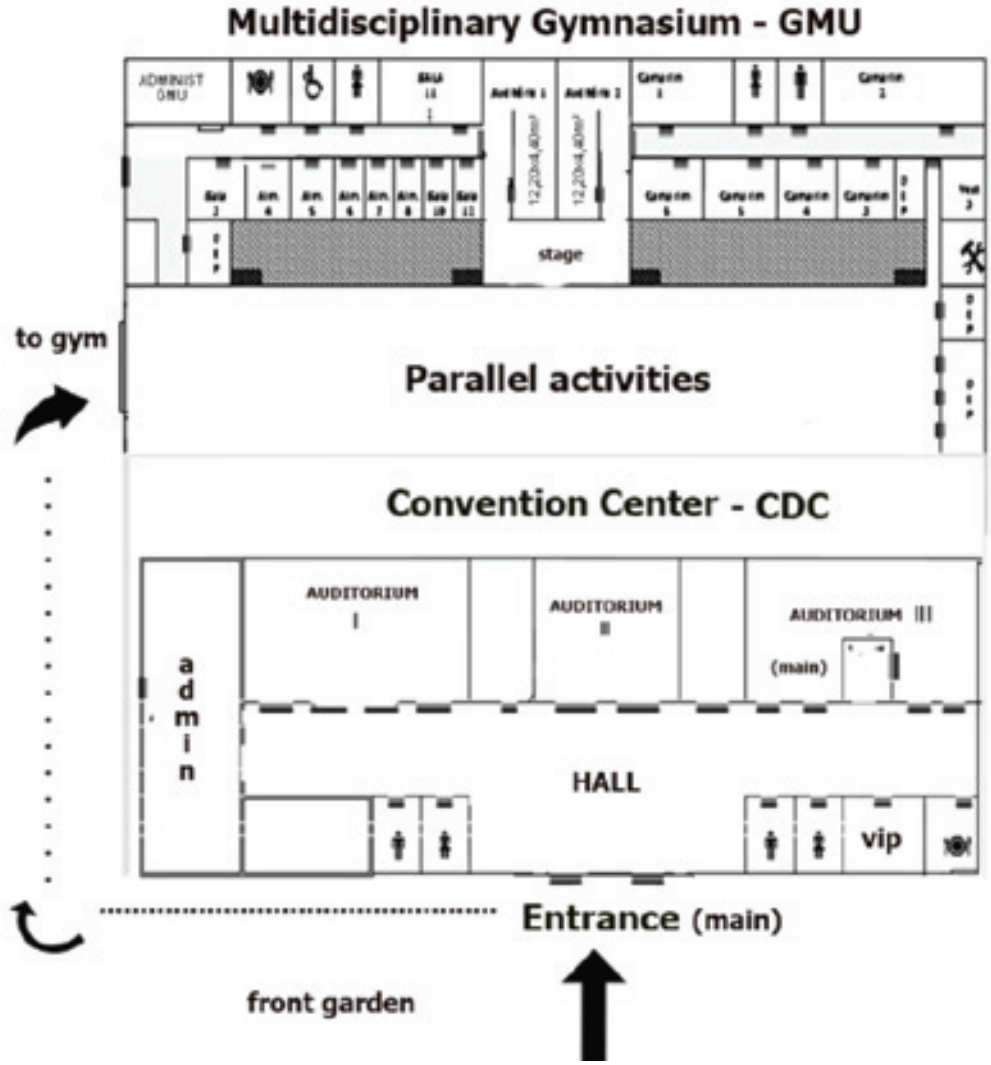
ACCESS ROADS TO UNICAMP CAMPUS

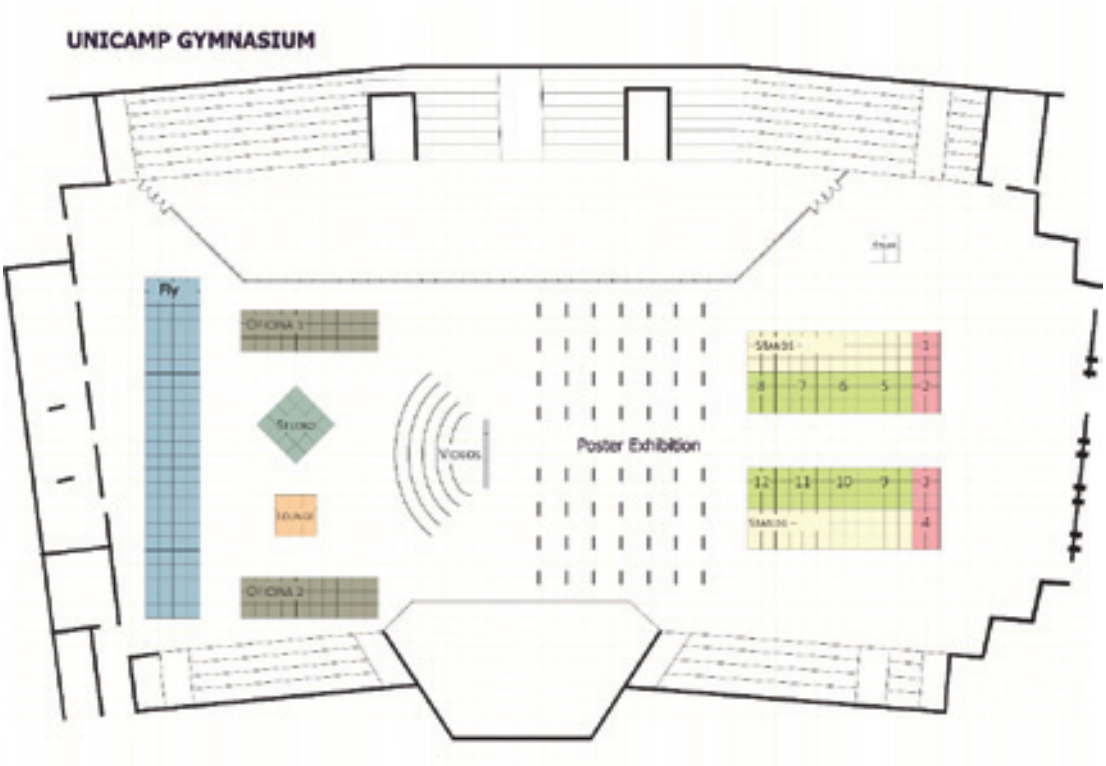




GMU - Multidisciplinary Gymnasium (Ginasio Multidisciplinar)

CDC- Convention Center (Centro de Convenções)


Multidisciplinary Gymnasium - GMU
stage
to gym
Parallel activities
Convention Center - CDC
AUDITORIUM I
AUDITORIUM II
AUDITORIUM III
(main)
admin
HALL
vip
Entrance (main)
front garden


UNICAMP GYMNASIUM
Poster Exhibition

Parallel Activities

September 01 to 04

Location: Unicamp Multidisciplinary Gymnasium

Time: from 08h30 to 17h30

Casting Arena

Experts from the Brazilian recreational fishing area demonstrate types of fly-casting and bait casting. Another goal of the arena is to engage researchers and visitors in the activity.

Fly Workshop (Betinho, President of SP Anglers Federation)

Fly Clinic

Two experienced anglers and fly tiers will show participants and visitors a simple and objective way to tie lures for fly-fishing different Brazilian species like peacock bass, dourado (Salminus maxillosus), piraputanga (Brycon hilarii), traíra (Hoplias lacerdae), dracula fish (Hydrolycus scomberoides), etc.

Big Screen – Video Cycle

"Best moments of fishing in Brazil"

Video show of recreational fisheries in different Brazilian regions by famous anglers: Betinho do Fly, Fish TV-fishermen, Ian-Arthur de Sulocki, Jair Rigotti and Rubinho Almeida Prado.

Fish TV Studio

Fish TV is the official broadcaster of the 7th World Conference of Recreational Fishing. The Conference will bring about a series of debates with scientific approaches aimed at increasing dialogue and knowledge about the diversity, dynamics and future prospects of fishing as recreation all over the world. Fish TV was chosen by the organizing committee as the official broadcaster of the event, and in addition to produce special films, carry out interviews and debates, etc. Fish TV will transmit on line the highlights of the event.

7th WRFC Mini Fair

Fish Leather Crafts – Corumba, State of Mato Grosso do Sul Brazil

The Association of Organized Women for Fish Recycling "Amorpeixe" (Lovefish) was founded in 2003 with the objective of generating employment and income for professional fishermen and their families. It is a sustainable project, carried out by a group of women from Pantanal, along with some local partners. The women's work conserves natural resources and environmental quality, contributing to the preservation of Pantanal wetland. The creation of the project has backed up the group's growth, contributing to the creation of an association that presents a transparent social contract and builds on a participatory way to seal an effective social compromise. Through a laborious process and craft, the fish skin is made into leather, taking off the peculiar smell of fish. With the fish leather more than 45 different products are made, like handbags, men's and women wallets, purses, agenda covers, bracelets, earrings, necklaces, etc. The group currently has 10 associates. The Association President is Keila Mariano da Silva.

Two best sellers about fishing in Brazil, with signing

Rubinho Almeida Prado & Alec Zeinad, “Peixes Fluviais do Brasil” (Brazilian Fresh Water Fish – sport species)*
Alberto F. de Amorim et al., “Peixes-de-bico do Atlântico”(Billfish from the Atlantic)*.

* Alec K. Zeinad, biologist and zoology professor from the State University of Sao Paulo (USP) , and Rubens Almeida Prado, arguably one of the greatest icons of Brazilian sport fishing, got together to produce this work, ensuring the credibility, comprehensiveness and quality of content. The book provides information about Brazialin sport fish species developed over more than 25 years dedicated to this sport. Numerous trips were made by Brazilian rivers, gathering information about the species, and deepening their knowledge beyond the information ‘screened’ and compiled from various technical and scientific papers.

** Sailing the blue sea is enter the territory of large ocean fish. In the abrupt slope of the continental shelf, with depths of approximately 200 meters, they reign almost absolute. Billfish of all ocean species are characterized by speed, resistance and incredible beauty. At the top of the food chain, have few rivals, to the great white shark, who dares to challenge them. Who are these animals that inspire writers and fishermen populate the imaginary? Some are found in all oceans, and others have a more restricted territory. In the Atlantic Ocean, six species are present. Although they have many features in common, each one is unique in its form and beauty. Meet them.

Rod Builder Art

Victor Poiani – Rodmaker, Jundiaí, SP

During the World Conference, RBA Rods, represented by one of its creators Victor Poiani, will exhibit a bit of his work and talk about the customization of fishing rods in Brazil and to which extent it adds value to the fishery as recreation and also the awareness of the need to preserve the wild fish species in our country. Victor will demonstrate some montages showing how a fishing rod is created, as well as its design details and finishing.

Regional Crafts – Brazilian Stones

Fernanda Lorenzetti Accessories

Sale of accessories with unique design, made with Brazilian stones, pearls and rhinestones Swarovski. Necklaces, earrings, bracelets, rings, among others.

Ama Terra

A company that believes in a better future, selling sustainable products and Solidarity Economy, using as raw material pet, organic cotton, canvas truck reused, etc.

Paintings by Brazilian Artists – Two Exhibitions

September 01 to 04

Location: Convention Center Hall

Time: 08:30 am - 05:30 pm

“Poetry at Sea” by Tiago Cesar

The paintings depicting “boats” are made with oil and acrylic paint. They are reminiscent of the sea and Brazilian fishermen (“caiçaras”). The paintings try to show the unvarnished truth of a life on the beach. Sunlight reflected on the boats gives a sensation they are alive. Everything fits and melts into one: the sun, the seawater and the boats.

Biography: Tiago Caesar got involved with drawing and painting during the course of Architecture and never abandoned art. Passionate about the possibility of communication that offers painting, Tiago admires reality with a mixture of colors that he expresses through his sensitive art. His favorite subject is boats and fishermen. He made his first exhibition at Casa do Lago - Unicamp and Piola Restaurant. Currently, he exhibits his works at the Family Center of Campinas.

September 01 to 04

Location: Casa do Lago

Time: from 08:30 am to 05:30 pm

“Country Life”, by Eliete Tordin

The exhibition portrays in Tordin’s art the spirit of countrymen. Between small valleys, it is possible to see the speckled with modest homes and work with the land represented by plantations and details of everyday life.

Biography: Eliete Tordin made her first solo exhibition in 1998 and, since then, she has developed her artistic career participating in national and international exhibitions. Self-taught in Naïf Art, she aims to keep the simplicity in her works and the form of spontaneous expression, influenced by the beauty from the area where she lives.

Tours around Campinas

Campinas was founded in 1774 and grew during the golden days of the coffee economic cycle (1800 – 1930). Today it is one of the fastest growing cities in Sao Paulo State, having approximately one million inhabitants. Carlos Gomes, Patron of Brazilian Music, was born here. The “City of Swallows”, as it is known, it offers different attractions, from technology to art, art. We hope the participants of the 7th World Recreational Fishing Conference enjoy some of our main sights.

Bosque dos Jequitibas

Rua Cel. Quirino, 2.

Museum of Natural History

Visitations from Tuesday to Sunday from 9am to 12pm and from 13h to 17h30 pm.

Fee: $ 2.00 = 1 dollar (giving right to visit the three spaces). Free admission for children up to 6 years and adults over 60 years.

The Museum of Natural History was created in 1938. Its main goal is to spread knowledge about the flora and fauna, to promote conservation, and to develop educational programs about environment. The Natural History Museum has a collection of 2000 pieces, including mammals, birds, reptiles, fish, insects and invertebrates. The animals are collected from zoos, environmental police and universities. Exhibition: Amazon Rainforest, Atlantic Forest, Cerrado, Litoral Paulista, Extinction, Animal Kingdom, Pantanal, Poisonous Animals, Fish, Botany, defense and predation, continental drift, teething adaptation, taxidermy and teratology.

House of Curious Animals

The House of the Interesting Animals, established in 2003, is a space that features live animals, according to the rules of IBAMA. Inside there terrariums with reptiles as iguanas, boas, rattlesnake, pit vipers, as well as amphibians and invertebrates such as spiders, scorpions and stick insects. The purpose of this space is to disseminate information about the importance of these animals in order to demystify the fear we feel of some species.

Municipal Aquarius

The Campinas Municipal Aquarium a section of the Natural History Museum. It is located inside a preserved house inside Bosque dos Jequitibas [an urban area with remaining Atlantic Forest, listed by CONDEPHAAT

(1970) and CONDEPACC (1991)]. The Aquarium was organized in 1992, undergoing revitalization in 2008-2010. Its current objective, which follows the IBAMA norms regarding conservation and animal welfare, features 13 freshwater aquariums and ten saltwater, with specimens of the fauna of the Atlantic and Pacific oceans and river basins in Brazil. The Aquarium, besides being a place of leisure, proposes to expand the dissemination of knowledge of marine and freshwater fish, the water ecosystems and their importance for life on the planet.

Lagoa do Taquaral – Parque Portugal (Taquaral Lake – Portugal Park)

Avenida Dr. Heitor Penteado, 1671

A nice place for walking, running, cycling and skating. Area of 800.000 m2, with lots of safe tracks for the practice of different sports (2,7 km extension). Planetarium, monorail, paddle, soccer fields, bike path, etc. Also, visit the replica of the caravel used by Pedro Alvares Cabral when he discovered Brazil in 1500.

Campinas Downtown: a few attractions

Jockey Club, historical and preserved building built in 1925. Also, visit Largo do Carmo and Church.

Mercadao, appropriate place to try or buy Brazilian delicacies and seasonings. One century of history, with 98 small shops inside.

Metropolitan Cathedral (1883), it took more than 7 decades to be built. Externally: neoclassical style. Inside: "baiano" baroque style decorated with beautiful pieces of carved wood.

Culture Station (1884), the old railway station turned into the headquarters of the Municipal Culture Secretary. The bricks were imported from England and its architecture leads the visitor to the Victorian Age. It was a regular train station until 2001; since then, its immense headquarters have been used to promote cultural activities.

All these points can be visited on foot. The walk will take no more than 2 hours.

Social Events

Welcome Reception and Cocktail – Sunday, August 31

This informal get-together will take place at Campinas Tennis Club (Rua Coronel Quirino, 1346, Cambui, Campinas) from 6:00 to 9:00 pm.

Poster Session Opening and Cocktail – Monday, September 1

This event will take place in the Multidisciplinary Gymnasium, starting at 5:30 pm and ending at 8:00 pm. Finger food, fruit juices and beverages will be served. Five judges will select the 3 best posters and the winners will be announced at the Conference Dinner on Wednesday evening.

Campinas – Pizza and Chopp – Tuesday evening, September 2

Campinas is famous for its beer and "cachaça" houses. Of course, there are an array of different possibilities of spending your free evening visiting the shopping centers (Galeria, Iguatemy and Don Pedro), galleries or

musical shows. The organizers highly recommend Bar Giovannetti (the best chope/draft beer in the region), Chopp Cathedral (Catedral do Chope), Braz (pizza place and draft beer) and SeoRosa. In case you try the Brazilian "cachaça", be sure to have someone to show you the way back to your hotel!

Conference Dinner – Wednesday evening, September 3

The official dinner will start at 7:00 pm and food will be served at 8:00 pm. It will take place at Campinas Tennis Club (Rua Coronel Quirino, 1346, Cambui, Campinas). The dinner was included in the *full* registration fee, but late registrations for dinner can be made until Tuesday noon. Delikatessen Buffet prepared a nice menu, including cocktail ("caipirinha" and beer), three main dishes (pasta, fish and meat), Brazilian desserts and nice Brazilian coffee at the end. Announcements: the host country for the 8th World Recreational Fishing Conference - 2017 and the authors of the three best posters. Prepare yourself for a surprise show.

International Advisory Board of the 7th WRFC

EZEQUIEL T DA SILVA (Chair)
State Univ.of Campinas – **Brazil**

ANDY DANILCHUK
University of Massachusetts Amherst – **USA**

BERNARDO UGALDE MUÑOZ
Consultora Pupelde Ltda. – **Chile**

BRETT JOHNSON
Colorado State University – **USA**

DOUGLAS T BEARD
USGS – **USA**

GENE WILDE
Texas Tech University – **USA**

JASON SCHRATWIESER
International Game Fish Association – **USA**

JOSEP ALÓS
IMEDEA – **Spain**

JUN-ICHI TSUBOI
Fisheries Research Agency - **Japan**

MICHEL DEDUAL
Department of Conservation – **New Zealand**

NÉSTOR CARLOS SAAVEDRA
Recreational Fishing Journalist – **Argentina**

ROBERT ARLINGHAUS
Leibniz-Institute of Freshwater Ecology and Inland Fisheries – **Germany**

STEPHEN SUTTON
James Cook University – **Australia**

STEVEN COOKE
Carleton University – **Canada**

TOMISLAV TREER
University of Zagreb – **Republic of Croatia**

WARREN POTTS
Rhodes University - **South Africa**

WEIMIN WANG
Huazhong Agricultural University – **China**

IAN COWX
University of Hull – **United Kingdom**

Brazilian Scientific Committee of the 7th WRFC

ADALBERTO F. DE OLIVEIRA F°
Paulista Anglers Fed.

JOÃO P. VIEIRA
FURG

PAULO CHAVES
Univ. Fed. do Parana

ANDRÉ L. Q. SANTOS
Univ. Fed. Uberlandia

KÁTIA FREIRE
Univ. Fed. Sergipe

PAULO TRAVASSOS
Ass, Bras. Eng. de Pesca

CARLOS E. C. FREITAS
Univ. Fed. Amazonas

LEANDRO G. OLIVEIRA
SISEMA-MG

RAFAEL TUBINO
Univ. Gama Filho

CLÁUDIO OLIVEIRA
Soc. Bras. Ictiologia

LUIZ F. D. DE OLIVEIRA
Projeto Piabanha, Rio de Janeiro

SANDRA MORELLI
Univ. Fed. Uberlandia

IAN-ARTHUR DE SULOCKI
Kalua Boat

MAGDA ANDRADE-TUBINO
Univ. Fed. Rio Janeiro

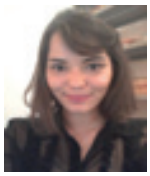
SOLANGE ARROLHO
Univ. Est. Mato Grosso

Local Organization Team of the 7th WRFC

COORDINATORS

Ezequiel Theodoro da Silva
Coordination

Elenize Maria Alonso David
Project Supervisor



MARIANA CRUZ
Press and Marketing

Adailton Clayton Santos
Photo & Video

Fernanda de Faria
Int. Relations

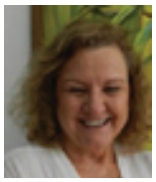
Marina Berriel
Transportation

Ana Lucia Ferreira
Executive Coordination

Geny Yamagute
Trips, Tours and Housing

Renato Faria
Website and Graphic Design

Clélio Scucuglia Lorenzetti
Budget



Marilena Furlaneto
Press and Marketing

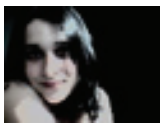
Thais Rodrigues Marin
Public Relations

Duini Magalhaes Redondo
Monitor Supervisor

Suzana de S. A. P. Ziliotti
Administrative Supervisor

STUDENT MONITORS

Adriano R. Mastroléa
Social Sciences



Angélica Calderari Brotto
History

Laryssa L. S. de França
Social Sciences

Marli M. de Farias
Pedagogy

Otávio B. A. Ariza
Performing Arts

Bruno C. M. Sant Anna
Physical Engineering

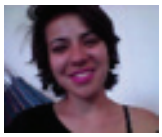
Diogo C. Silva

Paloma L. M. Fortunato
Physical Education

Patricia Hernandes Chaves
Pedagogy

Letters

Fernanda C. S. Almeida
Geography



Jéssica A. S. Rodrigues
Chemistry and Physics

Rodolfo Junior Fordiani
Mathematics

Viviana Echávez Molina
Multimedia- Arts

Keynote Speakers

Nigel Lester

Nigel Lester is a Fisheries Research Scientist with the Ontario Ministry of Natural Resources in Peterborough, Ontario, Canada. He holds a D. Phil. from the University of Sussex (Brighton, England) and a M.Sc. from Queen's University (Kingston, Ontario). His recent research has focused on the effects of climate and other environmental variables on fish life history and production. In addition, he has led the development of sampling standards and designs for monitoring lake ecosystems in Ontario.

Speech: "Enlightened Management of a Landscape Recreational Fishery"

September 1 – 2014, Monday, 09:40 – 10:40 am

Summary – The province of Ontario (Canada), with over 250,000 lakes and thousands of kilometres of rivers, supports a recreational fishery of two million anglers spending over 2.3 billion dollars a year on fishing-related expenses. It is impossible to manage this fishery on a lake-by-lake basis. In 2007, the province of Ontario formally launched a broad-scale approach to management of this landscape fishery. This approach shifted the emphasis from lakes to geographic zones when setting and evaluating management goals. My talk will provide an overview of the science needed to monitor and manage fisheries at this scale. The science includes traditional fisheries science aimed at understanding the environmental determinants of fish production and the impact of exploitation, as well as social science that focuses on angler behavior. I will describe the monitoring program that has been implemented in Ontario and show how science and monitoring is expected to guide management in adapting to ecological, social and economic changes.

Robert Arlinghaus

Professor for Inland Fisheries at Humboldt-University, B.Sc., M.Sc. and PhD from Humboldt-University working on questions of recreational fisheries from an interdisciplinary perspective. About 120 publications in the primary literature, including several books and edited volumes on recreational fisheries. Awards include the Medal by the Fisheries Society of the British Isles and the Awards of Excellence in Fisheries Management by the American Fisheries Society. Associate Editor of North American Journal of Fisheries Management and Editorial Board of Human Dimensions of Wildlife.

Speech: "Social Value Change and Sustainable Fisheries"

September 2 – 2014, Tuesday, 09:05 – 10:05 am

Summary – Recreational fisheries do not operate in isolation. Instead, they are tightly coupled to the contemporary Zeitgeist. With increasing urbanization, societal-level values shift, emphasizing values such as conservation of wildlife and of the well-being of individual fish. Some of these changes entail stark transformation to traditional practices in recreational fisheries. I will show the prevalence of society-defined norms of proper behaviour and how social value shifts affect recreational fisheries, drawing on examples from Europe in the context of fish welfare. I will also tackle the question of whether fish feel pain and if that matters morally.

Rubinho Almeida Prado

Biography: A graduate in economics Mackenzie University, he worked for 13 years at Citibank NA organizations. He got started professionally in the recreational fishing market in 1990. He built a wide range of knowledge about recreational fishing and, nowadays, he is the most famous sport fisherman in Brazil. He is an authority on the fishing area and can, therefore, talk about different aspects of the matter. His presence in the segment has been remarkable; the introduction of catch and release in Brazil is attributed to him. Being an economist, he has dedicated most of his time to the development of recreational fishing sector in Brazil and Latin America in the last twenty years. He pioneered the fishing programs for TV and he was in the video until early 1998, when he stopped for a while in order to develop other activities in this segment, such as tourism, courses, seminars, training, etc. In 2002, he consolidated his tourism agency activities with Pescaventura, always defending the philosophy of catch and release. In 2010, he returned to TV with a new fishing program called "Pescaventura".

Speech: "Recreational Fishing in Brazil and Latin America: potentialities, needs and challenges"

September 3 – 2014, Wednesday, 9:05 -10-05 am

Summary: Brazil and several Latin American countries offer immense potential for recreational fishing practices, not only for the large number of fish species, but also for the growth and improvement of infrastructure for leisure fisheries. At this conference, within the limits of the possible, I intend to provide an overview of recreational fisheries in countries of Central and South America, showing the main species, types of fishing, and defining their needs and challenges for the near future.

Julian Pepperel

Julian Pepperell is a marine scientist specializing in recreational fisheries. He is a recognized world authority on large pelagic fish, in particular, billfish, tuna and sharks, writes regularly for many national fishing magazines, is a past President of the Australian Society for Fish Biology and the author of the award winning book, 'Fishes of the Open Ocean', UNSW Press 2010.

Speech: "Shrinking access to places and species. The growing impacts of MPAs and threatened species listings on recreational fishing."

September 4 – 2014, Thursday, 09:05 – 10:05 am

Summary: In recent years, Marine Protected Areas have been rolled out on an unprecedented scale, none more so than in Australia. Even though most of these are multiple-use in concept, the areas being set aside for no-take are increasing hugely in size, with concomitant erosion of access for recreational fishers. At the same time, there continues to be a steady increase in the listing of recreationally important fish species under various levels of threatened or endangered classifications. And while some of these listings reflect local situations, they often have international ramifications, especially for highly migratory fish species. I will examine these developments and their present and future impacts on recreational fishing, focusing on Australia, which now contains 40% of the world's MPAs by area.

Conference Theme and Sub Themes

Change, transformation and adaptation in recreational fisheries

Change constitutes a fundamental property of all recreational fisheries; it is inevitable. To maintain and continuously develop recreational fisheries adaptation is pertinent. This involves adapting to ecological as well as social, economic or policy changes. What are the conditions that help a recreational fishery to successfully adapt to change? What are the factors that constrain or impede change? This conference is meant, above all, to provide the scientific and practical experience to answer change and adaptation-related questions, both from a social and natural scientific perspective. Such knowledge is particularly relevant for countries in economic development where rapid increase in recreational fisheries is expected to meet with substantial ecological and social changes on short time scales.

The main purpose of the 7WRFC is to foster productive dialogue among all stakeholders involved with recreational fishing in order to promote sustainability science all over the world. To carry out that dialogue, the organizers emphasize and assume the following scientific principles: holistic/integrative approaches to investigate the problems related to recreational fisheries; interdisciplinarity to analyze phenomena related to recreational fishing; and appropriate communication and information to facilitate the understanding of scientific outcomes among professionals and recreational anglers.

Key Issues

I. Social and environmental changes and its impacts in recreational fisheries

Recreational fisheries as integrated systems. Fish populations of today's world. Climate change. Preservation and renewal of stocks. Fish vulnerabilities. Measures to combat environmental harms and hazards (rehabilitation policies and actions; harvest regulations). Place of recreational fishing amongst competing demands.

II. Transformation and maximization of social and economic benefits generated by recreational fishery activities

Economic valuation. Societal benefits: poverty alleviation and livelihoods. New technologies. Communication networks among practitioners. Policies and regulations. Management approaches to sustain recreational fishing. Angling tourism.

III. Recreational fisherman's attitudes to cope with the impacts of change

Environmental and aquatic stewardship. Conservation and enhancement of aquatic systems and biodiversity. Ethical conducts; codes of conducts. Responsible fishing. Angler's behaviors towards ecological sustainability.

Additional issues

IV. Technological innovations in the recreational fishing area

V. Catch-and-release practices: novel insights

VI. Innovative management and governance methods in the recreational fishing area

VII. Research on angling diversity around the world

VIII. Minimum and maximum size for catches: policies and regulations

IX. Southern Hemisphere Recreational Salmonids Fisheries

X. Plural use of fishing resources as strategy for conservation

XI – Assessment of the Economic Importance of Recreational Fisheries

XII – Sustainability Sport Fishing of Billfish off Southwestern Atlantic

Daily activities of the 7th WRFC

Note: Every effort has been made to adhere to this schedule. Due to the nature and the dimension of the conference, some unexpected scheduling might have to be made. Please check the final schedule that will be in your registration packet for any change.

	Coffee break or Lunch
	Simultaneous translation (English Portuguese)
	web broadcast (streaming) on line transmission

Sunday, August 31	
Time	Tenis Club de Campinas Rua Coronel Quirino, 1346 (Cambuí, Campinas)
06:00 – 09:00 **pm**	Registration and Welcome Reception (Finger Food and Drinks)

Monday, September 01			
Time	Convention Center (CDC) – Unicamp		
08:00 – 09:00 **am**	Welcome and Registration (Light coffee and tea)		
09:00 – 09:10	Ezequiel Theodoro da Silva – Conference Inauguration		
09:10 – 09:30	Welcome address by Jose Tadeu Jorge – Rector of the State Univ. Campinas Welcome address by Betinho – President of SP Anglers Federation		
09:30 – 09:35	Introduction to Keynote Speaker by James R. Kahn		
09:35 – 10:30	Keynote Speech 1- Nigel Lester - Enlightened Management of a Landscape Recreational Fishery		
10:30 – 11:00	**Coffee Break**		
11:00 am – 01:00 pm	Roundtable – Assessment of the economic importance of recreational fisheries Coordination – Katia de Meirelles Felizola Freire (Brazil) Guests: Rashid Sumaila (Canada) and Brad Gentner (USA)		
01:00 – 02:30 pm	**Lunch**		
	AUDITORIUM I	**AUDITORIUM II**	**AUDITORIUM III**
	Social and environmental changes and its impacts in recreational fisheries **Chair**: Stephen Sutton	**Transformation and maximization of social and economic benefits generated by recreational fishery activities** **Chair**: Tomislav Treer	**Research on angling diversity around the world** **Chair**: Michel Dedual
02:30 – 02:50	**Alós et al.:** **75** - Recreational angling promotes timidity-related behavioral traits that collectively reduce encounters between fish and anglers	**Wilson:** **99** - Rebuilding angler participation through innovation – the British Columbia Experience	**Aalderen et al.:** **29** - Aerial and on-site surveys of recreational fishery on inland waters

02:50 – 03:10	**Väätäinen et al.:** **16** - Does standard metabolic rate explain personality variation in Eurasian perch (Perca fluviatilis L.)?	**Gillett et al.:** **107** - Improving resource resilience through people development: building capacity in Australia's recreational fishing sector	**Bower et al.:** **56** - Recreational fisheries in emerging economies and the developing world: identification of knowledge gaps and management priorities
03:10 – 03:30	**Díaz-Gil et al.:** **80** - Recreational angling may shape the morphotype and the metabolic scope in a small-bodied marine recreationally exploited fish	**Visit Mini Fair**	**Danylchuk:** **55** - Catch-and-release of giant trevally (Caranx ignobilis): can a rapid assessment reveal conservation issues and management needs for an emerging recreational fishery?
03:30 – 04:00	**Coffee Break**		
	Social and environmental changes and its impacts in recreational fisheries **Chair**: Warren Potts	**Transformation and maximization of social and economic benefits generated by recreational fishery activities** **Chair**: Steven Cooke	**Research on angling diversity around the world** **Chair**: Jason Schratwieser
04:00 – 04:20	**Fernandez et al:** **61** - General characteristics of recreational fishing in the influence area of the Itaipu Reservoir	**Beardmore et al.** *Presenter* – Arlinghaus**,** R. **39** - Effectively managing angler satisfaction in recreational fisheries requires understanding the fish species and the anglers	**Tubino:** **114** - Patterns capture onboard recreational fisheries: an exploratory multivariate approach
04:20 – 04:40	**Tsuboi et al.** **11** - Spatiotemporal monitoring of 134Cs and 137Cs in the freshwater fishery grounds of the algae-grazing fish ayu, Plecoglossus altivelis, after the Fukushima Daiichi nuclear power plant accident	**Kahn & Freitas:** **28** - Community-Based Sport Fishing as a Sustainable Development Path in Remote Regions in Developing Countries	**Bower et al.:** **90** - Talking to the tigers of the water: rapid assessments of catch-and-release Mahseer (Tor spp.) recreational fisheries on the Cauvery and Ganges rivers, India
04:40 – 05:00	**Hühn et al.:** *Presenter***:** Arlinghaus, R. **33** - Additive versus replacement effects of stock-enhancement exemplief by juvenile pike (Esox Lucius L.) stocking into German gravel pit lakes	**Visit Mini Fair**	**Freire et al.:** **122** - First analysis of recreational oceanic fishing off Northeastern Brazil
05:30 – 08:00 **pm**	**POSTER EXHIBITION** Finger food and Drinks – Gymnasium (This activity ends on Thursday, September 4 – noon)		

Tuesday, September 02			
Time	Convention Center – Unicamp		
08:00 – 09:00 **am**	**Light coffee and Tea**		
09:00 – 09:05	Introduction to Keynote Speaker by James R. Kahn		
09:05 – 10:05	Robert Arlinghaus - Social Value Change and Sustainable Fisheries		
10:05 – 10:30	**Coffee Break**		
	AUDITORIUM I	**AUDITORIUM II**	**AUDITORIUM III**
	Assessment of the Economic Importance of Recreational Fisheries **Chair:** Josep Alós	**Transformation and maximization of social and economic benefits generated by recreational fishery activities** **Chair:** Katia Freire	**Catch-and-release practices: novel insights** **Chair:** Andy Danylchuk
10:30 – 10:50	**Clarke & Bailey:** **12** - Review of BC's Angling licence options and analysis of future directions	**Hyder et al.:** **63** - A survey of recreational sea angling activity and economic value in England.	**Cooke et al.:** **50 -** How should we revive exhausted fish prior to release?
10:50 – 11:10	**Rautiainen et al.:** **44** - Regional economic impact of recreational fishing and hunting in Finland		**Ferter et al.:** **22** - Avoiding tagging bias in post-release behavior studies: Experimental catch-and-release of acoustically pre-tagged Atlantic cod (Gadus morhua) in a natural marine environment
11:10 – 11:30	**Southwick et al.:** **03** - Measuring the economic contributions of recreational fishing in a developing nation: the Panama Report	**Fujitani et al.:** **85** - A randomized experiment on the effectiveness of lecture-based instruction on recreational angler knowledge and attitude shifts in relation to fish stocking	**Brownscombe et al.:** **60** - Post-release behavioral impairment and predation risk in angled fishes
11:30 – 11:50	**Mosa & Sühring:** **118** - Economic valuation of recreational fishing in the Province of Salta, Argentina	**Andrade & Oliveira:** **06** - Recreational fishing tourism on the Brazil-Bolivia border	**Freitas et al.:** **18** - Mortality rates for sporting fishing of the peacock bass Cichla spp. at the Unini River (Amazon Basin - Brazil)
11:50 am – 12:10 pm	**Dellacasa:** **113** - An approach to economic movement generated by some saltwater fishing tournaments in Buenos Aires, Argentina	**Riepe et al.** *Presenter*: **Arlinghaus R** **26** - A sustainability science route to sustainable fish stocking.	**Ferter et al.:** **23** - Barotrauma and recovery of Atlantic cod (Gadus morhua) after rapid decompression: combining field observations and X-ray technology ***(continue)***

