

The Indian Ocean Tuna Tagging Programme

Jean-Pierre Hallier
Julien Million



Indian Ocean Tuna Tagging Symposium



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Grand Baie, Mauritius

Background...

- Tagging: best tool to collect fishery independent data
 - Tagging data used for growth, natural mortality, exploitation rates
- History
 - Since 1980, IOTC(IPTP) scientists calling for a large tagging programme in the Indian Ocean
 - In 2002, start of pilot and small-scale tagging activities
 - FA signed between the EU and IOC (10th December 2003) to implement the RTTP-IO (14 million euros)
 - 29 April 2005, arrival of the Aita Fraxku and Kermantxo in Port Victoria



Structure

- Pilot and small-scale phase:
 - 11 projects implemented from 2002 – 2009
 - Financed by the EU DG-Mare (200,000 €) and the Government of Japan (909,000 US\$)
 - Indonesia, India (Lakshadweep, Andaman), Japan, Mayotte, Maldives, South Africa, SEAFDEC, Spain
- Regional Tuna Tagging Project – Indian Ocean (RTTP–IO)
 - EU DG-Dev (9th EDF) funding: 14 million Euros
 - Contracting authority: IOC
 - Supervisor: IOTC
 - 2 pole-and-line vessels chartered for 31 months
 - 5 years Technical Assistance based in Seychelles

I. Tagging activities



Material and method

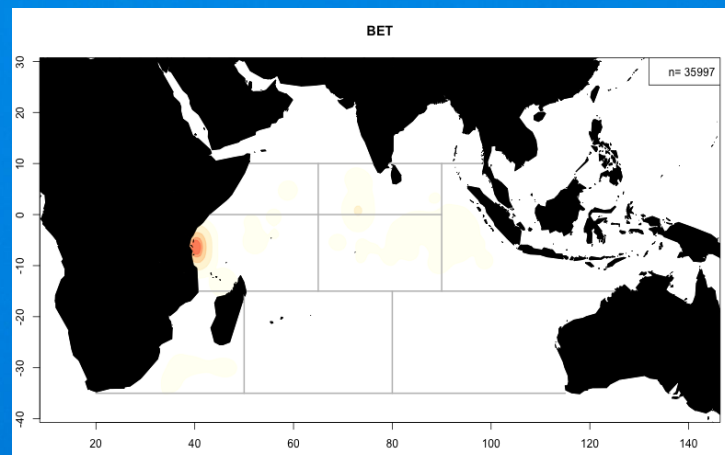