12:10 – 02:00 **pm**	**Lunch**		
	AUDITORIUM I	**AUDITORIUM II**	**AUDITORIUM III**
	Recreational fisherman's attitudes to cope with the impacts of change **Chair:** Jun-Ichi Tsuboi	**Innovative management and governance methods in the recreational fishing area** **Chair:** Michel Dedual	**Catch-and-release practices: novel insights** ***(continued)*** **Chair:** Andy Danylchuk
02:00 – 02:20 **pm**	**Sutton et al.:** **91** - A collaborative approach to using historical spearfishing competition data to identify climate-induced environmental changes and develop adaptation options for the spearfishing community	**Barwick et al.:** **35** - The fisher, the manager, the conservationist and the scientist. Collaborative management of Australia's Murray Cod Fishery	**Klefoth et al.:** **34** - Angling-induced direct selection on boldness in common carp (Cyprinus carpio)
02:20 – 02:40	**Fairclough et al.:** *Presenter:* **Pagano, M.** **41** - Breathing life into fisheries stock assessments through citizen science	**Harrison & Rowland:** **43** - Making management simple – improving social amenity of recreational fishing	**Weltersbach et al.:** **71** - Effect of hook size and handling on post-release survival of European eel (Anguilla anguilla)
02:40 – 03:00	**Aarts:** **25** - Key success factors for a growing sport fishing organization in The Netherlands	**Clarke & Post:** **64** - Science for the sustainable managment of Canada's recreational fisheries	**Havn:** **65** - The effect of catch-and-release angling at high water temperatures on behavior and survival of Atlantic salmon *(continue)*
03:00 – 03:30	**Coffee Break**		
	Recreational fisherman's attitudes to cope with the impacts of change **Chair:** Jason Schratwieser	**Innovative management and governance methods in the recreational fishing area** **Chair:** Tomislav Treer	Catch-and-release practices: novel insights *(continue)*
03:30 – 03:50	**Cuevas et al.:** **67** - Involving anglers as key stakeholders in a shark conservation programme	**Rioux & Dunn:** **78** - Angler engagement drives recreational fisheries management in the United States	**Lennox et al.:** **32** - Catch-and-release angling does not impede normal upriver migratory behavior of anadromous Atlantic salmon (Salmo salar)

03:50 – 04:10	**Li, Owen:** *Presenter:* **Sutton, S.** **38** - Improving the communication of science to fishers using Fuzzy Cognitive Mapping	**Tubino et al.:** **112** - Recreational fishing in protected area in Guanabara bay: challenges and opportunities for integration management	**Workshop - Adapting catch & release science: the angler-scientist nexus** **Coordination – Andy Danylchuk and Steven Cooke** **Final discussion and wrap up**
04:10 – 04:30	**Visit Mini Fair**	**Díaz-Gil et al.:** **79** - A new spatially-explicit framework for estimating harvest of heterogeneous recreational fisheries	
	Southern Hemisphere Recreational Salmonids Fisheries **Chair:** Warren Potts		
04:30 – 04:50	**Dedual:** **54** - Inequalities in the catch distribution and abundance of rainbow trout (Onchorhynchus mikyss) in the Togariro River, New Zealand	**Childs et al.:** **117** - Behavioral dynamics of estuarine-dependent fishery species may explain their vulnerability to exploitation	
04:50 – 05:10	**Keeling & Gabrielsson:** **46** - Wilderness fishery management for angler satisfaction	**Willard:** **100 –** Evaluating a catch shares pilot for Gulf of Mexico headboats	

Wednesday, September 03			
Time	Convention Center – Unicamp		
08:00 – 09:00 **am**	**Light coffee and Tea**		
09:00 – 09:05	Introduction to Keynote Speaker James R. Kahn		
09:05 – 10:05	Keynote Speech 3 – Rubinho Almeida Prado - Recreational fishing in Brazil and Latin America: potentialities, needs and challenges		
10:05 – 10:30	**Coffee Break**		
	AUDITORIUM I	**AUDITORIUM II**	**AUDITORIUM III**
	Technological innovations in the recreational fishing area **Chair:** Steven Cooke	**Innovative management and governance methods in the recreational fishing area** **Chair:** Josep Alós	**Workshop: Plural use of fishing resources as strategy for conservation** **Coordinator:** Agostinho Carlos Catella (Brazil) **Guests:** Milena Ramires (Brazil), Claudio R. M. Baigún (Argentina), Vandick Batista (Brazil)
10:30 – 10:50	**Hyder et al.:** **73** - Hooked on science: novel ways of working with anglers to deliver science.	**Arlinghaus et al:** **82** - An overview on the FAO Technical Guidelines for Responsible Fisheries: Recreational Fisheries	
10:50 – 11:10	**Pope et al.:** **10** - Estimating the number of recreational fishers for a regional fishery	**Bird:** **36** - Advancing understanding of recreational catch through social change and public engagement	**Teramoto et al:** **94** - Conflicts between artisanal and recreational fisheries from Bertioga/SP and proximity (this presentation is part of the workshop)
11:10 – 11:30	**Danylchuk et al.:** **116** - Site fidelity of bonefish (Albula vulpes) inhabiting small reef flats in Culebra, Puerto Rico: implications for management and conservation	**Ryan et al.:** *Presenter*: **Jones, R** **40** - Meeting the requirement of recreational fisheries data for integrated fisheries management	
11:30 – 11:50	**Diggles:** **19** - Development of resources to promote best practice in the humane dispatch of finfish caught by recreational anglers	**Pagano:** **42** - Recreational fishing initiatives - a partnership between government and the recreational fishing community	
11:50 am – 12:10 **pm**	**Weltersbach et al.:** **103** - Lure versus bait – How anglers can influence catch in the recreational cod fishery	**Schratwieser et al.:** **86** - IGFA Catchlog: an innovative approach for collecting recreational catch data	**FINAL DISCUSSION AND WRAP UP**
12:10 – 12:30	**Visit Mini Fair**	**Barra:** **95** - Socio-environmental impacts of recreational fishing and perspectives for a participatory fishing management in the upper and middle rio Negro, Amazonia, Brazil	
12:30 – 01:30 pm	**Lunch**		
01:30 – 05:00 **pm**	**FREE AFTERNOON - Excursions and Visitations**		
07:00 – 10:00 pm (Dinner served at 08:00 pm)	**Conference Dinner at Campinas Tenis Club** **No dress code** Rua Coronel Quirino, 1346 (Cambui, Campinas) Announcement – Country and City to host the 8th WRFC-2017 Result of the best poster Surprise Show		

Thursday, September 04		
Time	Convention Center – Unicamp	
08:00 – 09:00 **am**	**Light coffee and Tea**	
09:00 – 09:05	Introduction to Keynote Speaker Stephen Sutton	
09:05 – 10:05	Keynote Speech 4 – Julian Pepperell- Shrinking Access to Places and Species. The growing impacts of MPAs and threatened species listings on recreational fishing	
10:05 – 10:30	**Coffee Break**	
	AUDITORIUM II	**AUDITORIUM III**
	Innovative management and governance methods in the recreational fishing area **Chair:** Jun-Ichi Tsuboi	**Workshop –** Sustainability of sport fishing billfish of Southwestern Atlantic **Coordinators:** Alberto Amorim & Eduardo Pimenta (Brazil). **Guests:** Helcio Honda and Marcos Glueck (National Brazilian sport fishing representatives); Laurent Blaha, Evandro Soares, Philip Greenman, Mario Busato and Alexandre Guedes (Brazilian recreational anglers representatives); Roberta Schmidt, Sarah Carriao, Tiago Rodrigues and The Billfish Foundation (Fisheries research representatives) **Rodrigues et al.:** **07** - Occurrence of Istiophoridae Larvae (Perciformes, Xiphioidei) in Southern Brazil **FINAL DISCUSSION AND WRAP UP**
10:30 – 10:50	**McLeod & Sheaves:** **106** - Fish of Paradise, how sustainable sport fishing could help people and the environment in Papua New Guinea (video and presentation)	
10:50 – 11:10	**Harrison & Rowland** **45** - Gaining community support for management decisions in data poor fisheries	
11:10 – 11:30	**Aarts:** **24** - Changing towards online licenses: more members?	
11:30 – 11:50	**Burns:** **47** - A successful recreational angling management program: spatial zoning of anglers and boaters on the North Umpqua	
11:50 am – 12:10 **pm**	**Potts:** **115** - Using the social norms approach to rectify the self-fulfilling prophecy of non-compliance in recreational fisheries	
12:10 – 12:30	**Fujitani et al.:** **084** - Tracking recreational angler responses to a marine reserve to infer the cost imposed and suggest a functional fine	
12:30 – 12:50	**Rowland & Harrison** **108** - Collaborative co-management of recreational fishing in Western Australia: challenges and triumphs	
12:50 – 02:00 **pm**	**Lunch**	
	AUDITORIUM III	
	FAO Workshop – Recreational Fishing Governance	
02:00 – 02:10	Welcome - Raymon van Anrooy (FAO) and Ezequiel Theodoro da Silva (7th WRFC – Chairman)	
02:10 – 02:15	Introduction of the workshop Raymon van Anrooy (Fisheries and Aquaculture Officer - FAO Subregional Office for the Caribbean)	
02:15 – 02:50	Speech 1 – **A Cost-Effective Method for Estimating the Economic Contributions of Recreational Fisheries in Developing Nations** **Rob Southwick** (Southwick Associates, Inc., USA)	

02:50 – 03:20	Speech 2 – **The global catch of recreational fisheries** **Kátia de Meirelles Felizola Freire** – main author and presenter (Universidade Federal de Sergipe, Brazil), Nicola Smith, Vicky Lam, Dyhia Belhabib, Maria-Lourdes D. Palomares, Lydia Teh, Kristin Kleisner, Dirk Zeller and Daniel Pauly (Fisheries Centre, University of British Columbia, Canada), Jocemar Tomasino Mendonça (Instituto de Pesca, São Paulo, Brazil), Pietro S. Moro (Programa Costa Atlântica, Fundação SOS Mata Atlântica, São Paulo, Brazil), and Fábio S. Motta (Universidade Estadual Paulista, São Paulo, Brazil)
03:20 – 04:00	Speech 3 – **Recreational fishing in restricted areas and traditional communities inclusion: a case study presentation** **Daniel Vieira Crepaldi** (Brazilian Environmental Institute - IBAMA)
04:00 – 04:30	**Coffee Break**
04:30 – 05:00	Discussion
05:00 – 05:15	Wrap up, motions and document outline
05:15 – 05:30	**Closure of the workshop** – Raymon van Anrooy **Closure of the 7th WRFC** – Ezequiel Theodoro da Silva
05:30 **pm**	**END OF CONFERENCE - DEPARTURE**

Poster Exhibition - 7th WRFC

To be held during the Poster Session, Monday, September 1, 5:30 - 8:30 pm - Multidisciplinary Stadium.

Posters are going to be displayed from Monday, September 1, 5:30 pm to Thursday, September 4, noon.

Presenters are kindly asked to attach their posters on the pin board according to the individual ID divided by theme. A 7WRFC monitor will be present to guide and help to pin up the posters.

* PB___ pin board number ; * (WRFC___) abstract ID number

Theme I - SOCIAL AND ENVIRONMENTAL CHANGES AND ITS IMPACTS IN RECREATIONAL FISHERIES

PB 01 (WRFC-037) - Dynamics of Recreational and Professional Fishing in Estuary Cananeia and Iguape, Sao Paulo State, Brazil

Presenter - Jocemar Tomasino Mendonça

PB 02 (WRFC-074) - Are angling catch rates representative of the true fish abundance?

Presenter - Josep Alós

PB 03 (WRFC-083) - The influence of the project of conservation, rehabilitation and reintroduction of Macedonian trout (Salmo macedonicus Karaman 1927) in the waters of the Republic of Macedonia on the development of recreational fishing in the country

Presenter - Vasil Kosto

PB 04 (WRFC-111) - Changes in the biggest Argentine's saltwater tournament along 53 editions

Presenter - Rubén Francisco Dellacasa

Theme IV - TECHNOLOGICAL INNOVATIONS IN THE RECREATIONAL FISHING AREA

PB 05 (WRFC-048) Development of Resources to Promote Best Practice in the Humane Dispatch of Finfish

Presenter - Ben Diggles

PB 06 (WRFC-077) - FishSmart: Using communication and innovation to create access

Presenter - Danielle Rioux

Theme V - CATCH-AND-RELEASE PRACTICES: NOVEL INSIGHTS

PB 07 (WRFC-069) - Long term population response of mahseers (Tor spp.) to catch-and-release fishery management practice: conservation lessons from the former recreational fisheries of the River Cauvery, South India

Presenter - Steven Cooke

Theme VI - INNOVATIVE MANAGEMENT AND GOVERNANCE METHODS IN RECREATIONAL FISHING

PB 08 (WRFC-015) - Recreational fishing governance and management in Victoria Australia

Presenter - Dallas D'Silva

PB 09 (WRFC-038) - Certified Tidal Angling Guide Program aiding resource management and sector profile

Presenter - Owen Bird

Theme VII - RESEARCH ON ANGLING DIVERSITY AROUND THE WORLD

PB 11 (WRFC-049) - Fishing Research: A Scientometric Analysis

Presenter - Debora de Freitas

PB 12 (WRFC-027) - Assessment of recreational fishery in a subtropical estuarine complex from Brazil

Presenter - Fabio Motta

PB 13 (WRFC-062) - Inland Competitive Fishing in Brazil

Presenter - Katia de Meirelles Felizola Freire

PB 14 (WRFC-096) - A Profile of the Urban Angler Shores Fishing in Santos and Sao Vicente, Sao Paulo State, Brazil

Presenter - Carlos Gonçalves Belruss

PB 15 (WRFC-097) - Who is who at the Recreational Fisheries in the Surroundings of the Largest Port of Latin America - Santos, SP, Brazil

Presenter - Carlos Gonçalves Belruss

PB 16 (WRFC-098) - Recreational fishing in the south coast of the State of São Paulo, Southeastern Brazil

Presenter - Domingos Garrone-Neto

Theme X - PLURAL USE OF FISHING RESOURCES AS STRATEGY FOR CONSERVATION

PB 17 (WRFC-005) - Co-existing of recreational and commercial fisheries in the three neighbouring countries on the Danube – Croatia, Hungary and Serbia

Presenter - Tomislav Treer

PB 18 (WRFC-021) - Use of fishery resources by recreational and artisanal fishermen: a proposal for the management of the Jacare-Guaçu River (Ibitinga Reservoir) - medium Tiete basin, Brazil

Presenter - Paula Maria Gênova de Castro Campanha

PB 19 (WRFC-088) - Ichthyofauna in Guarapiranda Da (Sao Paulo, Btazil), as a resource of funds for recreational and professional fishing

Presenter - Lídia Sumile Maruyama

PB 20 (WRFC-092) - Sport Fishing as Subsidy for Monitoring the Migration of Fish in Northern State of Mato Grosso, Brazil

Presenter - Solange Arrolho

Theme XI - ASSESSMENT OF THE ECONOMIC IMPORTANCE OF RECREATIONAL FISHERIES

PB 21 (WRFC-104) - Economic impact of recreational fishing in an estuarine protected area from southeastern Brazil

Presenter - Fabio S. Motta

PB 22 (WRFC-110) - Diagnosis of recreational fishing in the Cuiabá river basin: a foundation for cientifically based fishery

Presenter Samuel Elias da Silva

Theme XII - SUSTAINABILITY SPORT FISHING OF BILLFISH OFF SOUTHWESTERN ATLANTIC

PB 23 (WRFC-089) Marlin Project: Sustainability of the Brazilian Oceanic Sport Fishing (1979-2014)

Presenter - Tiago Rodrigues

Poster Abstracts

THEME I - SOCIAL AND ENVIRONMENTAL CHANGES AND ITS IMPACTS IN RECREATIONAL FISHERIES

PB 01 - (WRFC-037) Dynamics of Recreational and Professional Fishing in Estuary Cananeia and Iguape, Sao Paulo State, Brazil

Presenter - Jocemar Tomasino Mendonça

Jocemar Mendonça (Instituto de Pesca, APTA/SAA – SP) - main author, Isadora Parada (Coordenadoria de Planejamento Ambiental, SMA – SP)

In recent decades, the southern coast of São Paulo has become an important destination for recreational fishing. This region also has the highest number of professional fishermen from around the São Paulo coast, particularly artisanal fisheries. In general, anglers reported as one of the problems encountered by its activity to decrease in fish stocks and indicate the existing high fishing effort as the main responsible for this decrease, particularly by professional fishing. Aiming to provide support for the management of recreational and professional fishing in the estuary this study examined the dynamics of these activities between the years 2004-2012, including the municipalities of Cananéia, Iguape and Ilha Comprida. Monthly, for Monday through Friday, come up the estuary into quadrants recording and mapping georeferenced fisheries activities in accordance with the fishing category (recreational or professional). In total, 434 outputs a field in which was recorded the location, number and type of boat, the number of fishermen and fishing gear were performed. It found the use of four types of boats: "Bateira" (fishing vessel use for professional fishing), paddle canoe, canoe with motor and "voadeira" (aluminum boat with motor). The "voadeiras" are the most used (90 % of anglers and 55 % to 70 % of professionals). The fishing gears most used by the anglers were fishing rods, while commercial fishermen have used 23 different fisheries gears. On average, the number of professional boats in the estuary is 2.2 times greater than the number of recreational fishing boats. The mouths distribution of recreational fishing showed stability with about 37 boats/fishing day (± 3.3 boats). Professional fishing presents two peaks (February / March and November), due to the fishing anchovy (Anchoviella lepidentostole) fishing with gillnets in these periods in the Iguape city, but on average 78.5 boats/day (± 21.9 boats) are found. The main fishing area for both categories is the central portion of the estuary (near the Pedrinhas village in the Ilha Comprida city). In professional fishing, this area is most sought by fishermen using "gerival" (fishing gear for catching shrimp as bait alive. In recreational fishing, 34% of fishermen use the local possibly is a popularly recognized for the high yield area, but there is still no sufficient proof to this information. The data showed that there is a large overlap of areas of recreational and professional fishing across the estuary, competing with the fishery resource. In the main fishing area (central portion of the estuary), this overlap is the only physical resources, as the angling catch fish as the main target of commercial fishing in this location is the estuarine shrimp. However, in other areas of the estuary, there is an overlap both physically as target resources, mainly due to the use of gill nets for commercial fishing. Due to the constant increase in the number of anglers in the estuary, it is necessary to the planning and implementation of actions to reduce existing between the two categories of fishing conflicts.

PB 02 - (WRFC-074) Are angling catch rates representative of the true fish abundance?

Presenter - Josep Alós

Josep Alós (Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany) – main author; Miquel Palmer (Instituto Mediterráneo de Estudios Avanzados,

IMEDEA (CSIC-UIB), Esporles, Spain); Beatriz Morales-Nin (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), Esporles, Spain); Toni Puiggros (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), Esporles, Spain); Charo Rosselló (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), Esporles, Spain); Carlos Diaz (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), Esporles, Spain); Xisco Verger (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), Esporles, Spain); Pedro Trias (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), Esporles, Spain); Robert Arlinghaus (Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, German & Chair of Integrative Fisheries Management, Faculty of Life Sciences and Integrative Research Institute for the Transformation of Human-Environmental Systems, Humboldt-Universität zu Berlin, Berlin, Germany.

Recreational angling has the potential to induce changes in fish behaviour due to the combined effects of selection and learning, but empirical evidence is still scarce due to the limitations associated of monitoring fish in their wild environment. However, detecting altered fish behaviour due angling is of utmost importance in the assessment of the status of the recreational fisheries because it can affect the relationship of fish abundance and catch rates. In fact, angling-induced change in fish behaviour could be the mechanism behind the hyperdepletion in recreational fisheries where catch rates decline more strongly than fish abundance. In this study, the potential for a fishery-induced adaptive change in behaviour was examined in two similar-sized marine coastal fish with contrasting feeding ecology in the Mediterranean Sea: the omnivorous Diplodus annularis and the carnivorous Serranus scriba. It was initially hypothesised that carnivorous fish would generally be more vulnerable to harvest than omnivorous fish. Moreover, we expected the average vulnerability to capture of surviving individuals to differ following previous exposure. Both predictions received empirical support in the carnivorous S. scriba. Our results suggest that angling has the potential to induce directional change on risk-taking behaviour in this species, favouring traits that enhance gear-avoidance behaviour. Fishery-dependent assessments may thus consistently underestimate population abundance by decoupling fish abundance and catch rates in carnivorous fish. Indeed, the mechanism found in our work may explain hyperdepletion patterns in catch rate, but such effects are likely to vary with the foraging mode of the fish species that is exploited and should be more pronounced in carnivorous fish compared to omnivorous ones. Carnivorous fish are key targets of recreational fisheries around the globe, and thus fisheries-induced adaptive change in behaviour should be widespread, with important consequences for inferring the status of many fish stocks from fishery-dependent stock assessments. Therefore, scientists and fisheries managers are advised to pay attention to the potential for sampling bias caused by the angling gear because the stock status might look much worse than it actually is, which might help shedding light on an ongoing high-profile debate on about whether catch rates and landings data are of use to fisheries and conservation science.

PB 03 - (WRFC-083) The influence of the project of conservation, rehabilitation and reintroduction of Macedonian trout (Salmo macedonicus Karaman 1927) in the waters of the Republic of Macedonia on the development of recreational fishing in the country

Presenter - Vasil Kosto

Vasil Kostov (University St. Cyril and Methodius in Skopje, Institute of Animal Science - Fishery Department

In this work the impact of the project named “project for conservation, rehabilitation and reintroduction of Macedonian trout (Salmo macedonicus Karaman 1924) in to the waters of Republic of Macedonia”, on the development of the recreational fishing in the country, was investigated. The Macedonian trout was in the group of endangered species. Her population in waters in Macedonia was drastically reduced, and in some waters was completely disappeared. That was the reason for implementation of the project for its protection, rehabilitation and reintroduction. Within the project matured male and female trout’s were electro fished from the waters where there is still left. After that the fishes were artificially spawned by the experts from the Institute of Animal Science - Fishery department. The eggs and offspring were breaded in the hatchery for nine months. With these fingerlings restocking of the river Vardar and tributaries was made. This procedure is being repeated every year from 2008 to this day. Today the population of the trout has increasing tendency in every trout-water in the country. We have concluded that this project’s results positively affect this country’s recreational fishing. A change has been noticed in the fishing techniques and fishing resources that are being used by the anglers. The number of the sold fishing licenses by the stakeholders has significantly increased in

all country regions, as well as the number of sold trout bites and fishing equipment. The significant income from the recreational fishing in the rural parts of the country is expected in the future.

PB 04 - (WRFC-111) - Changes in the biggest Argentine's saltwater tournament along 53 editions

Presenter - Rubén Francisco Dellacasa

Rubén Dellacasa (Independent Researcher)

In February, 1962 took place in beaches of Tres Arroyos, Buenos Aires province, Argentina a fishing tournament called 24 Hours of Black Drum (Pogonias cromis) in which 62 anglers participated. No one imagine that this contest would become in the largest salt water tournament of Argentina with thousands of anglers every year. The aim of this work was identify changes along contest history in number of participants, species captured and his weight and some organizational aspects. Was performed a research of archives in local newspapers and specialized magazines. Members and directors of the organizer club (Cazadores de Tres Arroyos) were interviewed and I attended some recent editions to observe the course of action of this tournament. Carried out 53 editions, black drum ranked first 35 times and white croaker (Micropogonias furnieri) 18. During the first 27 editions 88,9 % were won by large individuals of black drum (TW average= 14,378 kg). In last 26 editions 57,7 % were won by regular size individuals of white croaker (TW average= 3,446 kg). The number of fishermen was increased from 1962 to 1987 when reaches record of 6862 anglers. Since then decrease and increases again in 2011 (50th edition), staying stable so far. Periods with decreasing would be connected with economic crisis times in Argentina. Since 1992 to 2005 and from 2010 up to date, were carried out simultaneously some tournaments for the big fish, thinking in to maintain and increase number of participants. The number and economic value of prizes were increasing along time. The first prizes were cups, camping gear and fishing equipment until today to vehicles or boats. Urban development of beaches in the area tournament and increased tourist arrivals caused the date change and modifications in sectors for fishing, in order not to interfere with other recreational activities during summer high season. Other highlights along time were the biological control of fish caught and establish a minimum weight for them. The decreasing tendency for black drum presence and his consequences have not been investigated in the area. The disappearance of large catches, decline in angler's number, conflicts in beach use with tourists and other causes promoted changes in the organization of the tournament and rearrangement to fit the social and economic reality and to keep interest of the anglers.THEME V - CATCH-AND-RELEASE PRACTICES: NOVEL INSIGHTS

THEME IV - TECHNOLOGICAL INNOVATIONS IN THE RECREATIONAL FISHING AREA

PB 05 - (WRFC-048) Development of Resources to Promote Best Practice in the Humane Dispatch of Finfish

Presenter - Ben Diggles

Dr Ben Diggles, DigsFish Services Pty Ltd

Iki jime (also known as ikejime), is a Japanese method of brain spiking (pithing) that is the fastest and most humane way to kill fish. Rapid dispatch of finfish using this method results in improved fish welfare outcomes, as well as improved flesh quality and the potential for extended shelf life. However, we found that resources which demonstrate to fish harvesters accurate "how to" information on the iki jime procedure were non-existent. This information gap was considered a barrier to the widespread uptake of the iki jime method amongst groups such as recreational anglers and aquaculturists. To fill this information gap we undertook morphological investigations using x-ray and dissection to pinpoint the brain location of over 80 species from 33 families of finfish most commonly cultured and targeted by fisheries throughout Australia, New Zealand and the Asia/Pacific region. Brain locations were superimposed graphically on colour photographs of the exterior of each fish, and hard copy pamphlets containing this information were produced. A new website www.ikijime.com was developed, with interactive photo-graph/ radiograph overlays revealing the brain location of each fish species placed on an online database. Other extension tools arising from this project include development of the Ikijime Tool series of phone apps for Apple and Android phones. The Ikijime Tool Lite version is a free app that allows limited access to the online database. The Ikijime Tool version provides unlimited access to the online database, while the Ikijime Tool Extreme version contains its own database and thus retains full functionality even in remote places out of phone or internet range. Feedback from anglers and animal welfare groups in Australia and internationally suggests that these resources have been

well received, opening the way for the concept to be extended to other regions such as North and South America, Europe and Asia. Co–operation is sought with anglers and scientific groups in these regions in order to facilitate the ongoing development of the database to accommodate popular angling species from each of these locations."

PB 06 - (WRFC-077) FishSmart: using communication and innovation to create access

Presenter - Danielle Rioux

Danielle Rioux (National Marine Fisheries Service, National Oceanic and Atmospheric Administration, United States) - main author, Russell Dunn ((National Marine Fisheries Service, National Oceanic and Atmospheric Administration, United States)

FishSmart, is a United States, National Oceanic and Atmospheric Administration supported, angler-led program to improve the survival of fishes released by anglers. This collaborative effort is focused on developing fishing techniques, tackle, and management approaches to reduce catches of fish that need to be returned to the water and improve the survival of fish that are released. FishSmart has spurred and highlighted innovation, research, and management consideration of devices and practices to counter barotrauma, a condition deep water fish suffer from when brought to the surface quickly. Barotrauma involves the rapid expansion of gasses in a fish's body which can cause significant tissue damage and impaired swimming ability, resulting in mortality or increased rates of predation. In part, due to this phenomenon, high post-release mortality rate estimates are applied in the stock assessment process. High post-release mortality rates can contribute to reduced access for fishermen when stock status is assessed. The FishSmart program is innovating to counteract barotrauma, while simultaneously encouraging research on the survival of descended fish and broadly promoting the importance of proper handling and release of fish to maximize survival. The initiative has led to reconsideration of how release mortality is handled in the management of some fisheries and a recently initiated examination of NOAA Fisheries scientific approach to release mortality. Through this program there is the possibility to produce real conservation gains and improved science, which could result in improved survival and ultimately greater fishery access."

THEME V - CATCH-AND-RELEASE PRACTICES: NOVEL INSIGHTS

PB 07 - (WRFC-069) Long term population response of mahseers (Tor spp.) to catch-and-release fishery management practice: conservation lessons from the former recreational fisheries of the River Cauvery, South India

Presenter - Steven Cooke

Adrian Pinder (Mahseer Trust/Bournemouth University, Fern Barrow, Poole, Dorset, BH12 5BB. UK), Rajeev Raghavan (Mahseer Trust/Conservation Research Group (CRG), Department of Fisheries, St. Albert's College, Kochi, India), Robert Britton (Faculty of Science and Technology, Bournemouth University, Fern Barrow, Poole, Dorset, United Kingdom).

Long term population response of mahseers (Tor spp.) to catch-and-release fishery management practice: conservation lessons from the former recreational fisheries of the River Cauvery, South India Mahseer (Tor spp.) represent an imperiled yet highly prized game fish throughout their native range of South and South East Asia. Despite these potentially conflicting factors, the role of the international recreational angling community has been frequently cited as playing a vital role in conserving these species, while also providing socio-economic benefit to poor rural communities. Due to a lack of both base-line scientific data, and the challenges associated with monitoring fish populations in large monsoonal rivers, long term trends in fishery performance of mahseer were examined using catch-and-release (C&R) data logs from Galibore, a former fishing camp on the River Cauvery, in the Western Ghats Hotspot of India. Between 1998 and 2012, 23,620 hours of fishing effort were applied to catching and releasing 6,161 mahseer, ranging in size from one to 104 lbs in weight. Accounting for variance in individual angler performance, these data were analysed for Catch Per Unit Effort (CPUE) for numbers (No/hr-1) and weights (lbs/hr-1) of fish captured. The results revealed a significant increase in fish numbers (min = 0.13 fish/hr - max = 0.66 fish/hr) with a corresponding decrease in mean weight (17.7lb to 5.5lb) of individual fish over the course of the study period, thus demonstrating strong recruitment and qualifying the functionality of key life stage habitat requirements. Not only do these

data demonstrate a positive population response to recreational exploitation of the stock, but also provide a unique baseline against which the population response (either positive or negative) to the recent and radical change in management policy (closure of the C&R fishery in the River Cauvery) could be qualified, quantified and considered against future conservation targets."

THEME VI - INNOVATIVE MANAGEMENT AND GOVERNANCE METHODS IN RECREATIONAL FISHING AREA

PB 08 - (WRFC-015) Recreational fishing governance and management in Victoria Australia

Presenter - Dallas D'Silva

Dallas D'Silva, Executive Officer of the Victorian Recreational Fishing Peak Body (VRFish) Melbourne, Australia

The governance and management framework for recreational fishing in Victoria is summarised in the attached poster. The core elements are a Recreational Fishing Licence that generates revenue, which is reinvested in recreational fisheries management and development. A funding agreement between the Government and the peak body, VRFish is the cornerstone of co-management and provides a vehicle for consolidated representative advice to Government. A number of advisory and consultative forums are established to oversee fish stocking, the disbursement of licence revenue and stock assessment. Licence revenue is used to help protect our valuable fisheries and contribute vital funds towards education, enforcement, research and monitoring. Government funds are also allocated to further enhance the quality of recreational fishing experiences. The broad framework has evolved over time and despite there being some scope for future improvements, it is regarded as an effective and advanced model nationally. Future challenges include improving communication with recreational fishers, angler access, infrastructure and social licence to operate."

PB 09 - (WRFC-038) Certified Tidal Angling Guide Program aiding resource management and sector profile

Presenter - Owen Bird

Owen Bird, Executive Director, Sport Fishing Institute of BC, Canada

The Sport Fishing Institute of British Columbia (SFI) is a registered, not-for-profit association representing the province's recreational fishing industry. The SFI works with governments, industry and stakeholder groups to protect fish stocks and ensure predictable, sustainable recreational fishing opportunities for all recreational anglers. As part of its effort to improve the quality of anglers' experiences and respond to market demands for certified products and services, from 2006 culminating in 2010, the SFI worked collaboratively with Fisheries and Oceans Canada (DFO) and other government agencies to develop the Certified Tidal Angling Guide Program (CTAG). The innovative program developed a curriculum for training tidal angling guides in subjects ranging from nature interpretation, catch monitoring, fisheries biology, vessel and marine safety and customer service, and delivered the program through non-traditional methods to students spread across and large and challenging coastline. The program addressed the needs of experienced and novice guides, drew best practices from across a range of industry sectors and has produced a voluntary certification system that is effective for government regulators, industry and anglers. The program is unique in North America and shares similarities with a program in Australia and provides a new model for how a self-motivated industry and government can work collaboratively to improve fisheries sustainability and public safety while increasing the value of sports fisheries to local economies.

THEME VII- RESEARCH ON ANGLING DIVERSITY AROUND THE WORLD

PB 11 - (WRFC-049) Fishing Research: a Scientometric Analysis

Presenter - Debora de Freitas

Felipe Gusmao (Instituto do Mar, Universidade Federal de Sao Paulo, Brazil) – main author, Debora de Freitas (Instituto Tecnologico da Aeronautica, Brazil)

Recreational Fishing (RF) Research is multidisciplinary and comprises several fields of research, from the biology and ecology of the targeted fish species, to the social and economic aspects of the fishing activity. In

this study we evaluated the evolution of the scientific production of RF research using data from the Scopus database. Data was extracted using various terms commonly related to recreational fishing, such as catch and release, and sportfishing. Our analysis comprised the period of uninterrupted scientific production from 1971 to 2013 with a total of 4553 publications. We identified three periods in the frequency of publication: a period of steep increase in publications from 1971 to 1984, a period of stagnated and lower productivity from 1985 to 1995, and a period of continuous productivity growth from 1996 to 2013. A similar response was observed for the H index for these three periods. The average number of authors per publication showed a continuous increase throughout the whole studied period from 1.4 in 1971 to 3.85 authors per paper in 2013. Articles in scientific journals contributed to 81% of all production. Reports and Conference papers accounted for almost 30% of the whole scientific production during the 1971-1984 period and more than 20% during the 1985-1995 period. The three main subject areas of the journals publishing RF research in all periods were Agricultural and Biological Sciences, Environmental Science, and Earth and Planetary Sciences, comprising 81% of all subject occurrences in the dataset. Our analysis also suggested a significant variation in time of the journal subject areas where RF research is published, especially in the Social, Economic and Business Sciences. RF studies published in Social, Economic and Business science journals contributed less than 1% of all records during the 1971-1984 period, increasing to almost 10% during the 1996-2013 period. The country of affiliation most frequently recorded in the dataset was the United States, followed by Canada, Australia, United Kingdom and Germany, which altogether contributed to more than 70% of all records. Our study is the first extensive scientometric analysis of RF research literature and has shown some interesting aspects of this area of research. RF studies in the literature are often multidisciplinary and show a growing interest in the Social, Economic and Business side of this activity. The continuous increase in the mean number of authors per publication through time suggests that RF research has become more collaborative. Despite the low scientific production during the 1985-1995 period, productivity and citations have increased continuously since 1996, indicating a recent and growing interest in this field of research. The increase in the proportion of studies published as articles in scientific journals may be an important factor contributing to the higher number of publications and citations in recent RF research. The decrease in number of publications during 1985-1995 was apparently related to a decrease in the publication of RF studies as Reports during that period, but the actual reasons for such fall in productivity are unclear.

PB 12 - (WRFC-027) Assessment of recreational fishery in a subtropical estuarine complex from Brazil

Presenter - Fabio Motta

Fabio Motta (Universidade Estadual Paulista, Campus Experimental do Litoral Paulista, São Vicente - SP, Brazil) - main author, Jocemar Mendonça (Instituto de Pesca – APTA/SAA, Núcleo do Litoral Sul, Cananéia - SP, Brazil), Pietro Moro (J.M.P. Moro Consultoria)

In Brazil, recreational fishing has grown rapidly, with continued potential for growth because of Brazil's long coastline and diverse aquatic environments. However, data on these fisheries are scarce and remains a critical issue to delineate management actions. The aim of this study was to assess the recreational fishery in the Iguape and Cananeia Lagoon Estuarine Complex, Southeastern Brazil. Data were collected through a recreational fisheries' monitoring project (Atlantic Forest & Fishing) under the co-management framework of an Estuarine Protected Area (corresponding to IUCN category V). The field work was conducted by trained local fishing guides in partnership with research team. We surveyed 341 fishing operations, recording 51 fish species (26 families) and measuring 10,051 fish specimens. The Fat snook (Centropomus parallelus) and Smooth weakfish (Cynoscion leiarchus) were the most caught species, representing 51.1% and 14.1% of the total number of fishes, respectively. Considering the relative abundance in biomass, the Fat snook continues to be the most representative (38.8%), but the Common snook (C. undecimalis) assumes the second position with 14.1% of the total biomass captured. The annual fishing effort was estimated in 272,900 angler-hours and the mean catch-per-unit-effort (CPUE) was 3.42 fish-boat-hour or 0.971 kg-boat-hour. According to Froese's indicators, the length composition of the main fish species indicates that populations are overexploited. The continuity of recreational fisheries' monitoring and an integrated fishery management approach are crucial to local sustainability of fishery resources.

PB 13 - (WRFC-062) Inland Competitive Fishing in Brazil

Presenter - Katia de Meirelles Felizola Freire

Rafael Barbosa dos Santos & Kátia de Meirelles Felizola Freire (Universidade Federal de Sergipe, Brazil)

In Brazil, fishing activities are regulated by Law N. 11959 that splits fishing in two categories: commercial (artisanal and industrial) and non-commercial (scientific, recreational and subsistence). Recreational fishery is defined as the one practiced by Brazilians or foreigners, previously licensed by the Ministry of Fisheries and Aquaculture (MPA), using fishing gears allowed by law, aiming at leisure or sport. Sale of the catch is not allowed. Besides the long coast and the diverse river basins, there are also 2250 private fish-and-pay/ pay-and-fish farms that provide different recreational fishing experiences. Brazil has also the highest richness of freshwater fish species in the world (3124 species). In 2013, there were about 400 thousand licensed recreational fishers in Brazil, representing the second sport in number of practitioners. There is no estimate of catches originating from recreational fisheries. The objective of this study was to estimate catches from inland competitive fishing events in Brazil and to describe these events. We used news sites, sites and blogs of fishing teams/clubs, and also contacted recreational fishers directly. Up to now we were able to compile data for 127 different competitive fishing events, split in 256 rounds (1981-2014). The highest number of events was observed in southeastern Brazil (44.1%), followed by southern (31.5%), center-west (13.4%), north (9.4%), and northeast (0.8%). Some competitions take place once a year, some occurred only once and others have several rounds per year. The first event reported was “Campeonato de Pesca de Cáceres” in 1981, which led to the “Festival Internacional de Pesca Esportiva-FIPE”. In 1995, this was considered the largest freshwater fishing competition in the the world by the “Guinness Book”. The largest catch reported in one event was 1.5 t. In general 61.7% of fishing events took place in open-use areas and 26.2% in privately owned water bodies. Catch-and-release was practiced in 29.7% of the events and catch-and-kill in 9.0% (missing information for 61.3% of them). A total of 7-309 teams participated in the events, with 1-4 fishers/team. About 50% of the events were organized by fishing clubs/associations, but many were organized by local government. Events usually took place in March-May. The main target species was “tucunaré”, Cichla spp. (25.4%), which is the symbol of Brazilian recreational fisheries. Other target species are: black bass, pacu, croaker, snook, trahira, piranha, tilapia and astyanax. Artificial bait is used in most of the events, but natural bait is allowed in some of them. Main events have big prizes: cars and boats. The point system used is diverse: size or weight of the fish plus number of specimens caught. Even though organizers are obliged by law to send to MPA the results of these events, they usually do not. Thus, it is very difficult to obtain these results and to assess the total impact of this activity in Brazilian inland waters.

PB 14 - (WRFC-096) A Profile of the Urban Angler Shores Fishing in Santos and Sao Vicente, Sao Paulo State, Brazil

Presenter - Carlos Gonçalves Belruss

Carlos Gonçalves Belruss (Master of Science Post-graduation Program in Aquaculture and Fisheries / Instituto de Pesca (IP), CAPES Scholarship) - main author, Thomaz Rizzatti Sales (Undergraduate Student, PIBIC-CNPq-IP Scholarship), Marcelo Ricardo Souza (Scientific Researcher, LESTE/INSTITUTO DE PESCA, Santos -SP - Brazil), Sérgio Luis Tutui (Scientific Researcher, LESTE/INSTITUTO DE PESCA, Santos -SP - Brazil), Ingrid Cabral (Scientific Researcher, LESTE/INSTITUTO DE PESCA, Santos -SP - Brazil) Acácio Ribeiro Gomea Tomás (Scientific Researcher, LESTE/INSTITUTO DE PESCA, Santos -SP - Brazil)

As recreational fisheries are one of the most important leisure way in several countries, responsible for a large amount in local economies, and besides its scarcely knowledge this study was focused on describing some socioeconomic and technical aspects of the shore angling along Santos and Sao Vicente seaside. This region was located inside Bay of Santos surrounded by the Port of Santos, a legally protected area and a deficient sanitary condition due to almost a million inhabitants, which can be duplicated in the summer season. Between August 2012 and June 2013, 70 semi-structured interviews were done at distinct day time in seven fishing sites, resulting that its a male activity (96 percent), in the age interval of 30 to 40 years (37%), a month average income of 4.9 ± 3.6 minimum wages (around US$ 320, high school level (51%, although 47 percent reported the college level complete or not), economic active (75%), inhabiting (87%) the region. Summer (64%) was reported as the best season for fishing. Less than 60 percent of fishing, at least, were weekly (13% of them daily) by an average of 5h/day. The daily cost was less than US$ 23 (for 81%) and the main target

species were the cutlassfish Trichiurus lepturus (24%), the whitemouth croaker Micropogonias furnieri (17%) and the snooks Centropomus spp (10%), but 43 percent has no target species. The gear and techniques used were similar: rods of 3.5m in average, monofilament lines of 0.37 mm with 1 to 4 hooks, plumb weights of 75g, shrimp (Xiphopenaeus kroyeri), sardine (Sardinella janeiro) or ghost shrimp (Sergio mirim) as bait (98%). Only 31 percent had fishing license and the reason pointed by them was the lack of information and scarcity of policy restrictions (to 36%). The commercial fisheries were the responsible by the greatest impacts towards the recreational fishing (33%), followed by boat traffic (27%), pollution (24%) and the port dredging activities (6%). Concluding, the recreational fisheries must be seen by the local management due to share common interests to others ones, either by the fisheries resources and by territory uses. VII. Research on angling diversity around the world.

PB 15 - (WRFC-097) Who is who at the Recreational Fisheries in the Surroundings of the Largest Port of Latin America - Santos, SP, Brazil

Presenter - Carlos Gonçalves Belruss

Carlos Gonçalves Belruss (Master of Science Post-graduation Program in Aquaculture and Fisheries / Instituto de Pesca (IP), CAPES Scholarship) - main author, Thomaz Rizzatti Sales (Undergraduate Student, PIBIC-CNPq-IP Scholarship), Marcelo Ricardo Souza (Scientific Researcher, LESTE/Instituto de Pesca (IP) Santos, SP - Brazil), Sérgio Luis Tutui (Scientific Researcher, LESTE/Instituto de Pesca (IP) Santos, SP - Brazil), Ingrid Cabral (Scientific Researcher, LESTE/Instituto de Pesca (IP) Santos, SP - Brazil), Acácio Ribeiro Gomes Tomás (Scientific Researcher, LESTE/Instituto de Pesca (IP) Santos, SP - Brazil)

The recreational fisheries of Brazil are been fueled by the then-booming economy of the country. To appropriately manage the activity at the Santos-Sao Vicente Bay-Estuarine Complex, located at the central coast of State of Sao Paulo, a year-round study was conducted concerning its increasing importance and the scarcity of studies. This area includes six municipalities (Praia Grande, Sao Vicente, Santos, Cubatao, Guaruja and Bertioga), which has been submitted to a heavy influence of the Port of Santos, the petrochemical plants, summed to the disordered occupation around the estuarine zone. Twenty-two nautical marinas, the 7km maritime seaside of Santos and Sao Vicente (including their two fishermen decks) and other notorious fishing sites inside the whole estuary were randomly sampled between August 2012 and November 2013, resulting in 189 partially structured interviews. From that, 94 were answered by shore and 95 by boat anglers. Mostly were male (97%), married (72%), with average age of 48.2 ± 13.5 years for the shore anglers and between 43.9 ± 13.4 and 52,5 ± 12,2 years among the boat anglers. Eighty-one percent of the boat anglers had concluded the high school or college, but among the shore anglers only 24% had the high school; the college level corresponded to 23% of the boat anglers. In general, the anglers had 22.2 ± 13.7 years experienced in the recreational fisheries, and mostly reported a reduction of fishes abundance and size (75 and 66%, respectively) and pointed the summer as the best season for fishing (71%). The local inhabitants were 55% of the interviewed anglers, although those from Sao Paulo metropolitan area were the majority of the boat anglers (30%), whose average income was higher (29% more than US$ 1,850/month) than the shore anglers (40% until US$ 1,540/month). Almost the half part of the interviewed reported having a fisheries license (51%), and 74% of them were boat anglers. Consider the total cost of fisheries, 43% of the anglers spent until US$ 23/day, mainly the shore anglers (39%); otherwise 3% of the boat anglers reached costs higher than US$ 220/day. The shore anglers were practiced more frequently (weekly for 31% of the interviewed) than those with boat (weekly for 15%) with time spending about 6.2 ± 2.7h to 8.7 ± 1.7h by day, respectively. The most target species reported were the snooks (Centropomus spp, 53%), but 28.2 percent of the shore anglers had no target species. Thirty-five fishing sites were identified (14 for the shore fisheries and 21 from the boat fisheries). According to them, the commercial fisheries were indicated as the main factor affecting the recreational fisheries (34%) followed by the pollution (23%). Others answers were straightly linked to the fisheries sites: 5% of the boat anglers fishing at the inner estuary pointed the lack of security, other 5%, operating at the entrance of the Port of Santos channel, pointed the dredging and 18% from the Bertioga channel`s it was the boat traffic.

PB 16 - (WRFC-098) - Recreational fishing in the south coast of the State of São Paulo, Southeastern Brazil

Presenter - Domingos Garrone-Neto

Domingos Garrone-Neto1*, Jocemar T. Mendonça2, Pietro S. Moro3, Fabio S. Motta4. 1Universidade Estadual Paulista, Faculdade de Engenharia de Pesca, Registro - SP, Brazil. 2 Instituto de Pesca – APTA/SAA, Núcleo do Litoral Sul, Cananéia - SP, Brazil. 3 J. M. P. Moro Consultoria, Curitiba - PR, Brazil. 4 Universidade Estadual Paulista, Campus Experimental do Litoral Paulista, São Vicente - SP, Brazil.

In Brazil, among the modalities of recreational fishing, the practice carried out in the coastal shelf seems to be the most difficult to collect data. In the State of São Paulo, information about the marine recreational fishing is scarce. In the south coast, where a continuum of marine and coastal ecosystems is under a process of use planning, information about the marine recreational fishing are not available and remain a critical issue to delineate management actions. The aim of this study was to conduct an expeditious diagnosis regarding the recreational fishery that occurs around the costal islands and in rock bottoms ("parcéis") of the south coast of São Paulo, Southeastern Brazil, looking for: i) species composition in number of individuals, ii) catch-per-unit-effort (CPUE), iii) potential environmental impacts, and iv) costs involved. Data were collected through the monitoring of the recreational fisheries in the Environmental Protection Area of the South Coast (MEPASC), in two different moments: i) between April and November 2009, and ii) between January and April 2014. Field works were conducted by trained local fishing guides in partnership with the research team. We surveyed 16 fishing operations in 2009 and five in 2014, recording 352 specimens distributed in 29 species and 16 families. Only diurnal recreational fishing with pole and reel, from stationary or trolling boats, were recorded. The average size of the boats ranged between 17 and 21 feet, with 60-115 hp and usually three members (one guide + two anglers in 86% of the cases). Sardines (Clupeidae), squids (Loliginidae) and shrimps (Farfantepenaeus paulensis and Litopenaeus schmitti, Peneaidae) in association with the use of artificial lures were the most commonly baits used. The mean catch-per-unit-effort (CPUE) was 2.26 fish-boat-hour. The fishing around the first 400 meters of islands was more frequent (95%) than that practiced in the rock bottoms or farther from the islands. The average cost of the fisheries (boat rental, acquisition of baits and hiring guide) was estimated in R$700,00 per boat and the austral summer (December to March) was the period of highest concentration of the fisheries. Although our study did not consider others recreational fisheries (underwater and night angling), the results suggest an important activity in the south coast of São Paulo with potential to impact critical areas of MEPASC. The frequent fishing around the islands is a matter of concerning, since the circular distance of 300 meters is protected and represents an important area of residence and refuge for fish and other animals, including seabirds. If we take into account the need to manage these fisheries, information as presented here can be useful to managers and can indicate relevant aspects that need further investigation.

THEME X: PLURAL USE OF FISHING RESOURCES AS STRATEGY FOR CONSERVATION

PB 17 - (WRFC-005) Co-existing of recreational and commercial fisheries in the three neighbouring countries on the Danube – Croatia, Hungary and Serbia

Presenter - Tomislav Treer

Tomislav Treer (University of Zagreb, Faculty of Agriculture, Croatia) - main author, Istvan Kubatov (State Cadastre, Erd, Hungary), Predrag Simonovic (University of Belgrade, Faculty of Biology, Serbia), Marina Piria (University of Zagreb, Faculty of Agriculture, Croatia), Vera Nikolic (University of Belgrade, Faculty of Biology, Serbia), Dubravka Skraba (University of Belgrade, Faculty of Biology, Serbia)

Recreational and professional fishermen often argue against each other. Therefore the aim of this research was to compare the official data of both kinds of fishing on the Danube in the three neighbouring countries. The same section of the river was analysed in two countries – right bank in Croatia and the left one in Serbia (137 km), together with the both banks just upstream in Hungary (60 km). The data from Hungary covered 10 years (from 2002 to 2011), from Croatia 8 years (from 2004 to 2011), while from Serbia 5 years for commercial fisheries (from 2008 to 2012) and only 4 years for recreational fisheries (from 2009 to 2012). The average number of anglers per 1 km of river section is the highest in Serbia (92), followed by Croatia (46) and Hungary (37). The number of commercial fishermen is considerably smaller, so one of them in Hungary comes to 1.2 km of the river section, in Serbia to 3.7 km and in Croatia to 5.7 km. These relationships result in the catches (kg per river km per year) by recreational and commercial fishermen, respectively, in Croatia (634.5 and 289.4),

in Serbia (2993.8 and 607.6) and in Hungary (813.7 and 1138.1). Absolute catches, as well as CPUE (kg per fisherman per year) of both groups in all three countries are relatively stabile, without dramatic changes. As the number of commercial fishermen is small (in tens in each country) annual changes in only several of them do not cause correlation with their CPUE. On the other hand, thousands of anglers in each country have higher annual fluctuations in number. Consequently, negative correlation between the number of recreational fishermen and their CPUE is registered. For total catch it is statistically significant in Croatia ($p<0.01$, $r2 = 0.823$) and in Hungary ($p<0.01$, $r2 = 0.728$). It is also high in Serbia, but because of the small number of years investigated, not significant ($p = 0.276$; $r2 = 0.524$). Moreover, in Hungary it is significant ($p<0.01$) also for the following most important species: European catfish (Silurus glanis), northern pike (Esox lucius), perch-pike (Sander lucioperca), allochtonous species and on lower level ($p<0.05$) for other species. In Croatia it is near significant ($p = 0.052$) for allochtonous species. In Hungary correlation ($p<0.05$) between total catch of both, recreational and commercial fishermen is registered, indicating that in "good years" both groups catch more. Similarly, comparing combining catch of both fishermen groups, in two countries with more data, Croatia and Hungary, positive, although not statistically significant correlation was found ($p = 0.096$), suggesting that they have synchronized "good" and "bad" years. It could be concluded that, according to the official data, the existing ratio between recreational and commercial fishermen in these three countries does not negatively affect to each other and to the overall fishing. However, creating the join body would be beneficial for fisheries management."

PB 18 - (WRFC-021) Use of fishery resources by recreational and artisanal fishermen: a proposal for the management of the Jacare-Guaçu River (Ibitinga Reservoir) - medium Tiete basin, Brazil

Presenter - Paula Maria Gênova de Castro Campanha

Paula Castro (Instituto de Pesca/Secretaria de Agricultura do Estado de SP – IP/SAA-SP), Maria Helena Silva (UNIFESO- Teresópolis, RJ), Luciana Menezes (Instituto de Pesca/SAA-SP), Lidia Maruyama (Instituto de Pesca/SAA-SP), Magda Maluf (Instituto de Pesca/SAA-SP), Lilian Faria-Pereira (Instituto de Pesca/SAA-SP)

Catch of live-bait has been extensively practiced by artisanal and subsistence fishers in Ibitinga reservoir, which is a flooded region of the Jacaré-Guacu River in Sao Paulo. Catches of "tuviras" (a fish species of the Gymnotus genus) are done using rectangular sieves with a nylon net (a "mosquito" net type) mounted in an iron frame. However, this equipment does not have adequately regulated in the state of São Paulo. The equipment is handled by two fishermen, passed under the macrophytes banks and raised quickly, allowing for the capture of fish under the macrophytes. The product of the fishery (the live-bait) is stored in ponds to be sold to sport fishermen who use it for recreational fishing in several river basins in the states of São Paulo and Mato Grosso do Sul. The results were collected between March 2012 and October 2013; this was actively monitored with the effective participation of 26 fishermen (of the 48 registered) from the San Giacomo farm community in Ibitinga, a town in Sao Paulo. The participation of new bait fishermen, whose main productive activity was not the "tuvira" fishing was noticeable during the monitoring process. This fact has been of concern to the artisanal fishermen residents in the region who practice this activity on a small-scale. Preliminary results indicate that the more fishmen have entered the activity, which in the short-term is unsustainable for the " tuvira " as a natural resource, and bait fishing activities in the region. The tuvira fishing is usually a family activity done during the night (80 %) by individuals (50 %), two family members (38 %) or with friends (12 %). The estimate of the mean size of Gymnotus cf. carapo at first maturation (L50 %) was L50 % = 19.5 cm. It has been recommended to capture tuviras over 19.0 cm in total length, and employ an optimal fishing effort of up to 5 hours per night, as the increase of fishing hours significantly decreases the number of tuviras captured. Another important point that needs to be mentioned is the necessity of legalizing the sieves in the region, and prohibit fishing in areas of macrophytes banks used for recruitment and reproduction of the local ichthyic fauna. It is advisable to permanently monitor catches in marginal areas. This requires the participation of the bait fishermen and sports fishing commuity, who need to be actively involved in sustainable management of the fisheries as a natural resource.

PB 19 - (WRFC-088) Ichthyofauna in Guarapiranda Dam (Sao Paulo, Brazil), as a resource of funds for recreational and professional fishing

Presenter - Lídia Sumile Maruyama

Lídia Sumile Maruyama (Instituto de Pesca, SAA, Brazil; University of São Paulo, Brazil), Evaldo Luiz Gaeta Espíndola (University of São Paulo), Lilian Paula Faria-Pereira (Instituto de Pesca, SAA), Alexandre dos Santos

Bueno (SABESP, SP, Brazil, Instituto de Pesca, SAA), Ivan Mello Teixeira de Almeida (Atlântica Boats, SP, Brazil), Paula Maria Gênova de Castro (Instituto de Pesca, SAA).

Built in 1906 with the initial goal of producing and supplying energy, Guarapiranga reservoir is currently responsible for approximately 20 % of the water supply in the Metropolitan Region of São Paulo (RMSP). Over the years it has also become an attraction for leisure, due to the climate in the region, landscape, close proximity and easy access to urban centers. It receives nearly 10,000 visitors per day, who make use of its many beaches, marinas, clubs and summer houses. Besides tourism and leisure, recreational and commercial fishing is considered relevant social, economic and cultural activities in hydroelectric reservoirs. Between the years 2012 and 2014, a survey of the fish fauna was conducted in several areas of the dam, so that a relation between the ichthyofauna and the fishing could be established. Such ichthyofauna was captured with gillnets of different mesh sizes (4-14 cm opposite knots). The preliminary results showed that the (tirei) fish fauna was composed largely of lambari (Astyanax spp.), which represents 95.6% of the total number of captured individuals. The other species (4.4%), in an order of capture, were piranha or pirambeba (Serrasalmus spilopleura, S. marginatus), traíra (Hoplias malabaricus), tilapia (Tilapia rendalli, Oreochromis niloticus), bagre (Rhamdia quelen), cascudo (Hypostomus sp.), mussum (Synbranchus marmoratus), caborja (Hoplosternum littorale), acará (Geophagus brasiliensis) and tabarana (Salminus hilarii). Although not very attractive to sport fishing, such species are of great importance to recreational, subsistence and professional fishing. According to information obtained at the site, approximately 20 families of professional fishermen depend on fish for their sustenance. Furthermore, the mapping of boating activities in the dam was conducted and 11 marinas and 16 clubs were initially identified and quantified on its surroundings to supplement the information on the use of the dam for leisure. Although the dam had been properly structured for sport boat fishing, touristic enterprises were geared mainly for water sports, especially sailing due to the tradition of such activities in the dam since its construction. Most recreational fishermen fished next to the dam, which is an important area for recreation to locals. The fishing activity was developed daily, especially on weekends and in summer, during which approximately 20 to 30 fishermen captured mostly lambari and piranha. Therefore, such activities depend directly on the quality and availability of natural resources, which requires management measures to assist the organization of their uses."

PB 20 - (WRFC-092) - Sport Fishing as Subsidy for Monitoring the Migration of Fish in Northern State of Mato Grosso, Brazil

Presenter - Solange Arrolho (Researcher to Laboratory de Ictiologia da Amazônia Meridional, University of Mato Grosso State)

Teles Pires rivers and Juruena form the Tapajós, a major tributary of the Amazon River. Both environments have clear waters and rare beauty: that may, under natural conditions, providing the formation of a cohesive, harmonious and balanced unity between the fish fauna and the aquatic environment. The objective of this project is to characterize the reproductive period of economically important species used for fishing in the region, to determine the migration routes of fish and characterize the environment through environmental descriptors. Samples were taken in seasonal incursions (full, ebb, flood and drought) the Teles Pires River and its tributaries near thein region Pousada Mantega. For the demarcation of sites for data collection were determined places of higher incidence of sports fishing. Once listed, a photographic record was made, recorded biometric data (weight and length) identified the pickup location, type of fixture used with time of collection. The specimens were given a tag (numbered tag) at the base of the anal fin that matched the information obtained for one specimen. 579 fish belonging to 14 species, with a recapture rate of 10.37 %, were marked can be seen that some species move towards the forest. And with the rising level of water resource availability of small water bodies causes some fish populations migrate exclusively for trophic purposes of the bed of the stream to the areas of flooded forest returning to bed by lowering the water level. Drives long distances for species like jaú (450 kg), the piraíba (120k) and pirarara (280k) were recorded. Thus sportfishing assists in the study of species of migratory character for breeding, feeding and / or refuge by monitoring constant.

THEME XI - ASSESSMENT OF THE ECONOMIC IMPORTANCE OF RECREATIONAL FISHERIES

PB 21 - (WRFC-104) - Economic impact of recreational fishing in an estuarine protected area from Southeastern Brazil

Presenter - Fabio S. Motta

Fabio S. Motta (1Universidade Estadual Paulista, Campus Experimental do Litoral Paulista, São Vicente, SP – Brazil) - main author, Camila Gramkow (Tyndall Centre for Climate Change Research, University of East Anglia, UK), Jocemar T. Mendonça (3Instituto de Pesca – APTA/SAA, Núcleo do Litoral Sul, Cananéia - SP, Brazil), Pietro S. Moro (J. M. P. Moro Consultoria, Curitiba – PR, Brazil)

Protected areas (PAs) are known for their importance as an instrument for long term sustainability, as they help ensuring the provision of ecosystem services that are critical for prosperity and human well-being. However, little is known about the role that PAs play as a source and a driver of economic activity, i.e. there are economies that derive from and depend on the existence of PAs generating income and jobs crucial for population living inside and in the surroundings of PAs. This work contributes to filling this gap in the literature by assessing the economic impact of recreational fishing in the Cananéia-Iguape-Peruíbe Environmental Protection Area (protected area corresponding to IUCN Category V). The study area is a biodiversity hotspot in Southeastern Brazil and it has become an important destination for recreational fishers in the last three decades. Data on anglers' expenditure were collected through semi-structured interviews with 278 recreational anglers. The number of anglers that visit the region annually was estimated through cross-checking data from fisheries monitoring and recreational boat counting, from January 2009 through January 2010. It was estimated that nearly 23,147 recreational fishermen operate in the area yearly. The economic impact (EI) was estimated by applying the Money Generation Model method, which is based on the visitor`s expenditure in the region (the direct economic impact) to which a multiplier is applied (from which the total - direct plus indirect - economic impact is captured). Two multipliers were applied (1.3 and 1.5), considering conservative and optimistic scenarios (respectively), based on the literature on protected areas in Brazil. Considering the money exchange rate of the study period (1.874 Reais = 1 US$), it was estimated that the EI of recreational fisheries was between US$ 3,607,496.41 and US$ 4,162,495.86. These estimates are conservative in the sense that only the amount spent in the region as informed by fishermen were included, which leaves expenditure outside the region (e.g. fishing tackle) and unreported expenditure out of the estimation. They should be interpreted as a first conservative approximation of the economic impact of recreational fishing in a marine protected area from Brazil as a case study.

PB 22 - (WRFC-110) Diagnosis of recreational fishing in the Cuiaba river basin: a foundation for scientific based fishery

Presenter Samuel Elias da Silva

Samuel Silva (Pós-graduação em Ecologia e Conservação da Biodiversidade – Instituto de Biociências – UFMT) – main author, Lúcia Mateus (Laboratório de Ecologia e Manejo de Recursos Pesqueiros – Departamento de Botânica e Ecologia – IB – Campus da UFMT), Jerry Penha (Laboratório de Ecologia e Manejo de Recursos Pesqueiros – Departamento de Botânica e Ecologia – IB – Campus da UFMT).

The modality of recreational fishing is currently an economic activity which involves millions of people and moves a commerce that generates billions of dollars in developed countries. However, while developed countries invest in policies to regulate recreational fishing, developing countries are still lagging behind. There's no systematic record of recreational fishing in the Pantanal region of southern Mato Grosso, although this fishing modality is the most expressive on that region, which emphasizes the need for this kind of fishing to be considered a priority for evaluation. In this work we aimed to characterize and evaluate the effort of recreational fishing on a stretch of the Cuiabá River (between Santo Antonio do Leverger and Barão de Melgaço municipalities). Data were collected by semi-structured interviews conducted in situ with fishermen. During the high fishing season of 2013, which is between September and November, 188 fishermen were interviewed. Our data show a clear separation of two different profiles of recreational fishermen who fishes at the monitored area. The first group is composed by fishermen who fishes in platforms, not on boats of any kind. They are 42.2 years old average (SD = 12) and are self-employed professionals (29.1 %), public servants (25.9 %), retired (13.3%) or merchants (10.2 %). The predominant degree of education is high school (48.8 %) and the average salary is R$ 2, 438.00 (SD=1,829). The fishing activity lasts one day and the average investment is R$ 151.00 (SD =62). In this group 3,843 fishes were caught and we entered an average of 30 specimens captured by fisherman/day (SD=31). The

most captured species were the Pacu Peva (69.3 %), the Bagre (catfish) (14.8 %) and the Chimburé (4.1%). Only 11.5 % of the specimens captured were released to the river. The other fishermen profile opts for the comfort of the inns and fishing boats. They are an average 51 years old (SD=10) and are business men (31.1 %), retired (21.3 %) or public servants (18 %). The predominant degree of education is higher education (88.5 %) and the average salary is R$16,132 (SD=10,726). These fishermen come from different states, especially São Paulo (24.5 %), Goiás (14.7 %), and Distrito Federal (14.7 %). The fishing period lasts on average four days (SD=1.7) and the average investment is R$ 4,692 (SD=1800). In this group 3907 specimens were caught and 65.3 % were released to the river. Each fisherman captured on average 61 specimens per day (SD=98.5). The most captured species were Pacu Peva (39%), the Piraputanga (21%) and the Piranha (13%). We also recorded the capture of noble fishes, as the Pintado, the Cachara and the Pacu. Together they accounted for 6 % of total. Our analysis shows that these fishermen injected during the monitored period R$305.320.00 in current supply chain of recreational fisheries in the region. The data presented here are partial, but essential in public policies and fisheries management in the Pantanal region.

THEME XII - SUSTAINABILITY SPORT FISHING OF BILLFISH OFF SOUTHWESTERN ATLANTIC

PB 23 - (WRFC-089) - Marlin Project: Sustainability of the Brazilian Oceanic Sport Fishing (1979-2014)

Presenter - Tiago Rodrigues

1. Alberto Amorim: Instituto de Pesca (IP) – APTA – SAA, Santos (SP), 2. Eduardo Pimenta: Universidade Veiga de Almeida – Curso de Engenharia Ambiental, 3. Carlos Arfelli: Instituto de Pesca (IP) – APTA – SAA, Santos (SP), 4. Tiago Rodrigues: Scholarship Master Science student CAPES – Programa de Pós Graduação em Aquicultura e Pesca – Instituto de Pesca (IP) – APTA – SAA, Santos (SP), 5. Roberta Schmidt: TT3 Fapesp Scholarship, Instituto de Pesca (IP) – APTA – SAA, Santos (SP)"

Sport fishermen using rod and reel by trolling catch mainly sailfish, Istiophorus platypterus; dolphinfish Coryphaena hippurus; yellowfin tuna, Thunnus albacares; skipjack tuna, Katsuwonus pelamis; blue marlin, Makaira nigricans; and white marlin, Tetrapturus albidus. The Marlin Project was created in 1993 with the objective of studying the billfishes in Southeast Brazil by capturing, marking and releasing fish for studies of migratory route. The project also aimed to study biological aspects, when specimens were shipped, besides the standardization of catch per unit of effort - CPUE. Researchers were associated with the yacht clubs in southeastern Brazil to collect data. The sports fishing tournaments were followed up from the 1992/1993 season while presentations about billfish were ministred aiming the environmental awareness to the yachts clubs. Approximately 600 tags were placed in sports fishing tournament of YCI, CAIC, ICRJ, ICES and BUIC, including 50 swordfish markings in tuna fishing based in Santos. A white marlin released by a sport fisherman of YCI in Ilhabela - SP in 1994 was recaptured by tuna fishing off Florianópolis - SC after three years. A swordfish, released by commercial fishing in front of Florianópolis - SC in 1982, with about 70 cm and 14 kg was found after 11 years and three months in uruguayan and argentine international waters by a Uruguayan vessel, with 220 cm and 175 kg. A sport fisherman in Rio de Janeiro - RJ (ICRJ) released a sailfish, in December 1996 and it was recaptured by a tuna boat off Santos - SP in February 1997. On November 2008, another sport fisherman (ICRJ) released a sailfish in front of Cabo Frio and this fish was captured again by commercial fishing on December 2008, basically in the same place where it was marked. Another sailfish with 15kg was captured and marked on 31 of January 2011 near Praia Grande - SP and rediscovered on March 16th of that year by a sardine fishing trawler further south, near the border with the State of Paraná. With the creation of the Marlin Project, in 1993 the first billfishes were released. Board observers at the time (students generally) confirmed catches through testimonials and photographs. The minimum weight of boarding of blue marlin was 80 kg (YCI) in the mid 90s. Gradually this weight was increasing among yachts clubs to finally reach 300 kg, worthing 300 points in the ICRJ (disqualified below 250kg and above receiving score per kilogram). The adoption of environmental education as a tool was effective in establishing a new way of acting, which includes the practice of tagging and release the fish (tag & release), currently common in fishing tournament, an important achievement of the Marlin Project.

Abstracts – Oral Presentation

(Sequential order by control numbers)

04 - A cost-effective method for estimating the economic contributions of recreational fisheries in developing nations

Rob Southwick rob@southwickassociates.com

Theme - Innovative management and governance methods in the recreational fishing area

Rob Southwick (Southwick Associates, Inc., Fernandina Beach, FL, USA) - main author; Brad Gentner (Gentner Consulting Group, Inc. Silver Spring, MD., USA) and Raymon Van Anrooy (UN FAO and Secretary of the WECAFC)

"Many nations in the greater Caribbean region have been concerned about the sustainability of their fisheries resources, but do not have the means or expertise necessary to conduct the research required to support effective management and enforcement measures. An estimated 55% of the commercially exploited fisheries stocks in the Caribbean are overexploited or depleted and another 40% are fully exploited at present. While local businesses are calling for developing recreational fisheries, it is not known if current fishing pressure can be sustainably maintained or should be decreased. This uncertainty has serious consequences for investments in the sector. Securing the resources and commitment needed to effectively monitor and manage a nation's fisheries depends on support from various levels of government. A key first step towards gaining this support is to quantify recreational fisheries' economic contributions. To help Caribbean basin nations obtain economic data, regional fisheries organizations and NGO's worked through the Western Central Atlantic Fishery Commission (WECAFC) to develop a standardized methodology and handbook for nations to follow to quantify their recreational fisheries' economic impacts. This manual, completed in late 2012, is now being tested in several nations, with the results intended for presentation with the handbook for international review and endorsement at the 2014 World Recreational Fisheries Congress. The manual provides a simple step-by-step process for estimating angler expenditures and economic impacts. Considerations are given to tournaments, resident versus non-resident economics, and more. Economic multipliers are provided for each nation. Specific objectives of this manual are to help each nation a) increase awareness and understanding among decision makers and the general public about the economic importance of recreational fisheries and b) to help fisheries managers contribute to public policy discussions affecting fisheries management, conservation and economic policy."

06 - Recreational fishing tourism on the Brazil-Bolivia border

Fátima Aparecida Machado de Andrade fatima.corumba@gmail.com

Theme: Transformation and maximization of social and economic benefits generated by recreational fishery activities

Fatima Andrade - Frontier Studies lab-UFMS-Campus of the Pantanal. Tito Carlos Oliveira. (Prof. holder UFMS-CADEF Coordinator-Center for reviews and dissemination of border area).

"Corumba, a city on the River Paraguay, at the heart of the Pantanal, on Brazil's border with Bolivia, in the state of Mato Grosso do Sul, periodically receives recreational fishing tourists. This paper reveals some specificities of the amateur-sport-recreational fishing developed in the area. The main objective is to analyze the recreational fishing activity and its multiplier effects in the tourism supply chain. The methodological

scope was established through bibliographical research, associated with an exploratory field work and a qualitative and quantitative inventory of the actors involved in trade and services. Among the main results, it is worth emphasizing that: a) there is a visible socioeconomic contribution from the sector to the cities directly involved (Corumba, Ladario, Puerto Quijaro and Puerto Suarez); b) there is increasing involvement of the rural-riverine community in the bait trade and the pilotage service; c) there is an enlargement of the re-export trade in the franchised zone of Puerto Quijarro (Bo), which widens, as a result, the entire retail business on the border; and d) leisure transportation services (boat hotels), as well as other leisure services (bars, nightclubs, etc.) are intensified to meet the growing volume of tourists during the fishing period. The research led to the conclusion that the combined actions of tourism fishing and shopping refer to an activity which, even seasonally, enables the expansion of employment, the circulation of goods and services, thus authorizing the formulation of proposals of actions by both the private and the public sectors designed for the expansion and the consolidation of the economic activity in the region."

07 - Occurrence of Istiophoridae Larvae (Perciformes, Xiphioidei) in Southern Brazil

Tiago Rodrigues tiagosp7@hotmail.com

Theme - Sustainability Sport Fishing of Billfish off Southwestern Atlantic

Roberta Schmidt (Master Science student of Instituto de Pesca - IP, APTA/SAA) - first author; Tiago Rodrigues (Master Science student of Instituto de Pesca-IP, APTA/SAA); Eduardo Pimenta (M.Sc., Professor, Universidade Veiga de Almeida–UVA); Alexandre Hilsdorf (PhD., Universidade de Mogi das Cruzes-UMC) and Alberto Amorim (PhD., Instituto de Pesca - IP, APTA/SAA).

"The Istiophoridae, Istiophorus platypterus (sailfish) and Kajikia albida (white marlin) are commonly caught by commercial and sport fisheries off Southern Brazil. The presence of mature gonads of these species and juvenile of sailfish were observed during summer period. In the last two years (2011/2012 and 2012/2013) 16 research cruises were made and 54 surface trawls were performed using an ichthyoplankton net. The Istiophoridae family-level larval identification was made through morphological characteristics, and the species-level identification was performed by molecular biology using multiplex-PCR with species-specific primers and PCR-RFLP techniques. Five larvae of sailfish and two of white marlin were identified on the coast off Vitoria (ES) and Rio de Janeiro (RJ) cities, southern Brazil. The occurrence of sailfish and white marlin larvae shall be further studied, so that inferences about the area and period of spawning and development of early life stages of these fish can be made more accurately. In addition, these data may contribute to the management and conservation of these species on the Southwestern Atlantic."

10 - Estimating the number of recreational fishers for a regional fishery

Kevin L. Pope kpope2@unl.edu

Theme: Technological innovations in the recreational fishing area

Kevin Pope (U.S. Geological Survey—Nebraska Cooperative Fish &Wildlife Research Unit) – main author, Dustin Martin (University of Nebraska), Chris Chizinski (University of Nebraska), Mark Pegg (University of Nebraska), and Larkin Powell (University of Nebraska)

"Participation rates in recreational fishing are important to fishery-management agencies, especially those agencies that are primarily funded through license sales and excise taxes placed on fishing equipment. Fishing pressures on specific recreational fisheries are also important to fishery management agencies, especially those agencies concerned about potential overfishing and potential user conflicts. Unfortunately, participation rate and fishing pressure are often estimated on different spatial scales; as such, it is difficult to predict one estimate based on the other estimate. We believe that it would be politically advantageous for a management agency to estimate participation rates on finer scales than state-level. We present a method by which a standard creel survey can be utilized to estimate the population size of recreational fishers for a given waterbody or region."

11 - Spatiotemporal monitoring of 134Cs and 137Cs in the freshwater fishery grounds of the algae-grazing fish ayu, Plecoglossus altivelis, after the Fukushima Daiichi nuclear power plant accident

Jun-ichi Tsuboi tsuboi118@affrc.go.jp

Theme: Social and environmental changes and its impacts in recreational fisheries

Jun-ichi Tsuboi (Fisheries Research Agency, Japan) – main author; Shin-ichiro Abe (Fisheries Research Agency, Japan); Ken Fujimoto (Fisheries Research Agency, Japan); Hideki Kaeriyama (Fisheries Research Agency, Japan); Daisuke Ambe (Fisheries Research Agency, Japan); Keishi Matsuda (Fisheries Research Agency, Japan); Masahiro Enomoto (Fukushima Prefectural Inland Fishery Institute, Japan); Atsushi Tomiya (Fukushima Prefectural Inland Fishery Institute, Japan); Tsuneo Ono (Fisheries Research Agency, Japan); Shoichiro Yamamoto (Fisheries Research Agency, Japan); and Kei'ichiro Iguchi (Nagasaki University, Japan)

"The accident at Fukushima Daiichi nuclear power plant (F1NPP) has dispersed radioactive cesium-134 and cesium-137 (134Cs and 137Cs) into the grounds of the freshwater fishery of the ayu, Plecoglossus altivelis. To understand the effects of radioactive contamination, 134Cs and 137Cs were analyzed in running water, muddy sediment from the riverbed, attached algae, and whole body of ayu using samples from five river systems within Fukushima Prefecture from summer 2011 to autumn 2013. The concentrations of 134Cs and 137Cs in ayu were correlated with contamination levels in the catchment area of each river system, rather than the linear distance from F1NPP. The highest concentrations of 134Cs and 137Cs were found in sediments sampled at Abukuma River in the summer of 2011 (3437.5 Bq/kg-dry). The amount of 134Cs and 137Cs contained in water, sediment, algae, and ayu declined through time. The concentrations of 134Cs and 137Cs in ayu were highly correlated with levels in sediment samples. This suggests that ayu ingest 134Cs and 137Cs with muddy sediment when they forage algae attached to the streambed. Because the combined concentration of 134Cs and 137Cs exceeds the standard regulation of Japan for the maximum allowable level in food (100 Bq/kg-wet), fishing bans remain in two of the five studied river systems in 2013. We will present our estimation of the time at which ayu fishing in these two river systems can resume."

12 - Review of British Columbia's angling licence options and analysis of future directions

Adrian Clarke Adrian.Clarke@gofishbc.com

Theme - Social and environmental changes and its impacts in recreational fisheries

Megan Bailey (Wageningen University, Netherlands) and Adrian Clarke (Freshwater Fisheries Society of BC, British Columbia Canada)

"Every year in British Columbia, over a quarter of a million fishing licences are purchased so that men, women and families can enjoy freshwater angling activities in the province. BC residents purchase the majority of these, but other Canadians as well as non-Canadians also purchase licences. Almost half of B.C.'s adult residents will have bought an angling licence at some point in their lifetime. In 2010, the most recent year for which an analysis has been performed, licence revenues amounted to almost $14 million CAN, with direct, indirect and induced economic benefits to the province amounting to almost $1 billion in 2010. Unfortunately, licence sales in the province have decreased over the past 15 years, with a peak having been seen in 1993/1994, with 301,684 annual licences purchased, versus 217,474 in 2010/2011. This is an unfortunate trend not only seen in Canada, but in the United States as well. In 2007, the Provincial Fisheries Management Program was initiated, with one aim being to increase angling licence sales by 30% from 2004/2005 levels. To date, this goal now seems unrealistic and increasing licence sales is proving to be far more challenging than anticipated. Given this background, the goal of this study is a review and analysis of current licence pricing and products in BC, a review and analysis of the US states with the best examples of progressive licensing products, and the development of recommendations for changes for BC's approach. This study reviews the current licencing landscape in BC, and describes the economic contribution of the freshwater angling sector to the BC economy. Following this, a discussion of innovative ways to increase the revenue base takes place, where the focus is on the development of new or enhanced licensing products. Approximately ten years ago, a number of US states (e.g. Minnesota, California, Idaho) went through a review of their licensing options that resulted in large-scale

changes to the types of licences sold. The current range of licence products offered by BC has been essentially unchanged for decades. These potential changes to the BC system are analyzed in the context of the possible economic implications they could have for the province and potentially other jurisdictions."

16 - Does standard metabolic rate explain personality variation in Eurasian perch (Perca fluviatilis L.)?

Reetta Väätäinen reetta.vaatainen@uef.fi

Theme - Social and environmental changes and its impacts in recreational fisheries

Reetta Väätäinen (University of Eastern Finland) - main author; Marina Torrellas Arnedo (Universitat de Barcelona); Hannu Huuskonen (University of Eastern Finland); Jukka Kekäläinen University of Eastern Finland); Raine Kortet (University of Eastern Finland); and Anssi Vainikka (University of Eastern Finland)

"Fishing-induced evolutionary changes in fish populations have been widely studied in recent years in the context of commercial as well as recreational fisheries. Because life histories have a genetic basis, the increased mortality caused by fishing shifts the age and size at reproduction towards younger and smaller, respectively. In addition, selective fishing for example by size or behaviour is likely to cause additional selection. Because personality traits have a genetic basis, the selectivity of recreational fishing, for example through selective gear, may be directed towards them as well. Consistent individual differences in behaviour have further been associated with life history traits, such as growth rate or reproductive success, in species across animal taxa. Therefore, fishing-induced selection on behavioural traits is of applied interest from the perspective of fisheries management as well. Because also the consistent individual differences in minimal metabolism have been associated with differences in life history traits, the potential connection between metabolic rate and personality traits has become a research interest. A recent theory has suggested that individual fish with relatively high minimal metabolism would show more active, bold and aggressive behaviours relative to population and in addition it has been theorized that these individuals would be more vulnerable to angling. In this study, the connection between the behavioural trait boldness and standard metabolic rate (SMR) was examined in the Eurasian perch (Perca fluviatilis L.). Also the selectivity of two distinct angling methods was compared in relation to individual behaviour and metabolism. In addition, possible size dependence in capture order was studied. Linear mixed models were used to explain the variation in boldness with individual metabolic rate, angling method, capture order and capture hole. The behaviour and SMR of perch were found to be repeatable. However, no association was found between behaviour and SMR. Angling method or capture order did not explain the variation in fish behaviour or metabolism. However, boldness was found to be more similar inside capture holes than between capture holes, which was interpreted as reflecting assortativeness within perch shoals, even though possible day-effect could not be ruled out as a confounded explanatory factor. The results did not support the theory that minimal metabolism and behavioural traits would be correlated. No strong or direct selectivity for behavioural traits was suggested by the two angling methods used in this study."

18 - Mortality rates for sporting fishing of the peacock bass Cichla spp. at the Unini River (Amazon Basin - Brazil)

Carlos Edwar de Carvalho Freitas cefreitas@ufam.edu.br

Theme - Catch-and-release practices: novel insights

Lorenzo S.A. Barroco (Department of Fisheries Sciences, University Federal do Amazonas) - main author; Alvaro C. Lima (Department of Fisheries Sciences, University Federal do Amazonas); and Carlos E. C. Freitas (Department of Fisheries Sciences, University Federal do Amazonas)

"The expansion of recreational fishing in Brazil began in the 90s and has reached the black water rivers in the Amazon region, especially in the middle Rio Negro where are found the great peacock bass (Cichla spp.). With the sharp growth of this activity in the region, the catch-release fishing has been proposed as a sustainable procedure in fishing of peacock bass of the region. However, there are doubts about the fish mortality rates due this type of fishing. Then, we evaluated the effect of catch-release on survival of peacock

bass, comparing two types of artificial lures jig and half water. Two experiments were conducted during the periods of January / February and October / November 2012 in Unini River, right bank tributary of the Rio Negro (Amazon Basin – Brazil). In total 191 peacock bass were captured: 90 by jig baits and other lures for half-water. Both groups of fish were subjected to experiments confinement for a period of 3 days. The first group composed by 30 fish were caged individually and 60 collectively. In the second group, 30 were caged individually and 60 collectively. Additionally, 11 fishes of this group were tagged with radio transmitters for telemetry monitoring. The mortality rate was estimated as the percentage of dead individuals for each type of bait and containment environment. There was no mortality for the group of peacock bass caught with jig. Still, the bait half-water showed a mortality rate of 1.66% for the collective containment and 18.18% for monitored by telemetry, thus not having deaths of individuals confined individually. The Kruskal-Wallis test indicated that both the type of confinement and the type of bait had no significant influence on mortality rates of peacock bass in the catch-release. Besides other studies could include new factors in the analysis, our results show that the catch-release results in low mortality rates."

19 - Development of resources to promote best practice in the humane dispatch of finfish caught by recreational anglers

Ben Diggles ben@digsfish.com

Theme - Technological innovations in the recreational fishing area

Ben Diggles (DigsFish Services, Banksia Beach, Australia)

"Recreational fishers can improve the welfare of fish in many ways. These include protecting and restoring fisheries habitat and water quality, by obeying fisheries regulations and using appropriate fishing gear, and of course, by dispatching their fish humanely. Iki jime (also known as ikejime), is a Japanese method of brain spiking (pithing) that is proven to be the fastest and most humane way to kill fish. Studies have shown that rapid dispatch of finfish using the iki jime method results in other benefits besides improved welfare outcomes, including improved flesh quality and the potential for extended shelf life. However, fish brains are small and vary in location between species groups, and without guidance the average angler can find it difficult to accurately pith the brain of a live fish, and the fish may suffer during this process. We found that resources which demonstrate to recreational fishers the best practice methods for humane dispatch of finfish (including accurate "how to" information on the iki jime procedure), were virtually non-existent, and that this information gap was likely to be a barrier to the widespread uptake of the iki jime method. To fill the information gap we undertook morphological investigations using x-ray and dissection to pinpoint the brain location of over 80 species from 33 families of finfish most commonly encountered by anglers throughout Australia, New Zealand and the Asia/Pacific region. Brain locations were superimposed graphically on colour photographs of the exterior of each fish, and hard copy pamphlets containing this information were developed and distributed to fishers via fishing media and various other methods. A new website www.ikijime.com was then developed, allowing interactive photograph/radiograph overlays revealing the brain location of each species of fish to be placed in the public domain on an online database. The most recent extension tools arising from this project include development of the Ikijime Tool series of phone apps for Apple Iphone and Android operating systems. The Ikijime Tool Lite version is a free version that allows limited access to the online database. The Ikijime Tool version provides unlimited access to the online database, while the Ikijime Tool Extreme version contains its own database and thus retains full functionality even in remote places out of phone or internet range. Feedback from anglers and animal welfare groups in Australia and internationally suggests that these resources have been well received, opening the way for the concept to be extended to other regions such as North and South America, Europe and Asia. Co–operation is sought with anglers and scientific groups in these regions in order to facilitate the ongoing development of the database to accommodate popular angling species from each of these locations."

22 - Avoiding tagging bias in post-release behaviour studies: experimental catch-and-release of acoustically pre-tagged Atlantic cod (Gadus morhua) in a natural marine environment

Keno Ferter Keno@imr.no

Theme - Catch-and-release practices: novel insights

Keno Ferter (Fisheries Dynamics, Institute of Marine Research, Norway, and Department of Biology, University of Bergen, Norway) - main author; Klaas Hartmann (Institute for Marine and Antarctic Studies, University of Tasmania, Australia); Alf Ring Kleiven (Fisheries Dynamics, Institute of Marine Research, Norway); Even Moland (Population Genetics, Institute of Marine Research, Norway); and Esben Moland Olsen (Population Genetics, Institute of Marine Research, Norway, Centre for Ecological and Evolutionary Synthesis (CEES), University of Oslo, Norway, and Department of Natural Sciences, University of Agder, Norway)

"Studying the sub-lethal effects of catch-and-release (C&R) is challenging, as there are several sources of bias. For example, if behavioural alterations immediately after the release event are to be studied, it is important to separate tagging effects from actual C&R effects, which can be a challenge in marine environments in particular. To investigate the potentially negative consequences of C&R on Atlantic cod (Gadus morhua) in their natural environment, 80 cod were caught in fyke nets, fitted with acoustic tags and released. After a recovery period of at least 14 days, nine individuals were subsequently recaptured and released at least once by experimental recreational angling using rod and line, following best release practice. This experimental design made it possible to separate tagging effects from C&R effects as the cod were tagged and released several weeks prior to the experimental C&R angling. Even though all cod survived the C&R event, analysis of vertical movements showed that some individuals underwent short-term behavioral alterations (e.g., reduced swimming activity or disruption of diel vertical migrations). This study showed that pre-tagging fish with acoustic transmitters, before the actual experimental angling, is an option in marine environments when investigating fish behaviour immediately after the release event. To minimize the negative effects of C&R, fishery managers are encouraged to consider C&R practice in future management regulations, in conjunction with the development of best practice guidelines and angler education on proper fish handling."

23 - Barotrauma and recovery of Atlantic cod (Gadus morhua) after rapid decompression: combining field observations and X-ray technology

Keno Ferter Keno@imr.no

Theme: Catch-and-release practices: novel insights

Keno Ferter (Fisheries Dynamics, Institute of Marine Research, Norway and Department of Biology, University of Bergen, Norway) - main author; Odd-Børre Humborstad (Fish Capture, Institute of Marine Research, Norway); Marc Simon Weltersbach (Thünen-Institute of Baltic Sea Fisheries (TI-OF), Germany); Per Gunnar Fjelldal (Reproduction and Development Biology, Institute of Marine Research, Norway); Florian Sambraus (Reproduction and Development Biology, Institute of Marine Research, Norway and Department of Biology, University of Bergen, Norway), and Jon Helge Vølstad (Fisheries Dynamics, Institute of Marine Research, Norway)

"Barotrauma commonly occurs when fish with closed (physoclistous) swim bladders are rapidly brought up from deep water, and has been identified as one of the main contributors to post-release mortalities in a number of species. Atlantic cod (Gadus morhua), which is frequently targeted in many European marine recreational fisheries, may show a variety of barotrauma signs after forced decompression including (but not limited to) bloating, swim bladder puncture, stomach and anal eversion, and exophthalmia. Due to regulations (e.g. minimum landing sizes and bag limits) and voluntary decisions, release rates for this species are over 50% in many European countries, corresponding to several million cod released each year. To investigate different barotrauma symptoms in Atlantic cod and recovery from these, field studies were conducted, where cod

were caught on angling gear, filmed with underwater cameras, held in cages for observation and dissected. These were supplemented with a laboratory study where cod were radiographed before, immediately after, and up to 30 days after rapid decompression from 40 meters acclimation depth. In the field study, ruptured swim bladders occurred in cod taken at only seven meters depth. The incidence of ruptured swim bladders increased with depth of capture, with ruptured swim bladders in 100% of the cod caught at more than 20 meters. Other obvious barotrauma signs, though significantly less frequent, were bulging eyes and stomach protrusions. Dissection of the cod revealed a significant number of gas bubbles in the venous blood system, which restrained the blood flow to the heart. Although one should expect very high mortality rates with such severe barotrauma symptoms, many of the cod were alive at the end of the observation periods varying from one to four weeks in length. In the laboratory study, radiographs taken three days after the decompression showed inflated swim bladders, and that the gas bubbles had disappeared from the blood system. Thus, cod can recover from severe barotraumas if they manage to submerge immediately after capture. However, to ensure that cod have enough energy to submerge, anglers are encouraged to avoid fighting the fish to exhaustion, and to minimize handling before the release."

24 - Changing towards online licenses: more members?

Toine Aarts aarts@sportvisserijnederland.nl

T.W.P.M. Aarts (Royal Dutch Angling Association 'Sportvisserij Nederland', The Netherlands)

"Since January 2013 it became possible to become a member of an angling club in the Netherlands through a central online ordering website. The system was introduced and distributed by the Royal Dutch Angling Association 'Sportvisserij Nederland'. The system is directly linked with the central membership database. Angling clubs were given the possibility to participate voluntarily by activating the module through a website CMS. Where before new membership could only be obtained in tackleshops, new membership can now also be obtained by direct online payment through a bank system, credit card and PayPal. Participation of angling clubs as well as the profiles of new members obtaining a new membership the traditional and the new digital way, is discussed in this presentation. Furthermore two new permits for freshwater fishing were introduced in 2013 for 1.fishing during the night and 2.fishing with one extra rod (total of three rods). These extra licenses were only available through an online ordering website. Issues met by introducing the system as well as support by governmental authorities, participation of angling clubs and selling results are discussed in this presentation."

25 - Key success factors for a growing sport fishing organization in The Netherlands

Toine Aarts aarts@sportvisserijnederland.nl

Theme: Recreational fisherman's attitudes to cope with the impacts of change

Toine Aarts (Royal Dutch Angling Association 'Sportvisserij Nederland')

"In 2007 the governmental organization OVB was merged with the private sport fisheries organization called NVVS into Sportvisserij Nederland, the Dutch anglers association. At that time it was known that 1.7 million people (11%) of the population fishes at least once a year but only 550.000 people were registered buying a single rod governmental license. At that time 340.000 people were registered as a member of an angling club. Only 7 years later 590.000 people are registered but more important 509.000 are members of angling clubs. This presentation shows key factors for this success in a changing community where new technologies are used to contact potential members, to find new youth members and to improve service to members. It also shows the corporate attitude of Sportvisserij Nederland towards stakeholders in fisheries management, Nature conservation organizations and other NGO's, resulting in social acceptance of sport fishing in nowadays society in The Netherlands."

26 - A sustainability science route to sustainable fish stocking

Carsten Riepe riepe@igb-berlin.de

Theme - Transformation and maximization of social and economic benefits generated by recreational fishery activities

Carsten Riepe (Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany) – main author; Ben Beardmore (Center for Limnology, University of Wisconsin-Madison, WI, USA); Thilo Pagel (Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany); and Robert Arlinghaus (Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany, and Laboratory for Integrative Fisheries Management, Faculty of Agriculture and Horticulture, Humboldt-Universität zu Berlin, Germany)"

"One common tool for managing freshwater fish stocks in Germany is fish stocking. The general assumption behind the decision of angling clubs to engage in fish-stocking activities is that stocking ultimately has a positive influence on the benefits that anglers derive from their fishing trips and, consequently, on the choices that they make between alternative water bodies. Drawing on random utility theory, we conducted a discrete choice experiment among a sample of recreational anglers (N = 1,335) in the federal state of Lower Saxony, Germany. The methodology that we chose enabled us to measure the simultaneous effect of two stocking-related attributes (stocking frequency, likelihood of catching wild vs. stocked fish) and of other salient characteristics of a fishing trip (e. g., catch regulations, expected catch outcomes, club fee, crowding) on the overall utility that an angler obtained from a fishing trip. We also studied how these attributes of the fishing experience varied in their contribution to the utility offered by various freshwater fish species. All else being equal and after controlling for the impact of catch on angler utility, no significant influence of either stocking attribute (stocking frequency and wild vs. stocked fish in the catch) on the total utility gained from a fishing trip was found for all but one study species. Utility of anglers was instead strongly driven by catch-related attributes (catch rates and probability of catching trophy fish) and crowding across all species. We conclude that the previously documented large appreciation of fish stocking by ordinary anglers is in fact a hidden preference for catch outcome. Hence, the pro stocking social norm among anglers might vanish whenever fish stocks are elevated and maintained by other management means, and anglers are aware of the exact cause-and-effect relationships that contribute to maintaining sufficient catch outcomes."

28 - Community-based sport fishing as a sustainable development path in remote regions in developing countries

James Randall Kahn kahnj@wlu.edu

Theme: Transformation and maximization of social and economic benefits generated by recreational fishery activities

James Kahn, Washington and Lee University (USA) and Universidade Federal do Amazonas (BR); and Carlos Freitas, Universidade Federal do Amazonas (BR) and Washington and Lee University (USA)

"Remote regions in developing countries have often not shared in the increase in income and quality of life associated with economic growth in the industrial and service sectors. This is particularly true in countries with a rapidly developing economy and middle class, such as Brazil. Remote regions remained trapped in extractive activities of past generations, where income potential is very limited due to the economic power of intermediaries, the cost of getting products to the market, and the lack of value added in the remote region. In many remote regions, sport fishing opportunities are plentiful and since the expenditure will be based in the region, many of the problems associated with extractive output could be avoided. This paper examines the potential of sport fishing as a sustainable development path In remote regions, with an example from Barcelos, Amazonas, Brazil. The first part of the paper examines alternative income possibilities, and shows why community-based sport fishing has the potential to generate more income and other beneficial

improvements in quality of life. The second part of the paper discusses the investments in facilities and human capacity that need to take place in order for community-based sport fishing to be successful. The third part of the paper discusses a bio-socioeconomic model for assessing the impact of sport fishing on community quality of life and environmental quality. The paper concludes by examining our initial efforts and discussing steps for the future."

29 - Aerial and on-site surveys of recreational fishery on inland waters

Roland van Aalderen aalderen@sportvisserijnederland.nl

Theme: Research on angling diversity around the world

R.A.A. van Aalderen & R. Verspui, Sportvisserij Nederland (Royal Dutch Angling Association - The Netherlands)

"To gain insight into the interests of recreational fishing, a project was started on the recreational fishing use of large inland waters in the Netherlands. Between 2011 and 2013 four lakes, two rivers and two large canals were investigated. Aerial surveys took place twice a month to obtain an estimate of the total number of fishing trips per year and the geographical distribution along the water. In addition we also performed on-site interviews and handed out logbooks to anglers along the shores twice a month, to characterize their behavior. Data from national surveys on recreational fishing were used to extrapolate the observations to estimates of year-round activity. Overall quantitative data was collected on geographical and temporal distribution of fishing trips, angler-preferences, avidity, used means of transportation, catch quantity, the composition of caught species, and length-frequency distributions per species. Ultimately the results from this study were used in negotiations with water managers to substantiate the economic value of recreational fishing, indicate important fishing spots and to show that recreational fishing has a minimal impact on the ecological aims of the water managers. The methods used for this study as well as the results will be presented. Potential sources of error or bias will be discussed."

32 - Catch-and-release angling does not impede normal upriver migratory behaviour of anadromous Atlantic salmon (Salmo salar)

Robert Lennox robertlennox9@gmail.com

Theme - Catch-and-release practices: novel insights

Robert Lennox (Carleton University, Ottawa, Canada) - main author; Eva Thorstad (Norwegian Institute for Nature Research, Trondheim, Norway); Ingebrigt Uglem (Norwegian Institute for Nature Research, Trondheim, Norway); Steven Cooke (Carleton University, Ottawa, Canada); Tor Naesje (Norwegian Institute for Nature Research, Trondheim, Norway); Torgeir Havn (Norwegian Institute for Nature Research, Trondheim, Norway); Eva Ulvan (Norwegian Institute for Nature Research, Trondheim, Norway); and Oyvind Solem (Norwegian Institute for Nature Research, Trondheim, Norway)

"To reproduce, Atlantic salmon (Salmo salar) must migrate upriver to reach spawning areas. These migrations provide popular recreational sport fisheries for salmon, which for conservation reasons are increasingly dominated by catch-and-release rather than harvest. However, the effectiveness of catch-and-release for conservation is contingent on the ability of salmon to recover from the capture event, resume upstream migratory behaviour, and reach spawning grounds at appropriate times. We evaluated the tenability of these contingencies by affixing external radio transmitters to 228 salmon caught at sea in bag nets salmon before river entry (48 entered the river; our controls) and also to salmon angled and released in River Gaula, a prominent salmon river that is unregulated for hydropower but has a large natural waterfall acting as a barrier to migration at high water discharge. Previously angled salmon were captured by anglers with a similar frequency to control salmon, spent similar amounts of time resting below and passing a large natural barrier to migration, and crossed the barrier at similar water discharge compared to control salmon. The angled and released salmon were also generally distributed in similar locations throughout the river during the spawning season compared

to control salmon. While none of the control fish died during the study period, three of the angled and released salmon died prior to spawning, a significantly different percentage. However, among the three salmon that died following catch-and-release, one was angled in warm water (18°C) and subsequently retained for 15 minutes in a submerged flow-through holding tube in low velocity water before tagging, one was angled for a long duration (45 minutes), and one, a grilse, was retained on the line after being swum to exhaustion (15 minutes). Our behavioural metrics demonstrate that with appropriate care from anglers to reduce fight times and handling, released salmon will behave similarly to salmon that have not been angled."

33 - Additive versus replacement effects of stock-enhancement exemplief by juvenile pike (Esox Lucius L.) stocking into German gravel pit lakes

Daniel Hühn huehn@igb-berlin.de

Theme: Social and environmental changes and its impacts in recreational fisheries

Hühn, Daniel - Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Müggelseedamm 310, 12587, Berlin, Germany; Gwinn, Daniel C. - Program for Fisheries and Aquatic Sciences, School of Forest Resources and Conservation, The University of Florida, Gainesville, FL, 32653-3071, USA; Shaw, Stephanie - Program for Fisheries and Aquatic Sciences, School of Forest Resources and Conservation, The University of Florida, Gainesville, FL, 32653-3071, USA; Allen, Micheal S. - Program for Fisheries and Aquatic Sciences, School of Forest Resources and Conservation, The University of Florida, Gainesville, FL, 32653-3071, USA; Skov, Christian - DTU AQUA, National Institute of Aquatic Resources, Technical University of Denmark, Vejlsøvej 39, 8600 Silkeborg, Denmark; Arlinghaus, Robert - Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Müggelseedamm 310, 12587, Berlin, Germany and Chair for Integrative Fisheries Management, Department for Crop and Animal Sciences, Faculty of Agriculture and Horticulture, Humboldt-Universität zu Berlin, Philippstrasse 13, Haus 7, 10155, Berlin, Germany;

"Despite substantial stock enhancement to improve fisheries, the successes and risks of fish stocking are rarely quantified. Replicated studies are needed to differentiate among additive and replacement effects of stocking, but few of these exist. In this study, the outcome of stocking juvenile pike (Esox lucius L.) in naturally reproducing stocks was investigated using a before-after-control-impact design (n = 18 lakes). Stocking treatments encompassed adding either 35 or 70 tagged age-0 pike per hectare. Stocking increased natural age-0 recruitment over two orders of magnitude in several fisheries. Unstocked lakes served as temporal controls. A mark-recapture model suggested survival of age-0 pike was inversely size-dependent, and it was poorer for stocked than for wild fish indicating low fitness of stocked pike in the wild. Nevertheless, in spring after the fall stocking, age-1 pike catch per unit effort was significantly increased compared to controls in the high stocking treatment, particularly in lakes with poor vegetation coverage and correspondingly low natural recruitment. However, one year after stocking, additive effects of age-0 pike stocking were no longer detectable in the high stocking treatment, and no additive effects on pike abundance were apparent in the low stocking treatment. Part of the year class encompassed stocked fish in both stocking treatments, indicating that natural fish replacement had occurred. Depending on the origin of the stocking material, pike stocking has the potential for introduction of non-native genotypes, while not elevating natural stock size. Hence, the use of stocking to manage pike stocks should be discontinued unless natural recruitment is zero."

34 - Angling-induced direct selection on boldness in common carp (Cyprinus carpio)

Thomas Klefoth klefoth@igb-berlin.de

Theme - Catch-and-release practices: novel insights

Thomas Klefoth (1 Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany and 2 State Sport Fisher Association of Lower Saxony (Landessportfischerverband Niedersachsen e.V.), Hannover, Germany); Philip Rebensburg (1 Biology and Ecology of Fishes, Leibniz-Institute

of Freshwater Ecology and Inland Fisheries, Berlin, Germany and 3 Leibniz Centre for Agricultural Landscape Research (ZALF), Muencheberg, Germany); Christian Skov (4 National Institute of Aquatic Resources, Technical University of Denmark); Anna Kuparinen (5 Fisheries and Environmental Management Group (FME), University of Helsinki, Finland); Josep Alós (1 Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany); and Robert Arlinghaus (1 Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany and 6 Inland Fisheries Management Laboratory, Department for Crop and Animal Sciences, Faculty of Agriculture and Horticulture, Humboldt-University of Berlin, Germany)

"Rod-and-reel angling constitutes passive fishing and is thus supposed to induce direct selection on behavioural traits rather than imposing direct selection on life-history traits, but no experimental data are available to support this assumption. We conducted two experimental series using common-garden reared common carp (Cyprinus carpio) to identify the strength of angling-induced selection acting on behavioural traits in comparison to morphological- and life-history traits. In a first experiment, carp were tested for their boldness related behaviour under laboratory conditions and under semi-natural conditions in ponds. In addition, body-fat content and morphological parameters were investigated, followed by standardized and replicated angling of the fish. No consistent behavioural expressions of the carp could be identified within the laboratory, but boldness-related behaviour of the fish was repeatable within ponds. After 7 days of angling, larger and more bold individuals had a higher risk of being captured, but the selection gradient on body size was much more pronounced than that on behaviour. A second experiment was conducted to further investigate angling-induced selection acting on behavioural traits over a longer period. After 23 days of angling, bold and fast-growing carp were more vulnerable to capture, while no selection on body size was present. Mean standardized selection gradients indicated stronger selection on behavioural traits compared to life-history traits like growth, and morphology was largely irrelevant to explain vulnerability to angling. Our results show that fishing-induced selection strongly acts on behavioural traits if passive angling gear is used and that any selection previously reported to act on body size may be indirect through its impact on behaviour. Our findings suggest that heavily exploited fish population my host shy individuals that are difficult to be captured."

35 - The fisher, the manager, the conservationist and the scientist. Collaborative management of Australia's Murray Cod Fishery

Matt Barwick matt.barwick@recfishingresearch.org

Theme - Innovative management and governance methods in the recreational fishing area

Matt Barwick (Recfishing Research) - main author; John Koehn (Arthur Rylah Institute); Cameron Westaway (NSW Department of Primary Industries); Anthony Forster (Fisheries Victoria); and Peter Kind (Queensland Department of Agriculture Fisheries and Forestry), Mark Lintermans (University of Canberra).

"Achieving effective fisheries management outcomes can be challenging for multi-jurisdictional fisheries such as the recreational fishery for Murray Cod (Macculochella peelii) in Australia's Murray-Darling Basin. Meaningful engagement between management agencies, researchers, the fishing community and other stakeholder groups can assist with this. Murray Cod is Australia's largest freshwater fish species, is highly valued by recreational fishers, and is also listed under national environmental legislation as vulnerable to extinction. Whilst fisheries and conservation objectives are largely compatible, there is a need to ensure that actions to pursue population recovery and fishery enhancement are in concert, and are complimentary between jurisdictions. Establishment of a collaborative and multi-jurisdictional model for management of Murray Cod through the Murray Cod Fishery Management Group (MCFMG) has facilitated continued progress in the recovery of this species and improvement of fishing outcomes throughout much of the Murray-Darling Basin. The MCFMG comprises researchers, managers, and recreational fishers from each basin jurisdiction, as well as representatives of the Murray Cod Recovery Team. Here we consider positive outcomes achieved in the management of this iconic species through the MCFMG, key factors in the delivery of these outcomes, and lessons able to be derived and applied in the management of similarly complex fisheries elsewhere."

36 - Advancing understanding of recreational catch through social change and public engagement

Owen Bird birdo@sportfishing.bc.ca

Theme - Innovative management and governance methods in the recreational fishing area

Owen Bird, Sport Fishing Institute of BC, Canada

"In jurisdictions where recreational angling is enjoyed by large numbers of enthusiasts, effective catch monitoring, which is vital to sustainable fisheries management, can prove challenging during a period of shrinking government resources. In British Columbia, recreational fishing advocates, First Nations, volunteers and Fisheries and Oceans Canada (DFO) have grappled with this challenge and developed a strategic framework through which these groups will work with the large and dispersed community of more than 300,000 licensed anglers to gather and disseminate the needed information. The collaborative strategy identifies recreational fishing effort as a key indicator of risk suitable for defining monitoring requirements, and highlights a three-tiered approach to monitoring programs appropriate across various fishery risks. The plan then details key data management initiatives and integrated compliance monitoring requirements. The implementation plan concludes by defining accountabilities, potential funding options and highlighting the requirement for shared stewardship by all recreational fishery participants. It is intended to provide a template to government, stakeholders and the public on the approach to monitoring recreational fisheries. In short, the strategy seeks to reassure anglers that their information and experiences are vital to effective fisheries management, gather information in a timely, cost-effective and statistically significant manner, provide it to fisheries managers in a manner conducive to sound decision making, and then provide feedback to anglers about the utility and impacts of their data collection efforts."

39 - Effectively managing angler satisfaction in recreational fisheries requires understanding the fish species and the anglers

Ben Beardmore abeardmore@wisc.edu

Theme - Transformation and maximization of social and economic benefits generated by recreational fishery activities

Ben Beardmore (Center for Limnology, University of Wisconsin - Madison) - main author; Len M. Hunt (Ontario Ministry of Natural Resources); Wolfgang Haider (Simon Fraser University); and Robert Arlinghaus (Leibniz Institute for Freshwater Ecology and Inland Fisheries)

"Past research has proposed a link between angler specialization and catch orientation, suggesting that committed anglers are both more trophy-oriented and also more prone to catch and release fish than are casual anglers. To test the universality of these suggestions, we examined the moderating influence of centrality-to-lifestyle (as a measure of psychological commitment and angler specialization) on relationships between catch outcomes and satisfaction with catch across six recreationally important freshwater fish species in northern Germany. Across all species and species groups, satisfaction with catch was primarily determined by catch rate and size of captured fish. Indeed, regardless of species, more fish and larger fish in the catch imply more satisfied anglers. However, the relative strength of these relationships varied across species. Satisfaction with catch for zander (Sander lucioperca), for example, depended most strongly on catch rate, while for European perch (Perca fluviatilis), size of the largest retained fish was most important. Not only was the influence of catch outcomes on satisfaction with catch species-dependent, but it was also moderated by angler specialization, indicating that the same catch outcome will be associated with different ratings of catch satisfaction by differently committed anglers. Besides catch outcomes, non-catch aspects of the fishing experience had significant effects on catch satisfaction, such as the number of other anglers seen. This result underscores the role of non-catch factors on either establishing expectations or evaluating catch outcomes. While more and larger fish may be universally desirable, our results highlight the importance for recreational-fisheries managers to consider the particular mix of anglers and fish species when setting policies designed to influence the satisfaction and ultimately the well-being of anglers."

40 - Meeting the requirement of recreational fisheries data for integrated fisheries management

Karina Ryan - AC Ryan Jones mark.pagano@fish.wa.gov.au

Theme - Innovative management and governance methods in the recreational fishing area

Karina Ryan (main author); Fiona Crowe; Anthony Hart; Eva Lai; Claire Smallwood; Fabian Trinnie; Brent Wise (Department of Fisheries Western Australia)

"Catch allocation among multiple fishing sectors depend upon credible scientific data from each sector to underpin decision-making, allocation and management arrangements to ensure all sectors can access their allocated share. Since 2004 an Integrated Fisheries Management (IFM) policy has been adopted in Western Australia for three multi-sector fisheries: the Western Rock Lobster (WRL) (Panulirus cygnus) with allocation based on 95% commercial, 5% recreational and 1 tonne customary; Roe's abalone (Haliotis roei) within Metropolitan area with allocations of 36 tonnes commercial, 40 tonnes recreational and 500 kgs customary; and the West Coast Demersal Scalefish (WCDSF) with an allocation (of all species) of 64% commercial and 36% recreational. While total catch from the commercial sector are obtained from statutory catch return obligations, estimates of recreational catch are variable among the three multi-sector fisheries, depending upon the nature of the recreational fishery and the spatial and temporal scales of the resource. The WRL recreational fishery has a specific fishing licence with ~37,000 issued annually, and covers large spatial and temporal scales. Offsite mail surveys supplemented with occasional phone surveys have provided a cost effective method of monitoring this fishery over a 27 year period. The metropolitan Roe's abalone recreational fishery has a specific fishing licence with ~15,000 issued annually, however, the fishery operates over a limited temporal scale, which allows data collection from onsite surveys. The WCDSF had no recreational fishing licence until the Recreational Fishing from Boat Licence (RFBL) was introduced in 2010 and ~125,000 licences are issued annually. An offsite phone survey provides data for more than 100 species harvested in this fishery, with high precision catch estimates for the key species that dominate the recreational catch. In 2014, the lower West Coast Blue Swimmer Crab (Portunus armatus) fishery has been identified as the fourth resource for IFM with allocations and ongoing recreational monitoring yet to be formalised. Monitoring and managing allocations are an ongoing process, however, routine surveys -of recreational catches meets the requirements of fisheries management by providing estimates with a known confidence interval and a specified significance level which are comparable with other sectors."

41 - Breathing life into fisheries stock assessments through citizen science

David Fairclough mark.pagano@fish.wa.gov.au

Theme: Recreational fisherman's attitudes to cope with the impacts of change

David Fairclough (main author); Joshua Brown; Ben Carlish; Brett M. Crisafulli; and Ian S. Keay (Department of Fisheries Western Australia)

"Citizen science offers a potentially cost-effective way for scientists to obtain large data sets over large spatial scales. However, it is not used widely to support age-based fisheries stock assessments. Overfishing of demersal fishes along 1,000 km of the west Australian coast led to restrictive management to recover stocks. This diminished opportunities for scientists to cost-effectively collect biological data via traditional stratified sampling of the fishery to monitor recovery. The citizen science program Send us your skeletons (SUYS) was developed to support ongoing stock assessments and asks recreational fishers to voluntarily donate fish samples of indicator species from their catch to meet sample size objectives. During SUYS' first three years, recreational-fisher involvement and sample sizes dramatically increased and the cost of collection per sample was significantly reduced. SUYS is ensuring timely advice is available to management and its sustainability and participation messages have led to its broad support in the community and its use in school children education programs."

42 - Recreational Fishing Initiatives - a partnership between government and the recreational fishing community

Mark Pagano Mark.Pagano@fish.wa.gov.au

Theme - Innovative management and governance methods in the recreational fishing area

"Managing recreational fishing in Western Australia is challenging, with a 12,800km coastline spanning from the tropical to temperate areas, with at least 3,000 fish species. It is estimated that the 740,000 recreational fishers participating in this extremely popular activity (30% of the Western Australian population) contributes more than $AU600 million each year to the Western Australian economy. Working with Recfishwest, the peak body representing recreational fishing interests in Western Australia, and the community, the Department of Fisheries have implemented innovative fisheries management actions to ensure the long-term sustainability and enhancement of recreational fishing opportunities in Western Australia. These measures included the introduction of a recreational fishing from boat licence to fund world's best monitoring of recreational catches (iSurvey) and new progressive management tools, such as habitat enhancement projects, artificial reefs and Fish Aggregating Devices, stock enhancement opportunities, improved recreational fishing data collection and assessing the socio-economic benefits of recreational fishing activities. The introduction of the licence was embraced by the community with over 130,000 licences being issued, raising an additional $AU 4 million for the management of recreational fishing every year. This level of licence uptake was much greater than the 70,000 expected in the first year, and reflected significant recreational fishing community support. The Recreational Fishing Initiatives Fund 20% of all recreational licence monies are set aside in the Recreational Fishing Initiatives Fund (the Fund).The Fund is the responsibility of the Minister for Fisheries, however, responsibility for the operation and administration of the Fund rests with Recfishwest under a service level agreement with the Western Australian Department of Fisheries. Recfishwest sets state-wide priorities developed through community consultation, and then calls for formal Expressions of Interest for projects aligned with those priorities. All applications are assessed by a technical advisory panel before Recfishwest makes recommendations for projects to be funded. The minister for Fisheries then approves the projects which are managed under a formal contract. Recfishwest and the Department of Fisheries jointly administer the fund contracts. Recreational Fishing Initiatives Fund projects to date include: • Habitat enhancement projects ($AU 3.125 million); • Restocking and stock enhancement projects ($AU 0.6million); • Recreational community programs ($AU 1.1million); and • Fish research programs ($AU 1.2million). The Department of Fisheries has developed Government policies on habitat enhancement structures, and restocking and stock enhancement activities in Western Australia to support the range of initiatives being progressed through the fund. There is potential for the application of this recreational funding and initiatives development program in other jurisdictions around the world to clearly link government to recreational fishing priorities and investments for the betterment of recreational fishing experience and governance."

43 - Making management simple – improving social amenity of recreational fishing

Nathan Harrison nathan.harrison@fish.wa.gov.au

Theme - Innovative management and governance methods in the recreational fishing area

Nathan Harrison (Department of Fisheries Western Australia) - main author, Andrew Rowland (Recfishwest)

Prior to 2013 recreational fishing in Western Australia was managed on a bioregional basis. With over 12,000km of coastline, the state was divided into four bioregions. Across the four bioregions there were 13 different types of "risk-based" bag limit categories with significant variation between each bioregion. On a State-wide basis, this contributed to a situation where the rules were complex and difficult to understand. Community feedback suggested this management approach was negatively impacting on the social amenity value of recreational fishing. The risk-based approach which involved lumping different suites of species together also proved to be inflexible when deal with sustainability and allocation issues between commercial and recreational fishing sectors for key finfish species. To overcome these issues the WA Department of Fisheries in consultation with Recfishwest the peak industry body undertook a state-wide review of recreational fishing which focused on developing a new simplified resource-based approach to management.

Under the newly developed approach the 13 different types of bag limit categories were replaced with three state-wide resource-based categories for finfish (i.e. demersal, pelagic and near shore/estuarine). Recfishwest played a key role in facilitating community consultation on the proposed new arrangements. This was achieved using a novel approach of on online surveys and focus group meetings within the regions to gage the level of community support and make recommendations to government. By working co-operatively with the recreational sector it was possible to create a simplified more effective management framework that has helped the recreational sector meet management challenges and put some of the fun back into fishing. Importantly, four regional fishing guides have now been replaced with one state-wide guide and the new management structure is aligned with the Department of Fisheries stock monitoring program."

44 - Regional economic impact of recreational fishing and hunting in Finland Mikko Rautiainen (Metsähallitus, Game and Fisheries, Finland)

Mikko Rautiainen mikko.rautiainen@metsa.fi

Theme - Assessment of the Economic Importance of Recreational Fisheries

Mikko Rautiainen– main author; Urszula Zimoch (Ruralia-institute, Helsinki University, Finland); and Mika Laakkonen (Metsähallitus, Game and Fisheries, Finland).

"Metsähallitus is the administrator of state owned areas in Finland including 3.1 million hectares of water areas, 3.5 million hectares of managed forests and 4.0 million hectares of conservation areas and wilderness reserves. In 2013 more than 140.000 fishing and hunting licenses were sold to state areas by Metsähallitus. While travelling for their recreational activities, hunters and fishers use money for e.g. supplies, food, accommodation and services. This monetary flow creates significant direct and indirect impacts to the regional economies, which can be estimated using economic modeling techniques. Reliable data on the regional economic impacts is essential for the management authorities for example. to show the benefits of wildlife related recreational activities for the decision-makers: the state provides facilities and opportunities, regional economies get the benefit. The information can also be used to point out the economic effectiveness and benefits of different management actions. In 2013 Metsähallitus, in research cooperation with Ruralia institute, kicked off a project to develop an application to regularly monitor the regional economic impacts of recreational hunting and fishing in state owned areas. Previous case study has been done on the scale and importance of hunting in northern parts of Finland. However, for the first time, the regional economic impacts of state-land fishing and hunting in whole Finland have been estimated in this study. The data was collected with an online survey carried out by Metsähallitus in 2013. GEMPACK-based comparative-static regional Computable General Equilibrium (CGE)-model, RegFin has been used in assessment of the impacts at regional level and building the Excel-based evaluation tool by Ruralia institute.

The fishers´ and hunters' expenditures were grouped into retail trade, accommodation, local public-transport and entertainment commodities. Moreover, the location of the costs has been disaggregated into region where fishing or hunting took place, home region and "on the way" between those two regions. The total value of the expenditures in the region, where hunting or fishing took place in 2013, reached 34 million € of which 14,9 million € was the share of fishers. While only 16% of that sum is based on the fishermen and hunters being active in their home regions, it is clearly visible that fishing and hunting sector in Finland is strongly connected with travelling and bringing the income to the region. The results of the study show clear regional differences, especially between northern and southern Finland. There are significant differences in profiles of hunters and fishers based on their licence type, their home region and the licence location. The regional economic assessment has focused on basic indicators such as impacts on regional GDP, household consumption and employment. The simulation results show that regional impacts are highest in Northern parts of Finland. In Lapland the regional effects of growth in the number of licences are shown to be highest. An additional result of the project is an Excel-tool based on CGE modelling simulations."

45 - Gaining community support for management decisions in data poor fisheries

Nathan Harrison nathan.harrison@fish.wa.gov.au

Theme - Innovative management and governance methods in the recreational fishing area

Nathan Harrison (Department of Fisheries Western Australia) - main author, Andrew Rowland (Recfishwest)

"Assessing the status of fish stocks can be a difficult task. The majority of finfish stocks in Western Australia are characterized as data poor. Without estimates of stock biomass, management decisions are based around a "weight-of-evidence approach. This is achieved by systematically considering a range of biological and fisheries related information. While this approach may be understood by fisheries biologists and managers, any weight-of evidence approach will only be effective if there is sound political and community support for any decisions based on this approach. With potentially hundreds of thousands of people participating in individual fisheries, it is critical that management decisions lead to a positive change in fisher behavior. For this to occur, it is important that recreational fishers have an understanding of the logic and rationale behind management decisions. Recreational fishers should also to be involved in the decision making process in a meaningful way. Once decisions are made recreational fisher involvement in research and monitoring can help ensure fishers have a sense of stewardship and personal responsibility for the resource. This recognizes that fact that recreational fishers themselves that will largely determine the future quality of their recreational fishery. In Western Australia by developing sound relationships with peak industry bodies and working in a spirit of cooperation with the recreational fishing sector where fishers have been involved in structured management and research programs, a high level of compliance has been achieved in delivering sustainable management outcomes, which have maintained or improved the quality of recreational fishing experiences in WA."

46 - Wilderness fishery management for angler satisfaction

Helen Keeling h.keeling@fish-game.org.nz

Theme - Southern Hemisphere Recreational Salmonids Fisheries

Helen Keeling (Fish & Game New Zealand); and Rasmus Gabrielsson (Cawthron Institute)

"Population growth, increased mobility, expansion of tourism, improved access, and the spread of knowledge have led to increased use of wilderness fisheries over the past 30 years. In response to growing concerns about the impacts of increasing angling pressure on the New Zealand wilderness angling experience, a trial management regime was implemented in the Otago Region. Since 2004 anglers have been required to obtain a Backcountry Fishing Licence for designated rivers. In addition a Controlled Fishery booking system was introduced on the Greenstone River to ensure low encounter rates between anglers during the peak season. After 10 years we consider how New Zealand wilderness fisheries management has evolved. We reviewed annual angler use and satisfaction levels to evaluate whether additional licencing requirements and access controls have been effective in maintaining the quality of the wilderness angling experience. The introduction of a more restrictive management approach was initially met with some opposition, however over time both anglers and fishing guides have adapted to regulation changes. Many anglers now favour increases in the number of rivers included, as well as further use of Controlled Fishery systems to manage encounter levels and angling pressure. It is notable that while use has continued to increase on some rivers, overall angler satisfaction levels have generally remained high. When increased use has impacted angler satisfaction improved communication between anglers and managers, through web-based surveys, has enabled the identification of key factors driving dissatisfaction on individual rivers. Helicopter use, guiding pressure, exclusive capture and increasing use of wilderness areas by other user groups present ongoing challenges to managers. The establishment of the regime may be considered a success however a continued adaptive management approach will be required to preserve a high quality wilderness angling experience into the future."

47 - A successful recreational angling management program: spatial zoning of anglers and boaters on the North Umpqua River (Oregon, USA)

Robert C. Burns robert.burns@mail.wvu.edu

Theme: Innovative management and governance methods in the recreational fishing area

Robert C. Burns, West Virginia University, Morgantown, WV, US

"Spatial and temporal zoning for outdoor recreation experiences in various settings is an established method of managing visitor use. While many rivers in the US allow anglers and boaters to recreate in the same locations, the North Umpqua River (Oregon) has been zoned to allow for different zones for each activity. This management action has resulted in an unusually high level of user satisfaction by both recreationist groups, and low levels of recreation conflict and crowding. In this study, a total of 1065 anglers and boaters were interviewed during 2010-2012, along specific angling and boating zones of the river. The respondents were typically return visitors (60.6%) and spent an average of 18.1 days annually on the river and another 28.9 days at other recreation areas. Over half of the respondents were on a day trip (54.8%) while the rest (45.2%) were on an overnight trip. Day visitors spent on average 6.1 hours on the National Forest, and overnight visitors stayed on average for 3.9 days. The primary reason for recreating on the river was to be outdoors (mean = 4.7). The greatest proportion of visitors (39.0%) saw the amount of people they were expecting to see. River users indicated that the most important reason for recreating was to do outdoor activities I enjoy (51.8%). Additionally, river recreationists were most satisfied with the quality of recreation settings (mean = 4.7). Overall, the respondents rated their trip with excellent (mean = 4.3). Just over half of the river users (52.5%) reported boating as their primary activity, while many (42.9%) were participating in angling. Just a small proportion (4.7%) of the visitors sampled reported other activities beside boating and angling. Generally, river visitors did not feel crowded. That said, anglers were slightly more likely to feel crowded by other anglers while they were on the river (mean = 2.7). The respondents reported being in sight of boaters 41.2% of the time and being in sight of anglers 23.9% of the time. As a whole, river visitors reported that it would be acceptable to see boaters 41.0% of the time and anglers 51.0% of the time. Almost two thirds of the respondents indicated that their encounters with other boats or anglers had no impact on their trip experience. Overall, the visitors reported very few interactions with other visitors during their time on the river. A majority of the combined river users said that that encounters with other boaters (70.1%) and anglers (71.2%) had no impact at all on the quality of their trip experience. If negative impacts on trip experience were reported by river users, they were most likely to be a result of anglers interacting with other anglers (14.7%=somewhat negative impact; 2.6%=significantly negative impact). The oral discussion will discuss the management actions that made this management plan successful, and explain differences and similarities between the anglers and boaters."

50 - How should we revive exhausted fish prior to release?

Steven Cooke steven_cooke@carleton.ca

Theme - Catch-and-release practices: novel insights

Steven Cooke (Carleton University, Ottawa, Canada); Kendra Robinson (UBC, Vancouver, Canada), Graham Raby (Carleton University, Ottawa, Canada); Mike Donaldson (UBC, Vancouver, Canada); Jake Brownscombe (Carleton University, Ottawa, Canada); Andy Danylchuk (U Mass Amherst, USA); Scott Hinch (UBC, Vancouver, Canada); Vivian Nguyen (Carleton University, Ottawa, Canada); Tony Farrell (UBC, Vancouver, Canada); and David Patterson (Fisheries and Oceans Canada, Vancouver, BC)

"Fish can become exhausted as a result of capture and handling practices. It is presumed that anglers should revive fish before they are released. Does revival help or hurt? What is the best way to revive fish? What do anglers think of different revival strategies? This presentation will address these questions using data collected across 5+ years on Pacific salmon and bonefish."

51 - Adaptive harvest patterns for wild Atlantic salmon - the case of farmed salmon induced mortality

Jon Olaf Olaussen jon.o.olaussen@hist.no

Theme - Transformation and maximization of social and economic benefits generated by recreational fishery activities

Jon Olaf Olaussen, Trondheim Business School, Norway (main author); Yajie Liu, SIntef Fisheries & Aquaculture, Norway; and Anders Skonhoft, Department of Economics, NTNU, Norway

"Recently, increased sea lice densities caused by salmon farming have received growing attention in the main producer countries Canada, Chile and Norway. This paper presents a bioeconomic model for wild Atlantic salmon on the basis of the sea lice problem in Norway and explores the extent to which the optimal harvest pattern is affected by sea lice induced mortality. Because the salmon post smolts are the most vulnerable to attack by salmon sea lice, while harvest value is related to the mature spawning fish, an age structured population model is required. The economic losses are analyzed by calculating the reduced harvesting value as well as the non-consumptive value of the mature salmon due to various sea lice induced mortality scenarios. We compare the situation in which the harvest activity is assumed not to be influenced by sea lice with the case where the manager maximizes the social sustainable value taking sea lice induced mortality into account."

52 - Explaining compliance with recreational fishery regulations

Jon Olaf Olaussen jon.o.olaussen@hist.no

Theme: Recreational fisherman's attitudes to cope with the impacts of change

Jon Olaf Olaussen, Trondheim Business School, Norway

"A necessary condition for successful management of fisheries is that fishermen follow the rules and regulations put in place. A survey was designed to ask anglers about their attitudes towards various recreational fishing rules and regulations, as well as to what extent the different regulations were complied with. It is shown that there is no general pattern with respect to drivers of non-compliance across different regulations. Hence, for some regulations, legitimacy seems important, while for others is seems irrelevant. Moreover, in general we find no support that risk of detection plays a role in adherence to regulations."

53 - Catching catch-and-release - Evidence from an Atlantic salmon recreational fishery

Jon Olaf Olaussen jon.o.olaussen@hist.no

Theme: Transformation and maximization of social and economic benefits generated by recreational fishery activities

Jon Olaf Olaussen, Trondheim Business School, Norway

"Catch-and-release (C&R) is often regarded a win-win management tool in recreational fisheries. As long as release mortality is low, C&R may both secure sustainable fish stock and a large recreational fishing sector at the same time. Hence, apparently both the targeted fish populations and the recreational anglers are better off. However, this depends on both fish welfare assumptions as well as angler preferences. While fish welfare is widely studied, angler preferences have been ignored. The present paper presents the results from a study of angler preferences in a Norwegian recreational Atlantic salmon (Salmo salar) fishery. The results suggest that introducing mandatory C&R regimes may reduce the angler utility by a magnitude of up to 80% in this fishery, and hence advocates caution and surveys to be undertaken before C&R introductions."

54 - Inequalities in the catch distribution and abundance of rainbow trout (Onchorhynchus mikyss) in the Togariro River, New Zealand

Michel Dedual mdedual@doc.govt.nz

Theme - Southern Hemisphere Recreational Salmonids Fisheries

Michel Dedual, Department of Conservation Taupo Fishery

"The catch distribution amongst Taupo anglers is described from 16243 creel surveys collected from the Tongariro River between 1998 and 2013. The index of fish abundance during the same period was obtained from a continuous trapping program on the Waipa Stream, the second most important spawning tributary of the Tongariro River situated upstream of the fishing limit. The variations in the catch distribution were quantified using the Gini and Lorenz asymmetry coefficients (LAC) that are commonly used in socio- economic studies. The Gini coefficient provided a measure of the extent of the inequality in the catch distribution amongst anglers, while LAC indicated which type of anglers (unsuccessful v. successful) contributed the most to the amount of inequality in the catch distribution. Fish abundance was moderately significant explaining 28% (p=0.02) of the variation of the Gini coefficient indicating that the inequality in the catch distribution increased at low fish abundance. The positive relationship between the Gini and Lorenz asymmetry coefficients was stronger showing that when the inequality in the catch distribution is high it is primarily caused by the least successful anglers i.e. they are catching even less fish. Furthermore, the LAC variations were greater below than above the perfect symmetry (LAC =1) suggesting that the catch of successful anglers is less affected by fish abundance. This is to our knowledge the first attempt to explore the relationship between catch distribution inequality and fish abundance estimated by escapement in a recreational fishery. The possible management implications of these results are presented."

55 - Catch-and-release of giant trevally (Caranx ignobilis): can a rapid assessment reveal conservation issues and management needs for an emerging recreational fishery?

Andy J. Danylchuk danylchuk@eco.umass.edu

Theme - Research on angling diversity around the world

Andy J. Danylchuk (Department of Environmental Conservation, University of Massachusetts Amherst, Amherst, MA, USA)

"Giant trevally (Caranx ignobilis) is an apex predator in tropical waters of the Indo-Pacific, and they reside in a wide range of habitats from shallow flats to deeper reefs. The power fight and diversity of environments is appealing to a wide cross section of recreational anglers, and demands for targeting giant trevally as part of a catch-and-release fishery are increasing. As with many emerging recreational fisheries, little is known about the impacts of the angling event on the giant trevally. With the assistance of volunteer anglers and guides, a rapid assessment approach was used to evaluate the injury, physiological status, and release mortality of giant trevally in Kiritimati, Republic of Kiribati. Interviews of anglers and guides were also conducted to reveal perceived conservation and management issues regarding the sustainability of a giant trevally catch-and-release recreational fishery. Although data from such a rapid assessments can inform best practices, management, and policy decisions, potential limitations and challenges will be discussed."

56 - Recreational fisheries in emerging economies and the developing world: identification of knowledge gaps and management priorities

Shannon Bower shannon.bower@carleton.ca

Theme - Research on angling diversity around the world

Shannon Bower (a), Øystein Aas(b), Robert Arlinghaus (c,d), Douglas Beard (e), Ian G. Cowx (f), Andy Danylchuk (g), Katia Freire (h), Warren Potts (i), Stephen Sutton (j) and Steven J. Cooke (a) a: Fish Ecology and Conservation Physiology Laboratory, Department of Biology, Carleton University, 1125 Colonel By Dr., Ottawa,

ON K1S 5B6 Canada b: Norwegian Institute for Nature Research, Norwegian University of Life Sciences, Lillehammer, Norway; c: Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Müggelseedamm 310, Berlin 12587, Germany; d: Inland Fisheries Management Laboratory, Faculty of Agriculture and Horticulture, Humboldt University of Berlin, Philippstrasse 13, Haus 7, Berlin 10115, Germany; e: United States Geological Survey, 12201 Sunrise Valley Drive, Reston, VA, 20192, USA; f: Hull International Fisheries Institute, University of Hull, Hull HU6 7RX, UK;

g: Department of Environmental Conservation, University of Massachusetts Amherst, 160 Holdsworth Way, Amherst, MA, 01003, USA; h: Universidade Federal de Sergipe, Centro de Ciências Agrárias Aplicadas, Departamento de Engenharia de Pesca e Aquicultura, Cidade Universitária Prof. José Aloisio de Campos. Rua Mal. Rondon S/N Jardim Rosa Elze, Sergipe, Brazil, CEP 49100-000; i: Department of Ichthyology and Fisheries Science, Rhodes University, PO Box 94, Grahamstown 6140, South Africa; j: Fishing and Fisheries Research Centre, School of Earth and Environmental Sciences, James Cook University, Townsville 4812, Australia.

"The common paradigm of recreational fishery development supports a view in which recreational fisheries grow concurrently with industrialization through increased leisure time and often correspond with a decline in subsistence and commercial fishing. This position requires adjustment as the sector grows in the emerging economies and developing countries of the world. The continued reliance of millions of individuals on fishing activities for food and employment security suggest that recreational fishery growth in these areas will occur under vastly different conditions, and the low threshold of resilience to economic and ecological shock in many of these countries implies that risks surrounding sector growth may be greater than in the industrialized world. Despite these risks, the recreational fishery sector is growing rapidly in the developing world and to date, little is known about sector attributes at a global scale. In an effort to esta blish such a broad view, we conducted a survey of fisheries personnel in emerging and developing countries that was designed to identify knowledge gaps and management needs surrounding recreational fishery growth in addition to gathering information on specific fishery attributes from biological, social and economic perspectives. Knowledge generated by the survey in these key areas will help to clarify the magnitude of the sector and contribute valuable information to support sustainable fisheries management."

60 - Post-release behavioural impairment and predation risk in angled fishes

Jacob W. Brownscombe jakebrownscombe@gmail.com

Theme - Catch-and-release practices: novel insights

Jacob Brownscombe (main author); Graham Raby; Steven J. Cooke (Fish Ecology and Conservation Physiology Laboratory, Department of Biology, Carleton University, 1125 Colonel By Dr., Ottawa, ON K1S 5B6 Canada; and Andy Danylchuk (Department of Environmental Conservation, University of Massachusetts Amherst, 160 Holdsworth Way, Amherst, MA, 01002 USA)

"Catch-and-release recreational angling is a popular management and conservation strategy that assumes released fish will survive and experience negligible fitness consequences. However, physiological stress and injury induced by angling can lead to behavioural impairments that inhibit the ability of fish to survive, grow, and reproduce. In systems with high predator burden, post-release impairment may lead to increased predation risk, which may be cryptic. While post-release predation is anecdotally known to occur in many fisheries, it has only been scientifically quantified in a handful of species in specific environments, while the influence of angling practices (e.g. gear types, air exposure), environmental and ecological factors are still relatively poorly understood. Drawing on available examples from the literature, behavioural mechanisms contributing to post-release predation will be discussed, along with the influence of environmental and ecological factors. Potential remediation strategies for this issue will also be examined, as well as current gaps in knowledge and important avenues for future research."

61 - General characteristics of recreational fishing in the influence area of the Itaipu Reservoir

Domingo Rodriguez Fernandez domingo@itaipu.gov.br

Theme - Social and environmental changes and its impacts in recreational fisheries

Domingo Fernandez, Itaipu Binacional, Environment Department, Brazil; Caroline Henn, Itaipu Binacional, Environment Department, Brazil; Vilmar Bolzon, Itaipu Binacional, Environment Department, Brazil; Carla Canzi, Itaipu Binacional, Environment Department, Brazil; and Sandro Heil, Itaipu Binacional, Environment Department, Brazil.

“Recreational fishing is monitored in Itaipu Reservoir since 2001 . With the data obtained, it is possible to estimate that close to 4,500 people currently practice the sport every year, and 98.5 % from the State of Paraná (68 % of municipalities bordering the reservoir). Catches consist of 32 species, which the main in the reservoir are the Curvina (P. squamosissimus), Peacock Bass (Cichla spp), Piau (L. friderici), Traira (H. malabaricus) and Armed Catfish (P. granulosus). In the Paraná River the major are Piapara (L. elongatus), Dourado (S. brasiliensis), Piau (L. friderici), Piauçu (L. macrocephalus) and Pacu (P. mesopotamicus). The equipment most commonly used in the reservoir region is the fishing rods (70 %), and in the Paraná River regions the most commonly is fishing lines and rods. The catch per unit effort (fishing angler per day) were : 2.01 kg / fisher in the reservoir; Paraná River upstream 3.62 kg and Paraná River downstream 2.40 kg / fisher / day. The main cost in recreational fisheries is the fuel of the boats (41.1 % of total), followed by the costs of displacement by land (17.7%). In 2013, six angling tournaments were monitored in the Itaipu Reservoir. Three tournaments were related to fishing Curvina (P. squamosissimus), two are open type (several species) and one related to Peacock bass (Cichla spp.). In total we investigated the participation of 1,028 teams (each team consists of three fishermen), with an average of 171 teams per tournament and presentation of fish for 183 teams (17.8%), totaling 471 kg of fish caught (average of 94 5 kg per tournament). Modalities with greater participation were the open tournaments (average of 198 teams) and fishing Curvina (mean of 188 teams). The sport of recreational fishing in the area of Itaipu is an important recreational activity for neighbor region and for the State of Paraná, and although it is attractive, not significantly attracts fishermen from other states. It is important to combine this mode with artisanal fishing (about 800 fishermen in activity) because the only species with a significant presence in both modalities is the Curvina (P. squamosissimus), the main species in the amateur mode (55 % of the total biomass caught) and third in artisanal fisheries (11.6 % of the total biomass). The others, like the Peacock Bass (Cichla spp), for example, represent about 25 % of the catches in the amateur mode and less than 2.3% for artisanal fisheries.”

63 - Sea Angling 2012 - a survey of recreational sea angling activity and economic value in England.

Kieran Hyder kieran.hyder@cefas.co.uk

Theme - Transformation and maximization of social and economic benefits generated by recreational fishery activities

Kieran Hyder (Centre for Environment, Fisheries & Aquaculture Science, UK) - main author; Mike Armstrong (Centre for Environment, Fisheries & Aquaculture Science, UK); Adam Brown (Substance, Manchester, UK); Jodie Hargreaves (Marine Management Organisation, London, UK); Sarah Pilgrim-Morrison (Marine Management Organisation, London, UK); Max Munday (Cardiff Business School, Cardiff University, UK); Steven Proctor (Marine Management Organisation, London, UK); Annette Roberts (Cardiff Business School, Cardiff University, UK); and Kevin Williamson(Marine Management Organisation, London, UK).

“Recreational sea angling is an important activity in Europe with over 8 million anglers spending around €8 billion each year. There are also many social benefits of sea angling including relaxation, engaging with nature, and social rehabilitation. Catches of recreational fish can also be significant with species like the European seabass and cod important for both the recreational and commercial sectors. Release rates of fish caught by anglers are high in Europe often relating to fish being below statutory minimum landing sizes or mandatory releases. In other countries, co-management of recreational and commercial species is already practiced. However, lack of data has hampered the potential to include recreational angling in stock assessment, develop

national and European policy, and help angling bodies develop their own policies. As a result, the reporting of recreational catches of some species has a European legislatory requirement since 2002. Sea Angling 2012 (SA2012) was established to increase knowledge of recreational sea angling in England and to met UK obligations under European law. SA2012 estimated the number of sea anglers in England, how much they catch, how much is released, and the economic and social value of sea angling. It is the largest ever survey of sea angling in England comprising of six surveys carried out in 2012and included interviewing over 12,000 households, contributions from 11,000 anglers, and visiting over 2,000 stretches of coastline. It has been delivered in partnership with the angling community, based on statistically rigorous methods, and used both on-site and online methods. In this paper, we summarise the results of SA2012. There are 884,000 sea anglers in England, with 2% of all adults going sea angling. Resident sea anglers spent £1.23billion, equivalent to £831million excluding taxes and imports, and supported 10,400 full-time equivalent jobs. Taking indirect and induced effects into account, sea angling supported £2.1billion spend and 23,600 jobs. Sea angling has social benefits including providing relaxation, physical exercise, and a route for socialising. Improving fish stocks was the most important factor for anglers that would increase participation. Sea anglers fished for 3.8 million days with 0.1, 1, and 2.7 million angler days fished from charter boat, private boat, and shore respectively. Mean catch per day was highest on charter boats (9.8) followed by private boats (4.8) and lowest from the shore (1.6). The most common species caught, by number, were mackerel and whiting. Shore anglers released around 75% of the fish caught, many of which were undersized, and boat anglers released around 50% of their fish. Estimates of total annual retained catches for bass and cod had a number of large uncertainties but were estimated to be around 30-40% of the reported commercial fishery landings of these species into England in 2012. The ratio of recreational removals to commercial landing estimates for bass is similar to the results of surveys on the same stock in France and the Netherlands. The potential sources of bias in the estimates and comparisons between different methods will be discussed."

64 - Science for the sustainable management of Canada's recreational fisheries

Adrian Clarke & John Post Adrian.Clarke@gofishbc.com

Theme - Innovative management and governance methods in the recreational fishing area

Adrian Clarke (Freshwater Fisheries Society of British Columbia); John Post (University Of Calgary); Adrian Clarke (Vice President, Science Freshwater Fisheries Society of British Columbia, Victoria, British Columbia, Canada) and John R. Post (University of Calgary - Calgary, Alberta, Canada)

"In 2003, the Canadian Province of British Columbia embarked on an innovative approach to freshwater fisheries management that is unique in the world. A new private non-profit society was established, the Freshwater Fisheries Society of BC (FFSBC), and was given responsibility for the delivery of a number of key fisheries services that are typically delivered by government agencies including fish stocking programs and the promotion and development of sport fishing. Funding is dependent on angler participation and fishery performance so the FFSBC has become highly motivated to reverse a long term decline in angling participation by residents of the province. Our not for profit status allows us to enter into formalized research partnerships with Academic experts in the fields of ecology, physiology, Fisheries Management, and Human Dimensions. These partnerships are jointly supported by FFSBC and the Natural Sciences and Engineering Research Council of Canada and have greatly increased our capacity to take a multi-disciplinary approach to recreational fisheries management. One key partnership involves FFSBC, the British Columbia environment ministry, University of Calgary, University of British Columbia and Simon Fraser University. The purpose of this research is to provide the science in support of the sustainable management of Canada's recreational fisheries. Using the rainbow trout fishery of British Columbia as an experimental system, we are developing methods to predict angler effort responses to changes in quality by modeling ecological and angler-behaviour processes at both the local and landscape scales. The core of our work is a replicated experiment where we are manipulating fishing by changing stocking practices in hatchery lakes and access and harvest regulations in wild lakes. We are collecting information on the human dimensions of anglers (i.e. preferences and choice behaviour) and then combining this understanding with biological information in a model that will predict angler responses to our experimental manipulations. We are testing the validity of the angling response model at the local scale by monitoring changes in the number and types of anglers on each lake where we

have altered the angling quality. Expansion to the landscape scale involves combining the parameterized processes from the local scale model with geo-referenced data on lakes across southern BC. The landscape model will estimate the response of variables that are directly linked to social and economic values to various patterns of management policy options among lakes given the array of resources available and the population of potential anglers that may fish these lakes. We are now into year four of this partnership and this presentation will focus on initial results of the landscape manipulations, human dimensions data that and extrapolations to the landscape scale to inform management decisions."

65 -The effect of catch-and-release angling at high water temperatures on behavior and survival of Atlantic salmon

Torgeir Børresen Havn torgeir.havn@nina.no

Theme - Catch-and-release practices: novel insights

Torgeir B. Havn - Norwegian Institute for Nature Research, Høgskoleringen 9, NO-7034 Trondheim, Norway; Ingebrigt Uglem - Norwegian Institute for Nature Research, Høgskoleringen 9, NO-7034 Trondheim, Norway; Eva B. Thorstad - Norwegian Institute for Nature Research, Høgskoleringen 9, NO-7034 Trondheim, Norway; Øyvind Solem - Norwegian Institute for Nature Research, Høgskoleringen 9, NO- 7034 Trondheim, Norway;

Steven J. Cooke - Fish Ecology and Conservation Physiology Laboratory, Department of Biology, Carleton University, 1125 Colonel By Dr., Ottawa, ON K1S 5B6, Canada; Fred G. Whoriskey - Department of Biology, Dalhousie University, Halifax, NS B3H 4J1, Canada; and Ocean Tracking Network, c/o Dalhousie University, Halifax, NS B3H 4J1, Canada."

"Many Atlantic salmon Salmo salar populations have declined during the last decades. Various restrictions on riverine fisheries have been introduced to conserve spawning populations, including increased use of catch-and-release (C&R) angling. Previous studies have shown that survival of caught and released S. salar angled at water temperatures below 15 °C is high. The survival at water temperatures above 15 °C has so far not been well examined under natural conditions. In this study, behavior and survival following C&R was investigated in wild S. salar (n = 75) angled on sport fishing gear in the River Otra in southern Norway at water temperatures 16.3-21.1 °C. The fish were tagged externally with radio transmitters and immediately released back into the river to simulate a realistic C&R situation. The majority of fish (i.e., 91-92%) survived C&R. Most of the fish that were present in the River Otra during the spawning period 3-4 months later were located at known spawning grounds. Downstream movements (median farthest position: 0.5 km, range: 0.1-11.0 km) during the first four days after release were recorded for 72% of the fish, and this was regarded as an abnormal behavior induced by C&R. These fish spent a median of 12 days before commencing their first upstream movement after release, and 34 days before they returned to or were located above their release site. There was no significant effect of increased water temperatures on mortality. The mortality appeared to be slightly elevated at the higher end of the temperature range, but this was not statistically significant possibly due to a low sample size. In conclusion, C&R at water temperatures up to 20 °C had minimal impacts on movements to spawning areas and did not cause mortality above 10%. Nevertheless, low levels of mortality occur due to C&R angling and these losses should be accounted for by management authorities in rivers where C&R is practiced. Refinement of "best practices" for catch-and-release may help to reduce mortality, particularly at warmer temperatures."

67 - Involving anglers as key stakeholders in a shark conservation programme

Juan Martín Cuevas juanmartin_cuevas@yahoo.com.br

Theme: Recreational fisherman's attitudes to cope with the impacts of change

Juan Martín Cuevas, Environmental Institute, La Matanza National University and Chondrichthyans Research Group (CONDROS), Marine Biology and Fisheries Institute "Alte. Storni", Argentina; Gustavo Chiaramonte. Ichtyological Division, Argentine Natural History Museum "Bernardino Rivadavia", Argentina; Paula Cedrola, Protected Areas Department, Provincial Agrarian Council of Santa Cruz (CAP); Argentina Matías Suarez, Chondrichthyans Research Group (CONDROS), Marine Biology and Fisheries Institute "Alte. Storni", Argentina;

Ruben Dellacasa, Independent researcher, Argentina; María Luisa Colecchia Corso, Buenos Aires National University, UBA, Argentina; Nahuel Dercole, Buenos Aires National University, UBA, Argentina; and Ariana Oberti, Ichtyological Division, Argentine Natural History Museum "Bernardino Rivadavia", Argentina.

"Coastal Shark populations in Argentina have dramatically decreased probably due to overfishing (5 Vu to CR – IUCN Red List). Official shark landing statistics don't consider anglers, although is the only fishery with targeted sharks since 1997. Previous work revelled that most of angler activity involves coastal Marine Protected Areas (MPAs), and for most anglers, the threatened state of many of these species is cause of no concern. In 2008 the first scientific tagging program was implemented in Argentina, in a MPA, working with the aid of some local anglers. We realized that involving the anglers' communities as key stakeholders in a shark conservation program through tagging activities is a key factor for its success in order to decrease sharks' mortality rate, strengthen conservation actions and promote sustainable fisheries. We worked also in order to: increase the awareness and positive participation from anglers' communities towards the program and encourage Angler Clubs in replacing old predatory practices in tournaments into new catch-release activities. We developed a communication plan along the Argentine coast focused on four MPAs, establishing trained anglers and fishing guides as ambassadors of the project, whilst empowering them on tagging activities. The program includes 10 coastal shark species. Anglers were trained with tag-recapture methodology during Tagging Workshops, and tagging kits were supplied. Since 2008 seventy-three anglers were trained. During spring 2013 we conducted twenty-four communication events (conferences, journal, radio and TV interviews) and 6 Tagging Workshops for 62 anglers. Thirteen coastal fishing sites (surface: 5,615 km2) were integrated covering relevant angling localities along the coastline of Buenos Aires and Río Negro province, and two MPAs with long-established angling activity in southern Patagonia, Santa Cruz province. Trained anglers represent 50 fishing groups, whilst 20% of them report tagging events. A total of 1,151 tags were delivered to anglers since 2008; and 196 sharks (7 species) were tagged and released: Galeorhinus galeus (43%), Notorynchus cepedianus (16%), Carcharias taurus (0.5%), Carcharhinus brachyurus (22%), Squalus acanthias (16%), Sphyrna spp. (1.5%) and Squatina spp. (1%). Highest tagging rate was reported by Pehuencó's fishing guides (46%) whereas San Blas MPA have the highest number of tagging's events (n=116). Today there are no more shark tournaments with sacrifice inside MPAs, whereas three tournaments include the tagging of all the competitive size sharks. The TL frequency analysis of tagged sharks shows: G. galeus (Female 41:20 Male; TL > 125 cm; match mature sharks); S. acanthias (F26; TL > 70 cm; match mature sharks); C. brachyurus (F37:6M; 63 to 280 cm TL; comprises all the age classes); N. cepedianus (F14:7M; TL < 170 cm; mostly immature); finally, one C. taurus (Female = 200 cm TL; probably mature). Fishermen may be involved in a program for the conservation of sharks as key stakeholders successfully if their participation is simple and feasible; for them the message should be clear: ""you can continue fishing sharks, but in a sustainable manner"". Note that if there are groups with different motivations (fishermen and fishing guides) different messages for each of them should be created."

71 - Effect of hook size and handling on post-release survival of European eel (Anguilla anguilla)

Marc Simon Weltersbach simon.weltersbach@ti.bund.de

Theme: Catch-and-release practices: novel insights

Marc Simon, Weltersbach (Thünen-Institute of Baltic Sea Fisheries (TI-OF), Germany) – main author; Harry Vincent Strehlow (Thünen-Institute of Baltic Sea Fisheries (TI-OF), Germany); Keno Ferter (Fisheries Dynamics, Institute of Marine Research, Norway and Department of Biology, University of Bergen, Norway); Florian Sambraus (Reproduction and Development Biology, Institute of Marine Research, Norway and Department of Biology, University of Bergen, Norway); and Malte Dorow (State Research Centre for Agriculture and Fisheries Mecklenburg-Vorpommern, Institute for Fisheries, Fischerweg 408, 18069 Rostock, Germany)

"The catadromous European eel (Anguilla anguilla) is an important commercial and recreational fisheries resource throughout Europe. However, since the 1970s the European eel stock has experienced dramatic declines and is currently considered to be outside safe biological limits. Since 2007, a Council regulation of the European Union obligates all European Member States to provide eel management plans ensuring at least 40% escapement of the original biomass of mature silver eels (relative to undisturbed life conditions)

to the sea. For many European anglers, eel is an important target species, and several European studies have shown that recreational eel landings can exceed commercial eel harvests on regional scale. To reduce the fishing induced mortality some countries (e.g. United Kingdom, the Netherlands, Sweden and Norway) have prohibited targeted fishing for eel. Other countries have introduced stricter bag limits or higher minimum size limits. Stricter harvest regulations increase the likelihood of regulatory catch-and-release (C&R) practice in the recreational eel fishery. However, no information exists on the post-release survival of eel or other Anguilliformes. Therefore, a combined field and laboratory study was conducted to (i) estimate post-release survival rates of eel for different treatments, (ii) examine factors affecting survival, (iii) investigate the effects of C&R on physical condition, and (iv) study the potential hook shedding mechanism of deeply hooked eels. For the field study, a pond experiment was conducted with individually marked (passive integrated transponder tags), wild-caught eels (n = 350 caught with fyke nets). After four weeks of acclimation in the pond, eels were captured with rod and line. As eels are often deep-hooked, three different handling treatments (shallow-hooked and hook removed, deep-hooked and hook removed, deep hooked and line cut) were distinguished for two hook sizes. After release back into the pond, eels were held together with control fish (trap-caught in the pond during the experiment) for four weeks. A comprehensive examination was performed for all dead and survived eels to determine probable causes of death, progress of wound healing, physical condition, occurrence of wound infections and hook shedding. During the supplementary laboratory study, a subsample of deeply hooked eels was held in tanks and frequently radiographed to qualitatively evaluate potential hook shedding. The results contribute to the development of sound management plans and inform eel managers of the potential of C&R as an adequate management measure in the recreational eel fishery. Further, our findings are helpful to design best practice guidelines reducing the post-release mortality, and to provide information for angler education to reduce potentially negative impacts of C&R and to promote the conservation of the European eel."

73 - Hooked on science: novel ways of working with anglers to deliver science

Kieran Hyder kieran.hyder@cefas.co.uk

Theme - Technological innovations in the recreational fishing area

Kieran Hyder (Centre for Environment, Fisheries & Aquaculture Science, UK) - main author; Mark Thrush (Centre for Environment, Fisheries & Aquaculture Science, UK); Graham Monkman (School of Ocean Sciences, University of Bangor, Wales); Stuart Hetherington (Centre for Environment, Fisheries & Aquaculture Science, UK); Victoria Bendall (Centre for Environment, Fisheries & Aquaculture Science, UK); Nick Taylor (Centre for Environment, Fisheries & Aquaculture Science, UK); Michel Kaiser (School of Ocean Sciences, University of Bangor, Wales); and Mike Armstrong (Centre for Environment, Fisheries & Aquaculture Science, UK)"

"Scientific questions are becoming more complex with larger datasets required to support the assessment of impacts on whole ecosystems over long periods of time. For example, many years of data collected over wide geographical areas can be required to assess the impact of different pressures (e.g. noise, climate) on ecosystem health. The funding needed for data collection is considerable and limited, so it is important to look at new ways of obtaining and processing data. Citizen science has the potential to add to the scientific evidence-base through the use of people with no specific scientific training to collect and analyse large data sets. Anglers are experts in fish behaviour and identification, and have long been citizen scientists, collecting data about their quarry, catches, and environment. Importantly, anglers may provide information from many remote locations not covered by current structured survey work and therefore constitute a valuable, but underutilised, resource for fish population and environmental monitoring. The advent of the internet, SmartPhones, and web 2.0, alongside improvements in technology used for angling, has provided new ways for anglers to contribute to science and the conservation of their environment. In this paper, we will describe a number of case studies of the new ways that we are working with anglers to generate data that will help to conserve fish stocks, prevent spread of disease, and collect valuable information on the biology of rare species. The first example describes work that we are doing using text mining and internet portals aiming to look at the potential for catch and match reports posted online to act as indices to reconstruct angling catches over time for inclusions in stock assessment. The second example will examine the use of online portals for

collection of catch and economic information on sea angling, and the potential issues with data collected in this way. The third case study looks at how we can use SmartPhone apps to collect data from anglers that can be used to accurately map the distribution and health of wild fish populations throughout the freshwater and marine aquatic environment. This will enable us to promote awareness of disease threats and best practice for biosecurity and improve our surveillance for aquatic animal diseases. Finally, we will look at the use of angling charter boats as 'ships of opportunity' to place electronic tags on sharks. The potential of these methods in developing unique data sets, the potential issues with the methods, and how to resolve some of these issues will be discussed."

75 - Recreational angling promotes timidity-related behavioural traits that collectively reduce encounters between fish and anglers

Josep Alós alos@igb-berlin.de

Theme - Social and environmental changes and its impacts in recreational fisheries

Josep Alós (Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany) – main author; Miquel Palmer (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), Esporles, Spain); and Robert Arlinghaus (Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, German & Chair of Integrative Fisheries Management, Faculty of Life Sciences and Integrative Research Institute for the Transformation of Human-Environmental Systems, Humboldt-Universität zu Berlin, Berlin, Germany).

"The spatial interactions between fish and recreational anglers may affect many ecological processes, but they have been traditionally overlooked due to technological limitations in the joint tracking of fish and anglers in the wild. With recent developments in biotelemetry, recreational fisheries scientists and managers have gained new opportunities to accurately analyse movement pattern of fish at highly detailed spatial scales and test novel behavioural hypotheses to understand the dynamics of the recreational fisheries systems with implications for its management. In this study, we hypothesized that the general movement characteristics adopted by most of fish species exploited by angling, such as the tendency to move towards a refuge or the scale of the home range, could enhance the probability of encountering the recreational angler and affect fish vulnerability to fishing. We tested this hypothesis in a real fishing situation in the Mediterranean recreational fishery of the pearly razorfish, Xyrichthys novacula, where individual wild fish were acoustically tracked, their movement pattern characterized and their vulnerability quantified. We found empirical evidence supporting our hypothesis that more exploratory fish individuals and fish home range extension were more quickly removed from the population compared to the opposite behavioural types. This result suggests that recreational angling is able to exert selection differentials on the spatial behavioural traits favouring populations characterized by more timid individuals that move around close to a refuge and have a smaller activity space. The selection differentials imposed on behavioural traits are expected to be stronger than those exerted on body size. Fishery-induced change in the behaviour of fish can, therefore, indirectly alter food webs (because exploited fish change their prey exploitation patterns), reduce the quality of the fishery (because fish become harder to catch) and potentially also reduce yield (because timidity-related behaviour traits are sometimes correlated with lower individual productivity). Because the behavioural traits explored in our case-study are common for most of fish exploited by recreational angling worldwide, selection on spatial behavioural traits should be widespread and can notably contribute to the negative consequences of selective fisheries."

78 - Angler engagement drives recreational fisheries management in the United States

Russell Dunn Russell.Dunn@noaa.gov

Theme - Innovative management and governance methods in the recreational fishing area

Russell Dunn (National Marine Fisheries Service, National Oceanic and Atmospheric Administration, United States) - main author; and Danielle Rioux (National Marine Fisheries Service, National Oceanic and Atmospheric Administration, United States)

"The United States has one of the largest and most diverse recreational fisheries in the world. Recreational fishing is more than a pastime in the United States; it is a part of the social fabric and a key economic driver of coastal communities with approximately 11 million saltwater anglers taking 70 million trips and contributing more than $58 billion in sales impacts annually (2012). Recognizing that successful stewardship of fisheries resources is best accomplished through partnership, the United States National Oceanic and Atmospheric Administration embarked on a course of action to transform a deteriorating relationship with the recreational fishing community from enmity to partnership. The National Oceanic and Atmospheric Administration (NOAA) has stewardship responsibilities for U.S. marine fisheries, in collaboration with eight regional fisheries management councils, between three and 200 nautical miles from shore. In late 2009, NOAA committed to improving engagement with and better addressing the needs of the recreational fishing community. This public commitment formed the basis of a transformative agency-wide program known as the Recreational Fisheries Engagement Initiative (Engagement Initiative). Implementing a proactive multi-faceted national and regional strategy underpinned by a dedication to deliver on Agency commitments, NOAA has transformed many anglers from skeptics into supporters by changing the way it thinks and talks about recreational fisheries. In April 2014, NOAA Fisheries and the Atlantic States Marine Fisheries Commission convened recreational fishing leaders from the United States and its territories to collaboratively chart a course for future work. Open dialogue during the 2014 National Saltwater Recreational Fisheries Summit culminated with a commitment by NOAA to develop with anglers a first ever national policy for recreational fisheries through a transparent and open process."

79 - A new spatially-explicit framework for estimating harvest of heterogeneous recreational fisheries

Carlos Díaz-Gil cdiaz@imedea.uib-csic.es

Theme - Innovative management and governance methods in the recreational fishing area

Miguel Cabanellas- Reboredo (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), C/Miquel Marqués 21, 07190, Esporles, Illes Balears, Spain) – Main author; Carlos Díaz-Gil (Laboratori d'Investigacions Marines i Aqüicultura, LIMIA (Balearic Government), C/Eng. Gabriel Roca 69, 07157, Port d'Andratx, Illes Balears, Spain. Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), C/Miquel Marqués 21, 07190, Esporles, Illes Balears, Spain) – Presenting author, Josep Alós (Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany); Miquel Palmer (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), C/Miquel Marqués 21, 07190, Esporles, Illes Balears, Spain); and Beatriz Morales-Nin (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), C/Miquel Marqués 21, 07190, Esporles, Illes Balears, Spain).

"The total biomass harvested by the recreational anglers plays an important role on the global crises of many fish stocks and many countries have incorporated recreational harvest in the stock assessment of the exploited species. However, estimating recreational harvest is not trivial and demands sophisticated approaches to reduce bias and enhances accuracy. In this work we deal with two frequently ignored but relevant problems when estimating harvest in marine recreational fisheries: the spatio-temporal variability in effort and the heterogeneity of anglers' skills and motivations. We have developed a new framework based in combining model-based estimates of the effort (varying in space and time) with model-based estimates of catches per effort unit (varying in time and on the angler type). We have applied this framework to the squid recreational fishery developed at Palma Bay, Mallorca Island, Spain (NW Mediterranean). The spatial scenario was divided in a grid of 173 cells of 1 km2. The number of boats targeting squid at each cell was recorded from 63 visual censuses covering the entire scenario. Then, we first modelled fishing effort using conditional regression to estimate and predict the number of boats at any day of the year and at any cell of the scenario. Second, we categorized anglers into three types (low, medium and high skilled) using an off-site survey (questionnaire). The number of categories was optimized depending on the prediction power of the angler type from the answers of the questionnaire. Third, the same questionnaire was used in a creel survey during which actual catches were recorded too. Then, we modelled catch (number of squid per angler and day) as a function of angler type and a number of environmental co-variables. Finally, we matched for every day of a given year (2010): i) the predictions of daily fishing effort; ii) the predicted catch rates per angler type and; iii) the proportions of the three types of anglers, in order to estimate the daily harvest and its confidence interval (CI)

which were estimated by bootstrapping. The results obtained for the recreational squid fishery at Palma Bay suggests that this activity harvested around 20.5 tonnes during 2010, which represented an impressive 34% of the total squid landings by the entire commercial fleet of Mallorca Island (59.5 tonnes). The precision of the total harvest biomass was notably improved when considering the different types of anglers. In fact, the harvest estimate was also reduced when considering the heterogeneity of angler's skills (20.5 tonnes, 95% CI: 19.49 to 21.71) or ignoring them (26.6 tonnes, wider 95% CI: 25.2 to 28.2) wich highlighted the importance of incorporating the anglers heterogeneicity in recreational fisheries management. Our modelling process is innovative; it is fully based on fishery-independent data, can be easily implemented to any other fishery and has a reasonable predictive ability. Therefore, we suggest that it could be useful for managers and fisheries scientists worldwide that deal with recreational fisheries."

80 - Recreational angling may shape the morphotype and the metabolic scope in a small-bodied marine recreationally exploited fish

Carlos Díaz-Gil cdiaz@imedea.uib-csic.es

Theme: Social and environmental changes and its impacts in recreational fisheries

Carlos Díaz-Gil (Laboratori d'Investigacions Marines i Aqüicultura, LIMIA (Balearic Government), C/Eng. Gabriel Roca 69, 07157, Port d'Andratx, Illes Balears, Spain. Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), C/Miquel Marqués 21, 07190, Esporles, Illes Balears, Spain) – Main author; Josep Alós (Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany); Miquel Palmer (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), C/ Miquel Marqués 21, 07190, Esporles, Illes Balears, Spain); Ignacio A. Catalán (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), C/Miquel Marqués 21, 07190, Esporles, Illes Balears, Spain0; Marta Linde-Medina (Faculty of Life Sciences, University of Manchester, Manchester, U.K.); Bernat Aguiló (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), C/Miquel Marqués 21, 07190, Esporles, Illes Balears, Spain); Bárbara Ferreira (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), C/ Miquel Marqués 21, 07190, Esporles, Illes Balears, Spain); and Beatriz Morales-Nin (Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB), C/Miquel Marqués 21, 07190, Esporles, Illes Balears, Spain).

"Recreational angling does not randomly harvest fish. Instead, fish are removed depending on the life-traits they carry, which may result in phenotypic and genetic changes of wild fish populations. In many cases larger bodied individuals are preferentially removed by the anglers which may induce a downsizing of the adults with negative consequences for the sustainability of fish stocks. There is also evidence that recreational angling can select for behavioural traits that reduce the number of encounters with the recreational anglers (e.g. swimming speed or exploration) and the probability of ingesting a bait or lure (e.g. boldness or aggressiveness). However, little is known about how physiological and morphological traits can affect the capture probability in recreational angling scenarios. Recent theoretical approaches suggest that angling should positively select for small metabolic rates, small mouth and deeper/compressed body shape configurations, and that such selection may be independent of the body size. We tested this hypothesis in wild populations of the Mediterranean exploited painted comber, Serranus scriba, in a gradient of different exploitation angling intensities, from a heavily fished area (Palma Bay) to a marine protected area (Cabrera National Park). The hypothesis predicts that populations exposed to high angling pressure should be dominated by fish with smaller resting metabolic rates (RMR), smaller mouths and deeper body morphotype in response to the theoretical selective nature of angling. We found partial support for our predictions. First, individuals with higher RMR were more frequently observed in non-exploited populations in agreement with our expectations of selection against fish with high RMRs. Second, although we found clear evidence for size-independent smaller mouth sizes in exploited populations than in non-exploited, we did not find a relationship between the height of the body and angling intensity. The low prevalence of deeper-bodied fish in exploited populations could be attributed to the fact that natural and angling selection acts in the same direction in the case of this morphological trait. Overall, we report clear support for the hypothesis that recreational angling can modulate the physiology and the morphology of wild populations, which will imply negative outcomes for the food web, the fishery sustainability and the quality of the fishery. Unravelling if these patterns are produced either by an angling-induced genetic change or phenotypically is

challenging. Ideally it would require the rearing and measuring of the offspring from different populations under equal controlled environmental conditions which could explain the origin of these physiological and morphological differences. Until these kind of direct evidences are available, the patterns reported here suggest that angling-induced selection on both physiological and morphological traits may be widespread in small-bodied coastal fishes exploited by angling."

82 - An overview on the FAO Technical Guidelines for Responsible Fisheries: Recreational Fisheries

Robert Arlinghaus arlinghaus@igb-berlin.de

Theme: Innovative management and governance methods in the recreational fishing area

Robert Arlinghaus (Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Germany) - main author; Steven J. Cooke (Carleton University, Canada) and Brett M. Johnson (Colorado State University, USA).

"Recreational fishing constitutes the dominant use of wild fish stocks in all freshwaters of industrialized countries, and it is prominent in many coastal ecosystems. The importance of recreational fisheries is also increasing rapidly in many transitional economies. In 2012, the Food and Agricultural Organization of the United Nations (FAO) presented a Technical Guideline for Responsible Fisheries that was focused on recreational fisheries. It describes strategies to promote environmentally sustainable and socially responsible management of such fisheries. To this end, the document details policy, management and behavioural recommendations for sustainable recreational fisheries which are an increasingly important component of global fisheries. Specifically, the guidelines translate the relevant provisions for responsible fisheries according to the FAO Code of Conduct for Responsible Fisheries into specific advice for recreational fisheries. The concept of aquatic stewardship is introduced as an overarching ethical framework needed to achieve ecologically sustainable recreational fisheries on a global scale. Within this normative mindset the adaptive management philosophy based on quantifiable and transparent objectives and continuous learning and feedback loops is proposed along with the acknowledgement of principles such as the ecosystem approach and the precautionary approach. Detailed sections on policy and institutional frameworks (tailored towards policy makers), recreational fisheries management actions and strategies (tailored towards fisheries managers), recreational-fisheries practices (tailored towards individual recreational fishers) and recreational fisheries research (tailored to researchers and managers) provide more tangible advice for achieving responsible recreational fisheries. The special considerations of recreational fisheries in developing countries and economies in transition are equally considered. By adhering to the guidelines and recommendations presented in the FAO document on recreational fisheries, policy makers, managers and the entire recreational fisheries sector can orient fisheries towards maintaining or achieving sustainability."

84 - Tracking recreational angler responses to a marine reserve to infer the cost imposed and suggest a functional fine

Marie L. Fujitani fujitani@igb-berlin.de

Theme - Innovative management and governance methods in the recreational fishing area

Marie L. Fujitani (Leibniz-Institute of Freshwater Ecology and Inland Fisheries) - main author; Eli P. Fenichel (Yale University); and Joshua K. Abbott (Arizona State University)

"Marine reserves are spatial tools for fisheries management and conservation that restrict extractive activities within designated areas. Reserves regulate people by adjusting costs and incentives to alter the behavior of human users, for example by reducing fishing visits with a fine. Theory and empirical evidence indicate that behavior is deterred when the expected cost to the user (e.g. from enforced fines) exceeds the expected value of resource extraction. However, finding an appropriate level of fine given enforcement capacity is challenging and must balance the often conflicting conditions of operational effectiveness, physical feasibility, administrative practicality, economic equity, and social and cultural acceptability. I use a novel dataset that is a complete census of recreational fishing trips taken over nine years by a large recreational angling community

in the Gulf of California, Mexico, to determine angler response to a marine reserve, and use that information to generate a schedule of effective fines. With discrete choice models I show that the creation of the marine reserve only temporarily decreased visitation to the reserve site, and I determine the additional travel cost (in trespassing penalties) the anglers expected the reserve to impose. This value is very small, especially compared to the total cost of travel to the reserve site, and is likely due to anglers' low expectation of enforcement of reserve rules. I use the model to project the different fines that would be necessary to reduce reserve site visitation by a given percentage. The range of fines suggested by the data, and the corresponding effect of each level of fine on human behavior, is a tool to help assess the tradeoffs between biological, economic, and social goals, and reach a consensus. For example, by imposing a fine (with absolute enforcement) of $40, trips to the reserve site can be reduced by half; with a $100 fine there would be a three-quarters reduction in fishing trips. Due to the functional form of the utility function, there is a non-linear relationship between fine and behavioral response, with sharply diminishing returns to increasing the expected level of fine over $100 dollars. This matches theory on law enforcement that it becomes prohibitively expensive to completely eliminate undesired behaviors. Thus managers can select a fine that sufficiently reduces fishing pressure in order to meet biological goals, increase the posted fine amount to match enforcement capacity, and make trade-offs to obtain a data-driven level of fine that should be both biologically effective and not undesirably high for considerations of social justice and political acceptability."

85 - A randomized experiment on the effectiveness of lecture-based instruction on recreational angler knowledge and attitude shifts in relation to fish stocking

Marie L. Fujitani fujitani@igb-berlin.de

Theme - Transformation and maximization of social and economic benefits generated by recreational fishery activities

Marie L. Fujitani (Leibniz-Institute of Freshwater Ecology and Inland Fisheries) - main author; Andrew McFall (Leibniz-Institute of Freshwater Ecology and Inland Fisheries); Christoph Randler (University of Education Heidelberg); and Robert Arlinghaus (Leibniz-Institute of Freshwater Ecology and Inland Fisheries)

"Recreational anglers are among the most important stakeholders for freshwater ecosystems in industrialized nations, and fish stocking is the most widespread management tool for freshwater fisheries. However, depending on circumstances and practices stocking can be economically wasteful and/or ecologically harmful. In Germany, anglers are leaseholders of fishing rights and in that position perform fisheries management actions such as fish stocking. The most frequent vehicle for disseminating new information to anglers is 'frontal', lecture-style presentations, but it remains controversial whether this actually leads to internal concept shifts and changes in knowledge and other antecedents of behavior in the audience. We tested this using a large-scale randomized experiment with 17 angler clubs in Germany. This study is one of the largest randomized experiments of an educational intervention involving people who have direct input into how their natural resources are managed. The educational intervention sought to change knowledge, attitudes, personal norms, and beliefs about the popular, economically and ecologically important yet highly contested management practice of fish stocking. In the state of Lower Saxony, as in much of West Germany, inland fisheries are managed by angling clubs of several hundred members each with property rights over their specific water bodies. Clubs exercise largely independent control over management. Thus, club members have a say in stocking practices (e.g. by influencing club heads with pro-stocking social norms) and the status quo is to overwhelmingly and indiscriminately support stocking. Seventeen angler clubs from Lower Saxony were randomly assigned to receive either a 'stocking treatment' or 'sham control' seminar. The 'treatment' seminar provided biological background on stocking, examples of stocking successes and failures, potential risks, and management alternatives to stocking. The 'control' seminar covered biological management but did not mention stocking. From each club self-selected anglers (N=201 in total) attended the seminars and received a questionnaire on informational content, attitudes, and beliefs related to stocking before the seminar, after the seminar, and half a year later to assess long-term retention. Results were analyzed by Before-After-Control-Impact analysis with random effects for the different angling clubs. Treatment group anglers (n=115) showed a significant increase in knowledge of the biological nuances of stocking and some of the potential

risks. However, they did not show a change in attitudes, personal norms, or behavioral intentions towards stocking. While anglers exhibited understanding that stocking is not always the best option, the most relevant antecedents of behavior towards stocking were unaffected by the seminars, and no concept shift occurred towards considering other management options besides stocking. Our results show that frontal teaching successfully led participants to internalize ecological knowledge domains that challenged previously held pro-stocking beliefs and understanding, but fell short of evoking a conceptual shift in thinking and perspective."

86 - IGFA Catchlog: an innovative approach for collecting recreational catch data

Jason Schratwieser jschratwieser@igfa.org

Theme - Innovative management and governance methods in the recreational fishing area

Jason Schratwieser (International Game Fish Association, USA); Andrew Loftus (Andrew Loftus Consulting, USA); and Leah Baumwell (International Game Fish Association, USA)

"Obtaining quality estimates of marine recreational catch and effort in the USA has proven difficult. In-person angler intercepts and telephone interviews, while providing core data, have proven problematic for obtaining all data required for intensive fisheries management. The IGFA CatchLog was designed with a focus on fisheries management applications and provides the ability to supplement existing data collection efforts through a structured approach. The IGFA CatchLog combines a mobile application, website, and survey system to collect angler data for scientific and management purposes while also providing anglers with useful tools for improving their fishing experiences. Additionally, a Visual Identification system, integrated in the application, helps anglers identify catches by matching iPhone photographs to known images, processed through real-time algorithms. Initial trials in the marine waters of Florida's Everglades National Park have demonstrated that the IGFA CatchLog can be useful for collecting accurate fisheries catch data in a manner that also promotes angler use. The system was intentionally designed to allow expansion to other geographic areas and fisheries management applications. The ultimate goal of the IGFA CatchLog is to provide a system that is widely used, accurate, and trusted by managers and scientists to supplement current data collection efforts and foster sustainable management."

90 - Talking to the tigers of the water: rapid assessments of catch-and-release Mahseer (Tor spp.) recreational fisheries on the Cauvery and Ganges rivers, India

Shannon Bower shannon.bower@carleton.ca

Theme - Research on angling diversity around the world

Shannon D Bower (Fish Ecology and Conservation Physiology Laboratory, Carleton University, Canada) - main author; Andy J. Danylchuk (Department of Environmental Conservation, University of Massachusetts Amherst, USA); Rajeev Ragavan (Conservation Research Group (CRG), St. Albert's College, India; Mahseer Trust, Dorset, UK); Sascha Clark-Danylchuk (Fish Mission, Amherst, USA); Adrian Pinder (School of Applied Sciences, Bournemouth University, Dorset,UK; Mahseer Trust, Dorset, UK); Aaron M. Alter (Baobab Educational Adventures); and Steven J. Cooke (Fish Ecology and Conservation Physiology Laboratory, Carleton University, Canada)"

"The Mahseer (Tor spp.) of India are a group of Red-Listed potamodromous, slow-growing cyprinids that currently face numerous challenges including destructive fishing practices and hydropower development. Their management and conservation is further constrained by a lack of basic life history knowledge. The Mahseer recreational fishing community, until recently, has served as one of the only voices for this group of iconic species, fostering aquatic stewardship, providing livelihood alternatives for poachers (via ecotourism for catch-and-release fisheries) and generating revenue for local communities. In 2009, a national decree equating fishing with hunting in the Indian Wildlife Protection Act (1972) rendered recreational fishing illegal in protected areas and has resulted in uncertainty regarding the future of this fishery. In spring of 2014, we conducted a series of rapid assessments and stakeholder workshops on the Cauvery River in the south and the Ganges River in the north to evaluate the suitability of catch-and-release recreational fishing as a potential tool for conservation of

these threatened species and to develop a research agenda for the future. Rapid assessment results indicate that refinement of best practices to reduce air exposure and adapting gear choices to hook types that promote rapid hook removal will assist in maintaining a low mortality rate, while workshop outputs highlighted the need for increased engagement of stakeholders and managers. We discuss these results in detail, with a focus on disseminating best practices, fishery variability and governance strategies."

91 - A collaborative approach to using historical spearfishing competition data to identify climate-induced environmental changes and develop adaptation options for the spearfishing community

Stephen Sutton stephen.sutton@jcu.edu.au

Theme: Recreational fisherman's attitudes to cope with the impacts of change

Daniel Gledhill (CSIRO, Australia); David Welch (C2O Consulting, Australia); Alistair Hobday (CSIRO Australia); Stephen Sutton (James Cook University, Australia); Adrian Jeloudev (Underwater Skindivers and Fishermans Association, Australia); Matt Koopman (Southern Freedivers, Australia); Matthew Landsdell (CSIRO, Australia); Adam Smith (CSIRO, Australia); and Peter Last (CSIRO, Australia).

"Engaging recreational fishers and their knowledge of aquatic environments in recreational fisheries science, management, and stewardship is becoming increasingly important for achieving positive outcomes in fisheries conservation and management. In Australia, organized fishing clubs often maintain long-term records of their fishing activities, including effort and catch at the species level. Using these long-term records to describe and understand changes and trends in fisheries and aquatic systems is a promising way of engaging the recreational fishing community and augmenting our knowledge about aquatic systems. In 2010, Australian fisheries scientists from Commonwealth Scientific and Industrial and Research Organization (CSIRO) and James Cook University (JCU) partnered with spearfishing clubs in southeastern Australia to collate and analyze long-term spearfishing club competition datasets to: 1) examine changes in the distribution of coastal fishes in eastern Australia over the past 4 decades and establish correlation of these to climate-induced changes in the environment, such as warming sea surface temperatures; and 2) investigate the perceptions of spearfishers regarding climate-induced change and its effects on the distribution and abundance of coastal fishes, and identify potential climate change adaptation options for the spearfishing community. Through this collaborative project we produced the first quantitative multi-decadal, multi-species examination of climate induced change on Australian coastal fishes. The project revealed that data held by the recreational fishing community can be valuable for understanding long-term climate induced environmental change, and that a collaborative approach for analyzing such data can be highly effective at fostering the engagement of the recreational fishing community in climate-change monitoring and adaptation planning. This talk will provide an overview of the collaborative process, the value of the spearfishing competition data for understanding climate-induced changes in the marine environment, and the constraints that must be overcome to build and maintain effective partnerships between scientists and the spearfishing community."

94 - Conflicts between artisanal and recreational fisheries from Bertioga/SP and proximity

Carolina Sayuri Teramoto carol.teramoto@gmail.com

Theme - Plural use of fishing resources as strategy for conservation

Carolina Sayuri Teramoto (University of Sao Paulo) - main author; and Antônio Carlos Sant'Anna Diegues (University of Sao Paulo)

"The artisanal fishing activity of inestimable cultural value, in addition to the major contribution to fish production in Brazil, has been undergoing several internal and external pressures, threatening the livelihood and social reproduction of those who practice it. Recreational fishing is one of these pressures, it is an important economic activity, which influences and changes the dynamics of artisanal fisheries. The dispute between these two categories of fishermen for fishing resources and the territory are factors that contribute to the emergence of conflicts. Bertioga, a coastal city of São Paulo state, and Monte de Trigo Island, belonging

to the city of São Sebastião, the two area where this research was developed, hosts a community of fisherfolk, as well as a significant infrastructure for recreational fishing. The sizing of conflict is essential for effective fisheries management in the region. Thus, the aim of this study is to analyze the conflict between recreational and artisanal fishing in Bertioga and vicinity. A case study was conducted with the use of the following instruments to collect data: historical and legal survey, semi-structured interviews, questionnaires, oral histories, the information collected was examined using the triangulation because it enables a more holistic and contextual analysis of the situation in question. The Marine Environment Protection Areas - APAM - has been striving to develop a participatory management plan incorporating the demands of the various groups of fishermen. It must however, take into account the conflicts between artisanal and amateur that solutions are properly found."

95 - Socio-environmental impacts of recreational fishing and perspectives for a participatory fishing management in the upper and middle rio Negro, Amazonia, Brazil

Camila Sobral Barra camila@socioambiental.org

Theme - Innovative management and governance methods in the recreational fishing area

Camila Sobral Barra (Instituto Socioambiental - ISA)

"Building participatory fishing management in the middle Rio Negro is a sizeable challenge. Rio Marié's case will be discussed at the workshop as a governance experience according to the interests and rights of traditional and indigenous people, observing the collective participation and the legal terms and also counting on relevant authorities and partner organizations to build a sustainable model of recreational fishing tourism."

99 - Rebuilding angler participation through innovation – The British Columbia Experience

Andrew Wilson Andrew.Wilson@gofishbc.com

Theme - Transformation and maximization of social and economic benefits generated by recreational fishery activities

Andrew Wilson (Freshwater Fisheries Society of British Columbia, Canada)

"In 2003, the Freshwater Fisheries Society of BC was established in the Canadian Province of British Columbia to provide an innovative and unique approach to freshwater fisheries management. The non-profit Society is responsible for the delivery of a number of key fisheries services that are typically delivered by government agencies including fish stocking programs and the promotion and development of sport fishing. The Society is funded under a user-pay model and currently receives about 50% of freshwater fishing licence revenue to fund its operations. With funding dependent on angler participation and fishery performance, the Society is highly motivated to reverse a long term decline in angling participation by residents of the province. Working closely with a number of government and non-profit partners the Society has introduced a number of new programs including "Learn to Fish" and "Fishing in the City" that are aimed at attracting youth and reactivating lapsed and occasional adult anglers. Over its 11 year history, the Society has proven to be highly successful, innovative, and cost-effective and is making a strong contribution to the rebuilding of the sport fishing sector in British Columbia. This innovative and highly successful model will be of interest to other jurisdictions that are also working to rebuild participation in recreational fisheries and the social and economic benefits they provide."

100 - Evaluating a catch shares pilot for Gulf of Mexico headboats

Daniel Willard dwillard@edf.org

Theme - Innovative management and governance methods in the recreational fishing area

Daniel Willard, PhD (Environmental Defense Fund); and Joshua K.Abbott, PhD (School of Sustainability, Arizona State University)

Recreational fishing for popular species like red snapper and grouper in the Gulf of Mexico follows a failed pattern that is well known in commercial fisheries: fishing under regulated open access promotes a "race to the fish" which inevitably results in shorter seasons, shrinking bag limits and growing waste of fish. The existing data collection and monitoring system does not allow for in-season adjustments, inadvertently allowing large and persistent recreational overharvests. Fishing seasons for popular species are closed for much of the year. This pattern is not working for the Gulf's headboat industry, the anglers it serves or the fish populations it depends on to operate viable businesses. In this atmosphere, Environmental Defense Fund (EDF) is working with a group of headboat operators in the Gulf of Mexico to develop a pilot project to test a promising recreational fisheries innovation. This partnership led to the formation of the Gulf Headboat Collaborative, an affiliation of headboat operators that applied to NOAA Fisheries for an experimental fishing permit (EFP) to test how headboat catch shares can promote innovative data collection, sustainable fishing and conservation of fish stocks in Gulf of Mexico recreational fisheries. Operating under strict catch limits and reporting requirements, this EFP authorizes a sample of Gulf of Mexico headboat operators to fish for a limited amount of red snapper and gag grouper when it is best for their businesses and safest for their customers, instead of being constrained by short and unpredictable season openings – for example, the 28 day red snapper season in 2013. By requiring participating captains to use vessel monitoring systems, hail in/out to enforcement agents for each trip and submit daily electronic logbooks for all fishing trips, the EFP pilot also tests a model for improved performance in recreational fisheries monitoring and catch/effort data collection as an integral part of the catch share system. The two-year pilot began in January 2014. The Collaborative includes 17 headboats and may admit up to 20, which comprises approximately 25% of the Gulf of Mexico headboat fleet. Developed as a bottom-up approach, the EFP represents a unique collaboration between fishing industry, government, academia and the environmental NGO community. This pilot presents a unique opportunity for empirical evaluation in fisheries science and management. The program will improve the quality and timeliness of recreational fishing data and may improve economic and conservation outcomes for headboat businesses and fisheries managers. To measure these outcomes, EDF is working with academic partners and the Collaborative to develop a rigorous research program to evaluate economic and conservation impacts such as changes in headboat catch and bycatch, the spatial and temporal distribution of fishing trips, and angler demand. Our research will improve the state of knowledge in fisheries science and management, demonstrating a path forward for improved monitoring, data collection, and high-performance recreational fisheries management in the Gulf of Mexico and beyond."

103 - Lure versus bait – How anglers can influence catch in the recreational cod fishery

Marc Simon Weltersbach simon.weltersbach@ti.bund.de

Theme - Minimum and maximum size for catches: policies and regulations

Marc Simon Weltersbach (Thünen-Institute of Baltic Sea Fisheries (TI-OF), Germany) – main author; Harry Vincent Strehlow (Thünen-Institute of Baltic Sea Fisheries (TI-OF), Germany); and Joachim Gröger (Thünen-Institute of Sea Fisheries (TI-SF), Germany).

"Atlantic cod (Gadus morhua) is an important target species in the European recreational and commercial fishery. Due to legal restrictions (e.g. minimum landing sizes and daily bag limits) and voluntary Catch&Release (C&R) release proportions in the marine recreational cod fishery are high (up to 70%). The reform of the European Common Fishery Policy (CFP) has recently led to the introduction of a phased discard ban for regulated species such as cod in the commercial fishery. From a recreational fishery perspective the question arises whether the high release proportions are reconcilable with the new CFP. Although there

is some scientific evidence that post-release survival of cod is relatively high there is potential for further reductions. One effective way to reduce post-release mortality is to decrease the catch of undersized fish or non-target species by using more selective fishing methods and lure/bait types. To investigate the influence of the lure/bait type on (i) size of cod (ii) catch (catch-per-unit-effort) and (iii) catch composition (proportion of bycatch) we analysed data from the Baltic recreational cod fishery. Data collection was realised via onboard sampling of 47 charter vessel fishing trips of different operators along the German Baltic coast (ICES subdivisions 22 and 24) with a total of 909 anglers and a total net fishing time of 4467 h. In total, 3327 cod and 1873 non-target species were caught between January and December 2009. A supplementary 2-month pilot study between April and June was carried out (ICES subdivision 22) to collect more detailed information on the influence of lure/bait type on fish length. During onboard sampling of 11 charter vessel trips and 30 trips of smaller private boats 1042 cod were caught and included in the analysis. The results show that the mean total length was significant higher for cod caught on artificial lures (43.6 cm) compared to cod caught on live baits (28.4 cm) leading to a much higher proportion of sublegal cod (< 38 cm) and releases. In addition, the pilot study showed that the mean size of cod was highest for cod caught on shads (45.0 cm), followed by pilks (41.8 cm) and jigs (38.8 cm). There was no significant difference in the median of catch-per-unit-effort between anglers who used artificial lures (0.6 cod/h) and anglers who used live baits (0.6 cod/h). However, harvest-per-unit-effort was subsequently higher for anglers using lures than those using bait. The use of live baits significantly increased the catch of other species such as whiting (Merlangius merlangus) and European flounder (Platichthys flesus). The study showed that anglers targeting cod can significantly minimize the likelihood of hooking sublegal cod and other non-target species by using artificial lures such as pilks and shads instead of live bait. Therefore, lure recommendations might be an effective tool for fisheries manager to increase selectivity in the recreational cod fishery and support the CFP reform regulations."

105 - Innovative use of deepwater horizon disaster restoration funding to increase efficacy of Gulf of Mexico red snapper fishery management.

Todd Phillips tphillips@oceanconservancy.org

Theme: Innovative management and governance methods in the recreational fishing area

Todd Phillips, Ocean Conservancy

"The Deepwater Horizon (DWH) disaster occurred in 2010 spilling millions of gallons of crude oil into the Gulf of Mexico. The Oil Pollution Act of 1990 (OPA) requires the public and environment be compensated for natural resource injury and lost services caused by events such as the DWH. As required by the OPA, funding is beginning to be made available for restoration projects designed to restore the Gulf to pre-spill health. In the Gulf, restoration activities, like barrier island nourishment, wetland stabilization and fishing pier construction have thus far taken precedence over marine restoration projects. While these restoration activities benefit resource users and both nearshore and estuarine habitats, they do not address impacts to marine fish, such as the red snapper, whose offshore range and spawning period overlapped with the DWH hydrocarbon footprint. Red snapper is a culturally iconic fish species in the Gulf of Mexico for recreational anglers and the fishery supports a large economic driver of the Gulf. Red snapper are also a physoclistous fish species susceptible to lethal and sublethal pressure-related injuries, collectively known as barotrauma, when they are captured and brought to the surface. If released, fish suffering from barotrauma have a reduced chance of survival. Various methods, such as venting, have been used to mitigate the effects of barotrauma, however the effectiveness of these techniques is questionable and the post-release mortality of red snapper is largely uncertain. Fishing regulations are such that anglers discard red snapper at high rates and adequately managing this rebuilding fishery without detailed post-release survivability is a great challenge. Minimizing barotrauma-related injuries would reduce the impact of fishing and allow the red snapper population to recover more rapidly from any population losses resulting from the DWH event. Current research shows barotrauma effects can be mitigated in species similar to red snapper through the use of descending devices; however, little scientific research has been conducted on post release survivability of

red snapper affected by barotrauma. We explored a collaborative approach in creating a restoration project designed by anglers and scientists to investigate red snapper post-release mortality and the effectiveness of descending devices designed to reduce barotrauma, with the aim of increasing survivability and contributing to recovery of the species."

106 - Fish of Paradise, how sustainable sport fishing could help people and the environment in Papua New Guinea (video and presentation)

Ian McLeod ianmcleodnz@gmail.com

Theme: Innovative management and governance methods in the recreational fishing area

Ian McLeod and Marcus Sheaves (TropWATER and School of Marine and Tropical Biology, James Cook University, Townsville, Australia).

"Locally based sport fisheries in Papua New Guinea (PNG) have the potential to provide stable alternative livelihoods and new income streams for PNG's coastal villages. In addition, development of sport fishing—recreational catch-and-release angling for iconic game fish—is a major initiative that would support extensive capacity building across science, business and tourism, and generate significant environmental benefits. Black Bass (Lutjanus goldiei), the key target of PNG sport fisheries, is one of the world's premier sport fish. This unique, endemic PNG estuarine and freshwater species has been identified as a valuable target for the next wave of ecotourism development in PNG, playing an equivalent role to that played by the Bird of Paradise in the past. However a critical lack of biological knowledge prevented effective protection or management of the resource. To address these critical knowledge gaps, researchers from James Cook University in collaboration with the PNG National Fisheries Association and the Australian Centre for International Agricultural Research have developed an integrated research programme. The objectives are to: (1) develop an understanding of relevant aspects of the ecology and biology of Black Bass sport-fish resources of PNG; (2) devise protocols for the appropriate conduct of a sport fishery in a PNG context to maximise its resilience and long-term viability; (3) develop an understanding of potential livelihood costs and benefits, and how to manage them; and (4) determine the commercialisation needs of a sport-fishing industry in a PNG context. The fisheries research has now begun and involves a diversity of field-sampling approaches as well as high-tech acoustic tagging and chemical ecology techniques (micro-chemistry and stable isotope studies). Social, tourism and business studies will involve a mixture of fieldwork with local people, desktop work and case studies of existing sport-fishing ventures. During the presentation, I will discuss preliminary results describing the movement ecology, critical habitats for adults and juveniles, and feeding preferences of Black Bass. In addition, I will show a recently completed professional video showing the 'fish of paradise' underwater and on the line, and highlighting the potential of this project for PNG's sustainable future."

107 - Improving resource resilience through people development: building capacity in Australia's recreational fishing sector

Matthew Gillett matt@recfishwest.org.au

Theme: Transformation and maximization of social and economic benefits generated by recreational fishery activities

Matthew Gillett (Recfishwest, Australia) - main author; Andrew Rowland (Recfishwest); and Mark Pagano (Department of Fisheries Western Australia)

"Like many industries the Australia recreational fishing sector is facing a shortage of people willing and able to assume positions of advocacy, representation and communication for the increasingly complex environment in which the sector operates. Currently a small group of people to do an ever expanding range of tasks and projects. These same people make strategic decisions at the national, state and local levels and cannot be expected to carry this workload indefinitely. A shortage of people with the appropriate skill and knowledge has long hindered the advancement of the recreational fishing community. Often the impediment for young

recreational fishers taking on leadership positions is a perceived lack of knowledge or an understanding of the issues facing their industry. The first step in leadership development can simply be passing on knowledge and experience to the next generation. This project aimed to establish a consistent framework for recognizing and developing future recreational fishing leaders in Australia. Core to this project was specific training aimed within the age bracket of 17-30. Positive outcomes are now emerging as this increased capacity to effectively represent the values of recreational fishing is being applied to issues such as bioregional marine planning, animal welfare, resource allocation, marine protected areas and fisheries research. Here, we provide details of this framework, including specific examples of the succession plan implementation and training activities undertaken. This project represents a case study on how the recreational fishing sector in Australia is meeting the long-term strategic challenge of generational change and fostering the next wave of leadership, professionalism and people development. This project has already resulted in improved capacity within the sector and is delivering real change."

108 - Collaborative co-management of recreational fishing in Western Australia: challenges and triumphs

Andrew Rowland andrew@recfishwest.org.au

Theme: Innovative management and governance methods in the recreational fishing area

Andrew Rowland (Recfishwest, Australia) - main author; Nathan Harrison, (Department of Fisheries Western Australia); and Andrew Matthews (Recfishwest)

"Recreational fishers in Australia, indeed worldwide, are significant stakeholders in the management of aquatic resources. Recreational fishing is a key lifestyle activity in Western Australia (WA) with approximately one third of the state's population, an estimated 740,000 people, participating annually. In many instances, the participation of recreational fishers in management and governance of fisheries systems is significantly impeded by inadequate fisher unity and direction, and the fact that recreational fishing communities often form into heterogeneous groups. A key element to the successful governance of recreational fishing in WA has been the establishment of a cooperative working partnership between the Western Australian Department of Fisheries and the state's peak body representing the interests of recreational fishers, Recfishwest. This formal stakeholder-management agency partnership has evolved over the past 4 years into a true collaborative co-management approach focused on resource sustainability while maintaining and enhancing amenity values. Fisheries co-management as defined by Australia's Fisheries Research and Development Corporation is "an arrangement in which responsibilities and obligations for sustainable fisheries management are negotiated, shared and delegated between government, fishers and other interest groups and stakeholders". A commitment to genuine collaboration and partnerships are fundamental elements of fisheries co-management, however practical ways of achieving it can prove difficult to establish. Here we report on the key elements in establishing successful collaborative co-management in Western Australia, and how the current approach has been created gradually through increased stakeholder responsibility and the development of mutual trust and respect between key partners. Our journey to co-management involved two fundamental criteria. Firstly, WA government demonstrating a willingness to consider a management model involving greater shared responsibility with a decision in 2009 to explicitly recognise a single peak body representing the interests of recreational fishers. Secondly, the presence of a well-resourced and organised peak recreational fishing body with good governance and the skills to deliver services as well as the ability to negotiate in fisheries management settings. The Western Australian Department of Fisheries was one of the first fishery management agencies in the world to introduce Ecosystem-Based Fisheries Management (EBFM) across all its aquatic resources. The current recreational fishing governance arrangements in WA allow effective stakeholder participation in the state's EBFM framework as well as engagement in fisheries resource management and allocation decisions under the state's Integrated Fisheries Management (IFM) policy. The demonstrated benefits of collaborative co-management in WA are numerous. They include increased community resource stewardship, reduced management conflicts, greater long-term social/amenity outcomes, reduced necessity of political decision making, improved government services, and more effective expenditure and targeted investment of public funds. Here we describe the conditions, and provide examples from practical experience, that have positioned recreational fishing of WA to successfully adapt to changes both from social and natural origins."

109 - Improving the communication of science to fishers using Fuzzy Cognitive Mapping

Owen Li owen.li@my.jcu.edu.au

Theme: Recreational fisherman's attitudes to cope with the impacts of change

Owen Li (James Cook University, Townsville)

"Fisheries are highly changeable resources subject to numerous environmental and anthropogenic impacts. Modern, active-adaptive fisheries management has been adopted as a way to deal with the changeability of fisheries more effectively. Active-adaptive fisheries management stands to benefit from the improved communication of science from scientists and managers to recreational fishers. This study is about using Fuzzy Cognitive Mapping (FCM) to better understand how we might improve that information flow. Using a range of traditional and non-traditional methods to analyse fishers' FCMs, this study reveals variables that improve and constrain recreational fishers' interest in the uptake of science. Our results suggest that a message's clarity, perceived regular usefulness, good and bad emotion, and investments in money and time play important roles in dictating fishers' interest in the uptake of science. Our analyses also reveal that fishers' initial levels of interest in a topic have a significant effect on the complexity of the thought processes leading to fishers' further interest in a topic and the relative role of the driving variables and constraints. The patterns that we identify using this technique have major implications for improving the quality of science communication to fishers and therefore their capacity for stewardship and adaptation."

112 - Recreational fishing in protected area in Guanabara bay: challenges and opportunities for integration management

Rafael de Almeida Tubino rattubino@gmail.com

Theme: Innovative management and governance methods in the recreational fishing area

Rafael Tubino (Laboratório de Biologia do Nécton e Ecologia Pesqueira - ECOPESCA, Dept. de Biologia Marinha, Universidade Federal Fluminense, Brasil); Maurício Muniz (Instituto Chico Mendes de Conservação da Biodiversidade - ICMBio); Tatiana Mello (Instituto Chico Mendes de Conservação da Biodiversidade - ICMBio); Bernardo Couto; and Cassiano Monteiro-Neto (Laboratório de Biologia do Nécton e Ecologia Pesqueira - ECOPESCA, Dept. de Biologia Marinha, Universidade Federal Fluminense, Brasil).

"In Brazil, recreational fishing is practiced in many different natural environments, including protected areas where specific rules of use must be complied with activity, according to the category restriction. The Área de Proteção Ambiental de Guapimirim and Estação Ecológica da Guanabara are conservation units located inside the Guanabara Bay, one of the most important coastal systems of the South Atlantic Ocean, surrounded by metropolitan region of Rio de Janeiro which concentrates about 12 million inhabitants and protect the last remaining of the original mangrove. With the aim to characterize this activity within the protected areas and identify potential conflict points and potential actions to integrate the principles of management and the demands of fishermen, was conducted between 2010 and 2012 a monitoring program on fisheries. Of the 77 interviewees (mean = 50.9 years), all men, 41% completed high-school level. The frequency of fishing 3.5/month and average of 11.9 years of experience fishing in Guapimirim. Only 12% are members of fishing clubs and 42% of fishermen are licensed. Only 51.9% know the Área de Proteção Ambiental and 11.1% know the Estação Ecológica. Of the total, 21.4% said they did not meet the minimum measures capture the fish caught in the region and 65% said that they have measured the size of fish in the boat. The main species are snook (Centropumus undecimalis and C. parallelus). According to the perception of the interviewees, these species were the ones most decreased by in number and size over the years while fishing four exotic species were identified as those that emerged. The interviews revealed a negative correlation between the length of experience of fishermen and bass weight, suggesting a loss of reference between different generations of fishermen. The results generated are sufficient to identify the following points of conflict between the activity and the rules of resource use: (A) not full recognition of the protected areas in developing their activities, (B)

most fishermen know the current legislation (mandatory registration of fishermen and minimum measures capture). Among the proposals prepared for effective integration of practitioners to the process of management of protected areas are: A) continuous dissemination of minimum catch sizes together to fishermen through the use of the rule of minimum size, (C) Encourage the participation of fishermen on the Advisory Board of protected areas through effective representation and (D) to encourage fishermen to participate in the Fisherman Contributor program, which has as main objective the enhancement of amateur fisherman as a cooperating partner in conservation, integrated with other sectors. Among the invited practitioners to specific meeting on the issue, said all find useful uses of the rule of minimum catch sizes. When asked how long they would be willing to stop fishing to protect the main species of interest, the majority (53.3%) reported being willing to take this condition for three months and 26.6% chose the statement "never" justifying his choice by the practice of "catch and release"."

113 - An approach to economic movement generated by some saltwater fishing tournaments in Buenos Aires, Argentina

Ruben Francisco Dellacasa rfdellacasa@yahoo.com.ar

Theme: Assessment of the Economic Importance of Recreational Fisheries

Ruben Dellacasa (Independent researcher)

"Fishing tournaments meet big number of anglers each season. In the Southeast coast of Buenos Aires province (Argentina), highlights those that target the big fish. For lack of base information, the objective was to obtain an approach to economic movement generated by this kind of contests. Semi-structured interviews (n=165) were performed randomly to anglers during 15 of 24 tournaments carried out between 2009 and 2012. Questions were directed to some personal issues and fishing trip details, with focus in the total expenditure realized and what items or services were performed. In addition, local shopkeepers (n=50) were asked about their opinion on the level of sales in contest days. The study area was comprised of about 250 km of coastline between Mar del Sud (38° 21' S; 57° 59' W) and Marisol (38° 56' S; 60° 33' W).In average each angler spent U$ 85,46 per tournament throughout the study period. The main items were registration fee, fuel and bait. The individual expenditure in fuel was the most variable depending of city of origin and number of anglers per vehicle. The prize per tournament was U$ 16.400 in average and varied between seasons. The most of shopkeepers interviewed say that noticed an increase in sales for tournament days but could not measure it. The money mobilized per season by all concepts included in this work was U$ 646.454 in average. This quantity is a minimum probably undersized, because not included all possible items, like unforeseen expenses in the return trip, replacement of fishing tackle lost or damaged, etc. Nevertheless it's a first approach to total and shown the economical volume generated by this tournaments kind in local and zonal level. The survey carried out established a link between institutions, anglers and scientific for research and cooperation. The number of fishing tournaments in this area and the total number of anglers each season shows an increasing tendency. This fact could influence directly and indirectly over the economic movement. Local and provincial governments should take note about the economic volume generated and think a work with organizers, for example to improve the services and facilities to provide for local anglers and visitors."

WRFC-114 - Patterns capture onboard recreational fisheries: an exploratory multivariate approach

Rafael de Almeida Tubino rattubino@gmail.com

Theme - Research on angling diversity around the world

Rafael Tubino (Laboratório de Biologia do Nécton e Ecologia Pesqueira - ECOPESCA, Dept. de Biologia Marinha, Universidade Federal Fluminense, Brasil); Magda Andrade-Tubino (Curso de Ciências Biológicas, Universidade Veiga de Almeida, Brasil); and Cassiano Monteiro-Neto (Laboratório de Biologia do Nécton e Ecologia Pesqueira - ECOPESCA, Dept. de Biologia Marinha, Universidade Federal Fluminense, Brasil)

"In general, recreational fisheries show specific character in species composition captured. This fact is probably related to the individual preferences of anglers, their fishing experience and the use of suitable fitting equipment. The aim of this study was to identify the main factors correlated with specific patterns capture boat recreational fisheries practiced in Guanabara Bay and adjacent coastal zone. Fisheries monitored between September 2010 and March 2012 were selected.for implementation of an exploratory multivariate analysis. Among the 51 fishing trips monitored, those who had been selected fisheries containing the following information: a) date of the fishery, b) capture site, c) water temperature (º C), d) average depth (m), e) type of background, f) day period, g) species caught, h) CPUE, i) type of hook, j) type of sinker h) type of bait. Principal Component Analysis were applied to dataset to identify the relationship between biological variables (species) and observations (fisheries). The accessory matrix included abiotic data."

115 - Using the social norms approach to rectify the self fulfilling prophecy of non-compliance in recreational fisheries

Warren Mason Potts w.potts@ru.ac.za

Theme - Innovative management and governance methods in the recreational fishing area

Warren Mason Potts and Halse Sarah (Department of Ichthyology and Fisheries Science, Rhodes University, Grahamstown, 6140, South Africa)

"In the traditional natural resource management paradigm, recreational fishers have been categorized as instrumental actors, with their compliance determined as a trade-off between the financial incentive to comply and the chance of detection. Therefore, managers have generally held the view that compliance can be improved by either increasing the level of enforcement or by increasing the penalties for breaking the regulations. While increased levels of enforcement may improve compliance, these activities are unaffordable, particularly in developing countries. However, despite weak law enforcement and low penalties, several fisheries retain high levels of compliance. In these cases, the improved compliance behaviour is thought to be attributed to factors aligned with the normative concept, such as morality, legitimacy, social norms, and social pressure. One method of potentially influencing compliance behaviour through the normative concept is the social norms approach. This approach would use research to determine the social norms of compliance, how people feel about compliance (injunctive norms) and the norms that people perceive (perceived norms). It then attempts to correct public misperceptions of the perceived norm using targeted advertising campaigns. It has been successfully applied in the context of student drinking behaviour, smoking, seat belt use and HIV risk behaviour, but not in an environmental context. However, central to the success of the social norms approach is existence of a clear misperception between actual behavior and perceived behavior and that the misperception should be an overestimation of the undesirable behaviour. We used a shore-based coastal recreational fishery in South Africa to test the applicability of the social norms approach to recreational fisheries. A rapid response technique was used to gauge compliance behaviour of 155 anglers. This was followed by questions on their perception of the compliance of their fishing friends, competitive anglers and South African anglers in general. Interviewees were also questioned on their attitudes towards compliance and asked for their perception of the attitudes

of other anglers towards compliance. Although we found that 72% of the interviewed anglers were compliant, they overestimated the non - compliance of all South African anglers by 41%. Critically, anglers who believed that less than half of the other anglers were compliant were significantly less compliant than those who believed that more than half of the other anglers were compliant. This suggests that non-compliance in the South African recreational fishery is s self-fulfilling prophecy and that the misperception of poor compliance behaviour may be rectified using the social norms approach. A targeted educational advertising campaign in the popular angling media may therefore be an appropriate and cost effective method of improving compliance in South Africa's recreational fisheries."

116 - Site fidelity of bonefish (Albula vulpes) inhabiting small reef flats in Culebra, Puerto Rico: implications for management and conservation

Andy J. Danylchuk danylchuk@eco.umass.edu

Theme - Technological innovations in the recreational fishing area

Andy J. Danylchuk (University of Massachusetts Amherst, USA) - main author; Chris R. Haak (University of Massachusetts Amherst, USA); Jacob W. Brownscombe (Carleton University, Ottawa, Canada); Jack T. Finn (University of Massachusetts Amherst, USA); and Steve J. Cooke (Carleton University, Ottawa, Canada).

"Bonefish (Albula spp) inhabit shallow tropical and subtropical marine flats worldwide and are a prized target of recreational anglers as part of a catch-and-release fishery. In the Western Atlantic, most of the research related to the spatial ecology of bonefish has been conducted in The Bahamas and Florida Keys, regions comprised mostly of large expansive flats and tidal creeks connected to the shoreline. For this study, we used a fixed acoustic receiver array (n=59) to quantify the movement patterns of bonefish (n=50) residing on small isolated reef flats in Culebra, Puerto Rico. Bonefish in Culebra exhibit very high site fidelity, with individuals rarely being detected on receivers other than those on the specific reef flats where there were tagged. Some fish do make a small number (2-6 trips) of short (1-2 day) excursions to other reef flats, but then promptly return to their 'home flat'. Strong site fidelity of bonefish could have considerable implications in the face of habitat disturbance and high fishing mortality, and this knowledge will help resource managers make informed decisions regarding the implementation of management tools, such as net bans and marine protected areas."

117 - Behavioural dynamics of estuarine-dependent fishery species may explain their vulnerability to exploitation

Amber-Robyn Childs a.childs@ru.ac.za

Theme - Innovative management and governance methods in the recreational fishing area

Childs A-R1, Cowley PD21Department of Ichthyology and Fisheries Science, Rhodes University, Grahamstown 6140, South Africa 2South African Institute for Aquatic Biodiversity, Private Bag 1015, Grahamstown 6140, South Africa 3Norwegian Institute for Nature Research, P.O. Box 5685 Sluppen, NO-7485 Trondheim, Norway, Bennett RH1,2 , Næsje TF3"

"Recreational fishing, particularly in nursery habitats, such as estuaries, can have a negative impact on fish stocks. The catch composition of estuarine fisheries in South Africa is dominated by very few species, which have displayed contrasting levels of resilience to exploitation pressures. The estuarine-dependent spotted grunter Pomadasys commersonnii is considered over-exploited, but when compared to other estuarine-dependent species such as the dusky kob Argyrosomus japonicus and white steenbras Lithognathus lithognathus, its stock is still in a relatively healthy state. Fish movement ecology is complex, with estuarine-dependent species exhibiting diverse life cycles and complex behavioural strategies throughout their life histories. We examined telemetry datasets collected from five estuaries, and compared the mortality rates and movement behaviour of spotted grunter, dusky kob and white steenbras, to test the hypothesis that different behavioural traits provide varying resilience to the impacts of overfishing. Differences in their mortality rates and movement behaviour were observed. Fishing mortality was four times higher for dusky kob (42%), which exhibited tidal-

driven movements within estuaries, but displayed high levels of residency to their estuarine nursery areas and low levels of connectivity among estuaries (12% of individuals). In contrast, fishing mortality for spotted grunter was low (6%) – individuals utilized multiple estuaries (85% of individuals), yet exhibited site fidelity and residency to particular areas within estuaries. White steenbras displayed a high degree of residency to certain areas within estuaries, exhibited low levels of connectivity among estuaries, and had a fishing mortality of 10%. Since the proportion of individuals exhibiting estuarine connectivity was more than seven times greater for spotted grunter than dusky kob and white steenbras, it is possible that besides the benefits from their life-history traits (e.g. earlier maturation, ~ 3 years old), the high level of connectivity among estuaries make spotted grunter less susceptible to exploitation as the versatility and variability in habitat use make them unpredictable to anglers and thus reduce their catchability. Therefore, for a species that has an obligatory estuarine-dependent phase and vulnerable within-estuary movement patterns, adopting a migratory strategy that involves a high degree of connectivity among estuaries, may help to reduce the negative impacts that result from anthropogenic influences such as overfishing and habitat loss. Ultimately understanding the diverse migratory strategies of estuarine-dependent species may provide insight into the resilience of these species to recreational fishing and contribute to the design of appropriate management strategies."

118 - Economic valuation of recreational fishing in the Province of Salta, Argentina

Sergio G. Mosa sermosa@unsa.edu.ar

Theme - Assessment of the Economic Importance of Recreational Fisheries

Mosa, S.G., Franqui, F. R. and Sühring, S. S. (Instituto de Recursos Naturales y Ecodesarrollo, Universidad Nacional de Salta. Buenos Aires 177, 4400, Salta, Argentina).

"Recreational fishing is a major activity in the Province of Salta. The wide variety of rivers, streams and reservoirs existing in this province make it a rich diversity of fish species. The travel cost method (TCM) was used to estimate recreational value. Recreational fishing was evaluated through mail surveys conducted during 2001. Respondents were selected from the registry of 5,551 recreational fishermen registered in the former Department of Natural Resources and actually they renewed their fishing license that year. For our survey, the sample size was 1,417 fishermen. The sample included 956 persons from the Province of Salta, 271 of Jujuy and 190 of Tucumán, who are active users throughout the rivers and reservoirs of Salta. The socioeconomic characteristics of recreational anglers as age, occupation, level of education and income -as well as the frequency, duration, and costs of fishing trips- were evaluated. This activity had an annual expenditure of $10,051,145. Direct costs amount to $7,634,516 and to $2,416,630 for indirect costs. The economic contribution of the recreational fishing to the Salta economy is discussed in relation to other important economic activities in the Province."

122 - First analysis of recreational oceanic fishing off Northeastern Brazil

Katia M F Freire

Theme - Research on Angling Diversity around the world

Kátia de Meirelles Felizola Freire and Samara Cristina Santana Teles (Universidade Federal de Sergipe, Brazil), Gustavo Adelino (Zagaia Pesca Oceânica, Paraíba, Brazil), and Michel Machado (IBAMA, Coordenação de Recursos Pesqueiros, Brasília, Brazil)

Recreational fisheries in Brazil are very diverse and include two main components: daily activities and competitive events. They are practiced inland, as well as in marine waters, which include estuarine, coastal and oceanic waters. Several recent studies have described estuarine and coastal recreational fisheries along the Brazilian coast, but there is no published information on oceanic recreational fisheries off northeastern Brazil. Thus, this study was proposed with the objective of providing the first description of oceanic recreational fisheries off the Brazilian northeastern region. Even though recreational fisheries have been practiced for a long time in this region, with clubs established as early as the 1950s, oceanic fisheries are more recent.

Competitive fishing events have been promoted in the states of Bahia, Pernambuco (Fernando de Noronha) and Rio Grande do Norte. We will present results of past events that took place in the last two states. From 2000s onwards there was a boom of operators fishing in oceanic waters, who have been working in six out of the nine coastal states in northeastern Brazil. We analyzed in details the activities of the only existing operator fishing in oceanic waters off the state of Paraiba. The mean number of fishing licenses issued for that state in 2011-2013 was 256. Out of this total, about 20% goes fishing in oceanic waters (30-60% of them exclusively in oceanic waters). No fishing competitive event occurs in oceanic waters off the state of Paraiba. From 2008 to 2013, the operator worked with only one boat in oceanic waters off that state and about three times a month in average (1-10). The highest number of fishing trips was observed in January (austral summer) and the lowest in August (austral winter). In each operation, reel is normally set to catch pelagic and/or reef-associated species, but in some cases, operation is only for sightseeing, diving or spearfishing. Catches per trip were 30 kg in average (0-150 kg), with an annual mean catch of 760 kg (maximum of 1288 kg). Main species caught were: tuna (*Thunnus albacares* and *Thunnus atlanticus*), bonito (*Katsuwonus pelamis* and smaller unidentified species) and barracuda (*Sphyraena barracuda*). Even though catches are small in relation to commercial fisheries, they should be included in global databases to establish a baseline for future management. Results on the economic evaluation of this operation will also be presented based on questionnaires distributed among recreational fishers.

Roundtable and Workshops – Structure and Abstracts

ROUNDTABLE - Monday, September 1 – 10:30 am to 12:30 pm - Auditorium III
Assessment of the Economic Importance of Recreational Fisheries

Coordination –Katia de Meirelles Felizola Freire (Federal University of Sergipe, Brazil)

The objective of this roundtable is to provide an opportunity for all attendees to learn about initiatives worldwide on the assessment of the economic importance of recreational fisheries and share experiences on successes and challenges observed during the process. We hope this roundable inspires scientists from economies in transition to work on this very important issue and discuss some strategies that allow for future comparison among countries using similar methodologies but at the same time respecting local needs.

Guests

Brad Gentner (Gentner Consulting Group, LLC)

Rashid Sumaila (University of British Columbia – Canada)

Presentation A: Using Economics in Recreational Fisheries Management Globally

Brad Gentner - brad@gentnergroup.com

Gentner Consulting Group, LLC

Recreational fishing is a powerful economic engine. Many nations are beginning to focus on growing their recreational fishing industries because they view recreational fishing as more sustainable, particularly in situations where recreational fishing dollars remain in the country where the fishing has occurred. For instance, recreational fishing in the United States is a powerful economic engine, generating $58.4 billion in total sales impact and supports 380,898 jobs, nearly $8 billion more than the commercial industry, while taking far fewer fish. Because economics largely focuses on the allocation of scarce resources between competing uses and user groups, it is becoming increasingly critical to collect economic data and to use economics in the management process. Fishery science and management are concerned with both positive, what happens in a fishery system, and normative, what management should do, questions. Management generally involves three components: system attributes and dynamics, management options, and goals and objectives that stream from normative criteria by which outcomes are judged. Fisheries economics is largely concerned with two broad areas that management spectrum. One, translating positive system attributes and dynamics into normative criteria that can be used to choose goals and objectives, and, two, designing management options and management institutions. This presentation will focus on the first goal; defining positive and normative criteria and focusing on the types of decisions and types of criteria that economist use to support fishery management decisions. The presentation will start with a definition of the difference between positive and normative criteria and examples of positive and normative criteria. Next, a general framework for how economics should strive to interface with the management process will be presented. Finally, data needs and data collection strategies will be discussed.

Presentation B: Freshwater angling and the economy of British Columbia

Rashid Sumaila & Megan Bailey - r.sumaila@fisheries.ubc.ca

Fisheries Centre, University of British Columbia, Vancouver, Canada

British Columbia has over 20,000 lakes, with 750,000 kilometers of streams and 24 different fish species targeted by anglers. This Canadian Province is therefore one of the best places to engage in freshwater angling in North America. Sport fishing is an ideal way to connect with friends, family and the tranquility of nature. This makes it an increasingly important contributor to human well-being in British Columbia as rising numbers of locals and tourists engage in angling in the Province. In this presentation, I will discuss the impact of freshwater angling to the economy of British Columbia based on the 2010 Survey of Recreational Fishing in Canada. We find that in 2010, the direct economic impact of angling was $546 million, contributing $164

million in value added GDP and almost $94 million in wages and benefits. When we add indirect and induced impacts, including $55 million in tax revenues, the total impact of freshwater fishing came to $957 million in expenditures, which support the employment, salaries and wages of several thousand residents.

WORKSHOP 1 – Tuesday, September 1, 03:50 to 04:30 pm

Adapting Catch & Release Science: the angler-scientist nexus - Auditorium III

COORDINATION – Andy Danylchuk (University of Massachusetts Amherst) and Steven Cooke (Carleton University)

Recreational anglers are the cause of stressors imposed on fish they ultimately catch and then potentially release as either a voluntary or mandated conservation action. As such, the science of catch and release needs to be adaptive so that it adequately addresses potential changes in the way anglers interface with their catch (based on the evolution of fishing strategies, gear, motivations) and what they target. Equally, as anglers look to scientists and resource managers for solutions to make their leisure activity more 'sustainable', it is useful for anglers to better understand the current limitations of catch and release science, as well as their potential role in the research. For this workshop, we will examine the 'angler-scientist' nexus and whether clear communication about needs, limitations, and common goals can adequately manage expectations for a broader research agenda for catch and release science and management.

WORKSHOP 2 – Wednesday, September 3, 10:30 am to 12:30 pm – Auditorium III

COORDINATION – Agostinho Carlos Catella (Doctor in Freshwater Biology and Inland Fisheries from INPA/UFAM, Manaus, Amazonas, Brazil)

Plural Use of Fishing Resources as Strategy for Conservation

Challenges related to multiple use and conservation of fishing resources in the Pantanal region, Brazil

The Pantanal is a large floodplain area located in the Central South America, mostly within the Brazilian Midwest. The region has a complex environment with abundant and diverse wildlife and fish species, where the flood pulse is the most important natural phenomenon. Fishing is a traditional activity of great social and economic importance as subsistence, professional-artisanal and sportive modalities. The fishing profile has changed over the years. From the mid-1980s, the downturn in professional fishing occurred gradually, which lost fishing power and political space for the emerging fishing tourism sector, with better organization and resources availability. Currently, hooks are the only capture equipment allowed for all types of fishing. However, illegal fishing using banned equipment is still frequent in some areas. The fishing activities are multi-specific but, using hooks, the effort is exerted mainly on the large migratory species. The professional fishermen are interested in a greater production by weight and sport fishermen want to catch large specimens, resulting in different and conflicting directions for the management. The fishing tourism agencies stand behind the interests of sports fishing. Natural and antrophic factors can alter the fish stocks production. The former, as the annual inundation strength, acting in a cyclically way, alternates more and less productive periods; the latter implies in the loss of environmental quality. We point out the urgent need for a policy of plural use of fishery resources as a conservation strategy. It is important to recognize the role of the different stakeholders, to ensure a balanced access to resources and promote cooperation. That can help to get a better return from the use of the resources, rescue people from irregular activities, and join different efforts to fight for a development policy compatible with the environmental and fisheries conservation.

Guests:

Claudio R. M. Baigún (Laboratorio de Ecología y Producción Pesquera - Argentina)

Milena Ramires (Biologist - PUC/SP)

Vandick da Silva Batista (PhD in Freshwater Biology and Inland Fisheries from the National Institute for Amazonian Research)

Presentation A - Relations between artisanal and sport fishing in "caiçaras coast" communities of São Paulo, Brazil

Milena Ramires (Lecturer and researcher at the Master's Program in Sustainability of Coastal and Marine Ecosystems – ECOMAR, University of Santa Cecilia, Santos / SP)

Fishing is an important economic and cultural activity throughout Brazil. Among the various forms of fishing, artisanal and sport has undergone changes in its practices, influencing the populations that develop them in several ways. In recent years, the artisanal fishery suffered from a decline in fish resources and imposed restrictions on different exploited environments. Moreover, sport fishing is growing due to the increasing number of practitioners coming from the large urban centers in search of practical sport, recreation and contact with nature. However, it is important to emphasize that sport fishing has not yet received due attention in relation to planning, monitoring and scientific research, so little, incentive to be conducted in a sustainable manner. Relations between artisanal and sport fishing in some cases are conflicting and in other cases, they complete each other. This has been shown to be frequent in caiçaras communities in the State of São Paulo (Brazil). Artisanal fishermen offer to sport fishermen, fishing guide service, boat pilots, and bait suppliers, fishing gear maintenance, cleaning and storage of fish. The knowledge of the artisanal is valued by sport fishermen. Therefore, many artisanal fishermen see sport fishing as an economic alternative that keeps them in touch with the environment that they live in and with the resources; they know so well - the fish. This knowledge has been shown to be useful in proposals for the development and management of sport fishing in protected areas of restricted use, where artisanal fishing has limitations that reduce the productivity and hence household income. These limits do not affect the way sport fishing, because what matters to the sport fisherman is the pleasure of practicing the activity and not necessarily catch large quantities of fish. Thus, sport fishing can be considered as an important alternative source of incoming for local communities, which can provide timely collaboration in planning sport fishing and conservation of fishery resources.

Presentation B - Different fisheries, different objectives, is it possible an agreement?

Vandick da Silva Batista (Freshwater Biologist - Inland Fisheries from the National Institute for Amazonian Research)

Sportive, subsistence, commercial artisanal, commercial industrial and other types of fisheries corresponds to different objectives as fishermen thoughts and wishes runs from high to null mortality levels. These differences intensify conflicts even when the species fished are not the same among categories. Competition for the same resource; other externalities of one fishery category on others; differences on empowerment and economic interests; weaknesses of political channels to keep permanent dialogue among stakeholders are some of the main bottlenecks to reduce productivity and sustainability of multiple used fishery resources. Solutions are possible and involve empowering weaker fishers to balance discussions on political grounds, enlarging user's responsibilities, reduce accessibility to users not willing to collaborating on management or other policy activities, education for collaboration activities, and other co-management actions are needed to fishing agreements function properly.

Presentation C - Making visible the invisible: taking into account the recreational and sport fisheries for management policies in Argentina

Claudio R. M. Baigún (Laboratorio de Ecología y Producción Pesquera - Argentina)

Argentina exhibits a rich arrangement of lakes and rivers with diverse ecological characteristics and a long coastal shore, inhabited by a wide range of cold and warm water fish species and in most of the country, sport and recreational fisheries represent an important activity. Despite these fisheries take place mostly year round, specific data and information remain extremely scarce, with little attention given by researchers and managing agencies in assessment project and monitoring programs. Erroneously, recreational fisheries have been mostly associated to only leisure purposes without taking into account their social and economic relevance that mobilize significant economic resources and represent also valuable livelihood for many

stakeholders. Recreational anglers in Argentina exhibit a wide spectrum of typologies varying among regions and according to target species, thus displaying complex management scenarios. Some of them may exert a significant fishing impact that can provide a valuable and alternative source of fishing data, whereas others support extreme conservationist attitudes. Such issues, however, have not been yet well appreciated by managers, deepening these omissions in regions where artisanal, recreational and sport fisheries overlap. This study presents a review of the Argentine recreational and sport fisheries at a regional scale, highlighting the main issues and barriers which have precluded the effective inclusion of these fisheries in provincial and national level policies. We point out the need to start envisioning recreational and sport fisheries as a part of regular ordination processes, particularly when these activities become highly visible. To achieve this goal different biological, institutional, fishery, social and economic criteria and assessment tools should be considered promoting a more comprehensive and integrative perspective for fisheries management in Argentine inland and coastal waters.

Workshop 3 – Thursday, September 4, 10:30 am to 12:50 pm, Auditorium III

Sustainability Sport Fishing of Billfish off Southern Brazil

COORDINATION – Alberto Ferreira de Amorim (Instituto de Pesca - APTA – SAA, Santos, SP), Eduardo Gomes (Universidade Veiga de Almeida – Curso de Engenharia Ambiental)

In this workshop, we will invite most of the yacht club and their fishery Directors and representative anglers. Our main problem is the declining of billfish populations. We have the blue and white marlins prohibition. We need to include the sailfish. We invited the following yachts clubs: Yacht Club Ilhabela-YCI, Iate Clube do Rio de Janeiro-ICRJ, Iate Clube do Espirito Santo-ICES, Yacht Clube da Bahia-ICB and the Canavieiras Charts. Also the representative of the Brazilian fishing in CONAPE, Mr Helcio Honda, ANEPE chairman, will open the Workshop. He will speak about the Brazilian sport fishing organization. Each fishery director shows his nautical structure and talks about fishing tournaments. I am including my master students to present our billfish research and show the billfish population decline. The coordinator presents the main problem, justifying the facts and opens the debate requesting suggestions for the sustainability of billfish sport fishing, and the end open the discussions to everybody. Our intention is to prepare a document for Mr. Honda delivered in the CONAPE meeting.

Concerned with the decline of billfish catch per unit of effort-CPUE anglers of yacht clubs and the marlin project coordinators, created the Environmental Preservation Campaign of Billfish, in January 2010, at the Iate Clube do Rio de Janeiro in Cabo Frio, RJ. The main lines followed were: diagnosis of sport and commercial catches; rescue of CPUE historical commercial and sport fishing; research reproduction, growth and migration; environmental education for children of commercial fishermen; and explanation of the prohibition on sale of blue and white marlin. The ONG Vivamar was chosen to manage the resources received from donations and the sale of the book “Billfish of the Atlantic”. Every year the group of researchers holds meetings to present the progress and discuss the future of the project.

Presentation A - VIVAMAR Fishing Organization Report

Alberto Ferreira de Amorim (Instituto de Pesca - APTA – SAA, Santos, SP)

Vivamar is a non-governmental organization dedicated to the marine environment. Informally emerged in the mid-2003 based on the union of several groups of nautical sports, especially anglers and divers, was founded, on March 31, 2004. The reason for the union of these sport fishermen was the realization that reserves were being created in almost all the islands of our coast, reducing the nautical sportsman. Aiming to correct this deviation, and effectively protect the marine environment rationally and encourage the participation of people in our coastal problems discussion, Vivamar ONG was created. Fight for the preservation of our rich marine environment and preserving a healthy and sustainable marine fisheries activities tradition, are the main goals of Vivamar. A major challenge that must be faced with rational, science-based projects, that we

will be promoting and sponsoring through positive actions in relation to the Brazilian marine ecosystem. We are developing environmental and social projects, taking into account marine life and sustainable boating activities, including angling. If you want to be part of our members or participate in our activities. You can still meet our statutes, to know who are the directors of our organization, our partners and support in the following site www.vivamar.org

PRESENTATION B - Yacht Club Ilhabela Report

Alberto Ferreira de Amorim (Instituto de Pesca - APTA – SAA, Santos, SP)

The Yacht Club de Ilhabela-YCI was founded on 25 January 1956 and just in 60 became the major employer of island. Also the Spearfishing Cup, the biggest event of this sport in Brazil of the 60s, or Ilhabela Sailing Week, today considered the most important ocean sailing event of the northern pier. It was in January 2011 that the club finally opened its boldest work, a modern floating marina with capacity to house more than one hundred vessels. Each seat is equipped with all the infrastructure support such as water and electricity and incorporates a floating structure that minimizes environmental impacts. The minimizes impacts to the environment, compared to a marina based on pillars, but also contributes to the increase of wildlife in its surroundings as it works as an "artificial reef", attracting fish and seabirds large that feed on the abundant supply of foods that grow in the vicinity of floating structures. In the 70 decade the oceanic tournament begging and the first billfish was caught offshore Ilhabela. According to Fishery Director, of the XXVI Tag and Release Tournament (2013/2014) in the 3rd step held on November 30th, there was a higher incidence of blue marlin in the entire history of YCI. Blessed are the 17 teams that participated in this historic moment, a weekend with calm and windless sea. 13 Blue Marlin were caught tagged and released, and 3 captured and lost. We also had information that more 6 blue marlin were caught and lost, before there was time to inform the control.

PRESENTATION C - ANEPE Historical Report

Helcio Honda (Associação Nacional de Ecologia e Pesca Esportiva)

The ASSOCIAÇÃO NACIONAL DE ECOLOGIA E PESCA ESPORTIVA [National Association of Ecology and Sport Fishing] – ANEPE, a nonprofit organization, founded in 2005, representative of sports fishermen and of the economic chain related to amateur / sports fishing in Brazil, with a seat in the National Council of Aquaculture and Fishing – CONAPE, an agency of the Ministry of Fishing and Aquaculture – MPA; a member of the Committee of Productive Chain of Fishing and Aquaculture – COMPESCA, of the Federation of Industries of the State of São Paulo – FIESP, and member of the Nautical Work Group (GTT-Náutico) of the Ministry of Tourism. It will present some topics on the organization of Brazilian sports fishing as follow: the ancient concept of sports fishing; the change of image; the gap to fill; growth factors; Anepe as representative of the productive chain with Embratur and MTUR, Conape and MPA and Compesca of Fiesp; insertion of family in sports fishing; union with other kinds of tourism; formatting of products to offer (institutions); need to qualify manpower; decrease of pressure over fishing stocks; alternative to artisan fishermen (Aquaculture and Tourism).

Workshop 4 – Thursday, September 4, 02:50 am to 05:30 pm, Auditorium III

Recreational Fisheries Governance (FAO)

Coordination - Raymon van Anrooy

The demand for guidance on recreational fisheries and its governance and management has increased in recent years. Changing perspectives in management are also changing information requirements for fisheries managers; e.g. there is a need to consider a wider range of issues (besides production volume and value) in decision-making processes. Resource managers need to consider recreational fisheries development and management within the full scope of ecosystem services, as well as to exercise appropriate precaution as an

important part of the approach to sustainability. The main objectives of this workshop are to: 1. Disseminate the principles of FAO Technical Guidelines for Responsible Fisheries: No. 13 Recreational Fisheries among recreational fisheries stakeholders; 2. Stimulate, compile and synthesize scientific data related to management and governance of recreational fishing practices around the world; 3. Present findings of high quality studies in support of better governance and management of recreational fisheries; and 4. Increase attention to recreational fisheries governance and management issues among participants at the 7WRFC.

Guests:

Daniel Vieira Crepaldi (Brazilian Environmental Institute - IBAMA)

Kátia de Meirelles Felizola Freire (Universidade Federal de Sergipe, Brazil)

Rob Southwick (Southwick Associates, Inc., USA)

PRESENTATION A - A Cost-Effective Method for Estimating the Economic Contributions of Recreational Fisheries in Developing Nations

Rob Southwick (Southwick Associates, Inc., USA). Brad Gentner, Gentner (Consulting Group, Inc. Silver Spring, MD., USA). Raymon Van Anrooy (UN FAO and Secretary of the WECAFC)

PRESENTATION B - The global catch of recreational fisheries

Kátia de Meirelles Felizola Freire – main author and presenter (Universidade Federal de Sergipe, Brazil), Nicola Smith, Vicky Lam, Dyhia Belhabib, Maria-Lourdes D. Palomares, Lydia Teh, Kristin Kleisner, Dirk Zeller and Daniel Pauly (Fisheries Centre, University of British Columbia, Canada), Jocemar Tomasino Mendonça (Instituto de Pesca, São Paulo, Brazil), Pietro S. Moro (Programa Costa Atlântica, Fundação SOS Mata Atlântica, São Paulo, Brazil), and Fábio S. Motta (Universidade Estadual Paulista, São Paulo, Brazil)

This contribution will present the first global time series (for the years 1950 to 2010) of estimates of marine recreational catches, based on 'reconstructions' of the marine catches of the world by the Sea Around Us, based at the University of British Columbia, and its collaborators throughout the world. Reconstructions are bottom-up estimates of fisheries withdrawals in a given area (e.g., the Exclusive Economic Zone of a maritime country) derived from all available sources of information - some very indirect - that can be used for such purposes, under the assumption that any reasonable estimate will be more accurate than the 'zero' values that are implied when an estimate is not provided. For different countries, different methods were used to infer recreational catches, e.g., using national statistical databases in which numbers of fish caught were recorded and converted into weights, as well as using YouTube videos documenting recreational fishing trips, or inferring catches from numbers of active recreational fishers (including those who fish only during competitive fishing events), their trips per year, and mean catch per trip. Overall, estimates of catches were obtained for over 150 countries and territories, while the 100 or so countries and territories not covered generally did not have distinct recreational fisheries. The major trends in catch and catch composition of the recreational fisheries will be presented both globally, by region, and for Brazil as a case study. This will be accompanied by recommendations regarding their inclusion in a global statistics database, which should include all causes of fishing mortality if our fisheries - including recreational fisheries - are to be managed on an ecosystem basis.

PRESENTATION C - Recreational fishing in restricted areas and local communities' inclusion: a case study presentation

Daniel Vieira Crepaldi (Brazilian Environmental Institute - IBAMA)

"The recreational fishing activity in Brazil is being undertaken in an uncontrolled manner, without any planning, monitoring or supervision measures, in a competitive model which has led some rivers to over-exploitation. This operation pattern until exhaustion of fishing resources has resulted in the search for unexplored regions specially in the Legal Amazon and in Protected Natural Areas (PNAs) – be they Conservation Units or Indigenous Lands. In these places conflict records has increased deriving from inserting recreational fishing

without any due consultation of the interested or affected communities, as well as the measurement of impacts and/or socio-environmental and economic benefits of the activity. The cases of study here presented provide bases to structure protocols for regulation of the recreational fishing activity in PNAs, considering the accumulated experience and new legal device. Some aspects are identified as fundamental to assure the activity sustainability which are identified: consultation to the communities; methodologies to measure the potentiality and social-environmental feasibility and implementation of a joint monitoring and management program. In this context, the recreational fishing tourism in PNAs may become a multiple opportunity: for the recreational fishermen, for the conservation of the territories, and for the sustainability of the indigenous and traditional communities."

CONTACT LIST
(up to August 5-2014)

AALDEREN, R.A.A. VAN
Netherlands
aalderen@sportvisserijnederland.nl

AARTS, TOINE
Netherlands
aarts@sportvisserijnederland.nl

AHMED, SHUHEL
Bangladesh
sapparotradeintl.bd@gmail.com

ALÓS, JOSEP
Spain (Germany)
alos@igb-berlin.de

ALVES, LAERTE BATISTA DE OLIVEIRA
Brazil
laerte.alves@icmbio.gov.br

AMARAL, SERGIO FERREIRA DO
Brazil
amaral@unicamp.br

AMORIM, Alberto
Brazil
prof.albertoamorim@gmail.com

ANDRADE-TUBINO, MAGDA
Brazil
magdatubino@biologia.ufrj.br

ANROOY, RAYMON VAN
FAO Subregional Office for the Caribbean
Raymon.VanAnrooy@fao.org

APARECIDA MACHADO DE ANDRADE, FÁTIMA
Brazil
fatima.corumba@gmail.com

APARECIDA MACHADO DE ANDRADE, FÁTIMA
Brazil
fatima.corumba@gmail.com

ARLINGHAUS, ROBERT
Germany
arlinghaus@igb-berlin.de

ARROLHO, SOLANGE
Brazil
solarrolho@yahoo.com.br

BAIGUN, Claudio
Argentina
cbaigun@gmail.com

BARRA, CAMILA SOBRAL
Brazil
camila@socioambiental.org

BARROCO, LORENZO SORIANO ANTONACCIO
Brazil
lorenzo_barroco@hotmail.com

BARWICK, MATT
Australia
matt.barwick@recfishingresearch.org

BATISTA, Vandick
Brazil
tchoni@uol.com.br

BEARD, DOUGLAS T
USA
dbeard@usgs.gov

BEARDMORE, BEN
USA
abeardmore@wisc.edu

BELRUSS, CARLOS GONÇALVES
Brazil
cbelruss@hotmail.com

BIRD, OWEN
Canada
birdo@sportfishing.bc.ca

BOLZON, VILMAR GERONIMO
Brazil
vilmar@itaipu.gov.br

BOWER, SHANNON
Canada
shannon.bower@carleton.ca

BROWNSCOMBE, JACOB W.
Canada
jakebrownscombe@gmail.com

BUENO, ALEXANDRE DOS SANTOS
Brazil
bueno_alex@ig.com.br

BURNS, ROBERT C.
USA
robert.burns@mail.wvu.edu

BYRNE, CIARAN
Ireland
emma.fortune@fisheriesireland.ie

CALMON DE SÁ, ANGELO
Brazil
angelo-sa@uol.com.br

CALZAVARA, PETRONIO
BRAZIL
PETRONIO@AROPLAN.COM.BR

CAMPANHA, PAULA MARIA GÊNOVA DE CASTRO
Brazil
paulagc08@gmail.com

CAMPION, SUZANNE
Ireland
suzanne.campion@fisheriesireland.ie

CANOVA, FERNANDO
Brazil
fernando.canova@gmail.com

CARRIÃO, SARAH MORENO
Brazil
sarah.3088@gmail.com

CARVALHO BEZERRA DE MENEZES, LUCIANA
Brazil
lcbm@usp.br

CATELL, Agostinho Carlos
Brazil
agostinho.catella@embrapa.br

CHAVES, PAULO
Brazil
ptchaves@ufpr.br

CIARAVOLO, DAVID
Australia
david.ciaravolo@gmail.com

CLARKE, ADRIAN
Canada
Adrian.Clarke@gofishbc.com

CLEARY, BRETT
Australia
brett@bayhire.com.au

CONWAY, RUSSELL
Australia
russell.conway@justice.vic.gov.au

COOKE, STEVEN
Canada
steven_cooke@carleton.ca

COWX, IAN
United Kingdom
i.g.cowx@hull.ac.uk

CREPALDI, DANIEL
Brazil
ADaniel.Crepaldi@ibama.gov.br

DANILCHUK, ANDY
USA
danylchuk@eco.umass.edu

DAS, SUMON
sapparotradeintl.bd@gmail.com

DEDUAL, MICHEL
New Zealand
mdedual@doc.govt.nz

DELLACASA, RUBÉN FRANCISCO
Argentina
rfdellacasa@yahoo.com.ar

DÍAZ-GIL, CARLOS
Spain
cdiaz@imedea.uib-csic.es

DIGGLES, BEN
Australia
ben@digsfish.com

D'SILVA, DALLAS
Australia
dallas@vrfish.com.au

ENGSTEDT, OLOF
Sweden
olof@sportfiskarna.se

FAIRCLOUGH, DAVID
Australia
mark.pagano@fish.wa.gov.au

FERNANDEZ, DOMINGO RODRIGUEZ
Brazil
domingo@itaipu.gov.br

FERTER, KENO
Norway
Keno@imr.no

FITZPATRICK, LIAM
Australia
liamsfx@hotmail.com

FREIRE, KÁTIA DE MEIRELLES FELIZOLA
Brazil
kfreire2006@yahoo.com.br

FREITAS, CARLOS EDWAR DE CARVALHO
Brazil
cefreitas@ufam.edu.br

FREITAS, DEBORA
Brazil
freitas.debora@gmail.com

FUJITANI, MARIE L.
Germany
fujitani@igb-berlin.de

GARRONE-NETO, DOMINGOS
garroneneto@yahoo.com

GBENRO, SANYAOLU OLANIYI
NIGERIA
niyo009@yahoo.com

GENTNER, Brad
USA
brad@gentnergroup.com

GERN, FABIANA REGINA
Brazil
fabigern@gmail.com

GILLETT, MATTHEW
Australia
matt@recfishwest.org.au

GUSMAO, FELIPE
Brazil
gusmao.lfm@gmail.com

GUTERRES, LUÍS FERNANDO DOS REIS
Brazil
luis.guterres@uerr.edu.br

HAQUE, MOHAMMAD NAJMUL
Bangladesh
sapparotradeintl.bd@gmail.com

HARRISON, NATHAN
Australia
nathan.harrison@fish.wa.gov.au

HAVN, TORGEIR
Norway
torgeir.havn@nina.no

HENN, CAROLINE
Brazil
chenn@itaipu.gov.br

HONDA, Elcio
Brazil
honda@hondaestevao.com.br

HOSSAIN, YEAMIN
Bangladesh
yeamin.fish@ru.ac.bd

HÜHN, DANIEL
Germany
huehn@igb-berlin.de

HYDER, KIERAN
United Kingdom
kieran.hyder@cefas.co.uk

ISLAM, AMINUL
Bangladesh
sapparotradeintl.bd@gmail.com

ISLAM, SAIFUL
Bangladesh
sapparotradeintl.bd@gmail.com

JAHID, KHANDAKER
Bangladesh
jahidfmrtku@gmail.com

JOHNSON, BRETT
USA
brett.johnson@colostate.edu

JOHNSTON, FIONA
Germany
johnston@igb-berlin.de

JONES, CHEYNE
Australia
cheyne_jones@centuriesahead.com.au

JONES, RHIANNON
Australia
rhiannon.jones@fish.wa.gov.au

JONSSON, GREGER
Sweden
greger@salmolapland.se

KEELING, HELEN
New Zealand
h.keeling@fish-game.org.nz

KANH, James R.
USA
KahnJ@wlu.edu

KHAN, MESBAUDDIN
Bangladesh
sapparotradeintl.bd@gmail.com

KIRJAVAINEN, EIJA
Finland
eija.kirjavainen@mmm.fi

KLEFOTH, THOMAS
Germany
klefoth@igb-berlin.de

POPE, KEVIN L.
USA
kpope2@unl.edu

LENNOX, ROBERT
Canada
robertlennox9@gmail.com

LESTER, Nigel
Canada
nigel.lester@ontario.ca

LOPES MACHADO, MICHEL
Brazil
michellopesm@gmail.com

LOUISE SHORT, JOSIE
Australia
josielouise13@hotmail.com

LUNDGREN, MARKUS
Sweden
markus.lundgren@sportfiskarna.se

MARQUES, HUGO
Brazil
h.marques@outlook.com

MARTÍN CUEVAS, JUAN
Argentina
juanmartin_cuevas@yahoo.com.br

MARTINEZ, NIGEL
Belize City
belizefederationoffishers@gmail.com

MARTINS, VILMA NEVES
Brazil
martinsvilma@hotmail.com

MARUYAMA, LÍDIA SUMILE
Brazil
lidia@pesca.sp.gov.br

MATTHEWS, ANDEW
Australia
amatthews@conquestag.com.au

MCGRATH, ANTHONY
Australia
sageflyrods@hotmail.com

MENDONÇA, JOCEMAR TOMASINO
Brazil
jocemar.mendonca@gmail.com

MIAH, MOHAMMAD CHUNU
Bangladesh
sapparotradeintl.bd@gmail.com

MOHAMUD ALI, TAHLIL
Somalia
coastalorg@gmail.com

MORALES-NIN, BEATRIZ
Spain
beatriz@imedea.uib-csic.es

MORELLI, SANDRA
Brazil
morelli@ufu.br

MOTTA, FABIO S.
Brazil
limbatus@gmail.com

MUÑOZ, BERNARDO UGALDE
Chile
bugalde@pupelde.cl

OFORI, ERIC
GHANA
farmersvillage@gmail.com

OLAUSSEN, JON OLAF
Norway
jon.o.olaussen@hist.no

OLIVEIRA F°, ADALBERTO FRANCISCO DE
Brazil
betinhoflyeco@uol.com.br

OLIVEIRA, CLÁUDIO
Brazil
claudio@ibb.unesp.br

OLIVEIRA, LEANDRO GERVÁSIO DE
Brazil
leandro.gervasio@meioambiente.mg.gov.br

OLIVEIRA, LUIZ FELIPE DAUDT DE
Brazil
felipedaudt@yahoo.com.br

ORESLAND, VIDAR
Sweden
vidar.oresland@slu.se

OTTOSSON, KENNETH
Sweden
kenneth.ottosson@hush.se

PAGANO, MARK
Australia
Mark.Pagano@fish.wa.gov.au

PEPPERELL, Julian
Australia
julianp@internode.on.net

PETRERE JR, MIGUEL
Brazil
mpetrere@rc.unesp.br

PHILLIPS, TODD
USA
tphillips@oceanconservancy.org

PIMENTA, Eduardo
Brazil
epimenta@uva.br

POTTS, WARREN
South Africa
w.potts@ru.ac.za

PRADO, Rubinho Almeida
Brazil
rubinho@pescaventura.com.br

RAMIRES, Milena
Brazil
milena.ramires@hotmail.com

RANDALL KAHN, JAMES
USA
kahnj@wlu.edu

RAUTIAINEN, MIKKO
Finland
mikko.rautiainen@metsa.fi

RIEPE, CARSTEN
Germany
riepe@igb-berlin.de

RIOUX, DANIELLE
USA
danielle.rioux@noaa.gov

RODRIGUES, TIAGO
Brazil
tiagosp7@hotmail.com

RUPPE, JOERG
Brazil
Joerg.Ruppe@gmx.de

RYAN, KARINA
Australia
mark.pagano@fish.wa.gov.au

SAAVEDRA, NÉSTOR CARLOS
Argentina
nespesca@sion.com

SANTORO, CARLOS ALBERTO
Brazil
contato@carlossantoro.com.br

SANTOS, ANDRÉ LUIZ QUAGLIATTO
Brazil
quagliatto@famev.ufu.br

SCHMIDT, ROBERTA FERNANDES
Brazil
robertafschmidt@gmail.com

SCHRATWIESER, JASON
USA
jschratwieser@igfa.org

SELLIN, HENRIQUE BUENO
Brazil
henriqueselli@gmail.com

SERRADOR, MARCUS VINICIUS
Brazil
mserrador@terra.com.br

SIDDIQUEE, MOHAMMAD MOSTAFA
Bangladesh
sapparotradeintl.bd@gmail.com

SILVA, EZEQUIEL T.
Brazil
emarthi@terra.com.br

SILVA, SAMUEL ELIAS DA
Brazil
sam_ictio@yahoo.com.br

SILVESTRI, ROBERTO
Italia
r.silvestri@cibm.it

SOUTHWICK, ROB
USA
rob@southwickassociates.com

SOUZA, GABRIEL RAPOSO SILVA DE
Brazil
gabrielraposo.souza@gmail.com

SOUZA, ROBSON O.
Brazil
robson.oliveirarr@gmail.com

STEFANIC, IVAN
Croatia
stefanic@tera.hr

SULOCKI, IAN-ARTHUR DE
Brazil
ian@kaluapesca.com.br

SUMAILA, Rashid
Canada
r.sumaila@fisheries.ubc.ca

SUTTON, STEPHEN
Australia
stephen.sutton@jcu.edu.au

TERAMOTO, CAROLINA SAYURI
Brazil
carol.teramoto@gmail.com

TOMÁS, ACÁCIO RIBEIRO GOMES
Brazil
cbelruss@hotmail.com

TRAVASSOS, PAULO
Brazil
p.travassos@depaq.ufrpe.br

TREER, TOMISLAV
Croatia
treer@agr.hr

TSUBOI, JUN-ICHI
Japan
tsuboi118@affrc.go.jp

TUBINO, MAGDA ANDRADE
Brazil
magdatubino@gmail.com

TUBINO, RAFAEL DE ALMEIDA
Brazil
rattubino@gmail.com

TUTUI, SÉRGIO LUIZ
Brazil
stututi@hotmail.com

UDDIN, MOHAMMAD NASHIR
Bangladesh
sapparotradeintl.bd@gmail.com

URPANEN, OLLI
Finland
olli.urpanen@metsa.fi

VÄÄTÄINEN, REETTA
Finland
reetta.vaatainen@uef.fi

VAN AALDEREN, ROLAND
Netherlands
aalderen@sportvisserijnederland.nl

VIEIRA, JOÃO P.
Brazil
vieira@mikrus.com.br

WANG, WEIMIN
China
wangwm5911@gmail.com

WELTERSBACH, MARC SIMON
Germany
simon.weltersbach@ti.bund.de

WILDE, GENE
USA
gene.wilde@ttu.edu

WILLARD, DANIEL
dwillard@edf.org

WILSON, ANDREW
Andrew.Wilson@gofishbc.com

ZAFAR IQBAL, MALIK
Pakistan
m_b_seeds@yahoo.com

ZIMMERMANN, ADONIS
Brazil
instituto.vidanativa@gmail.com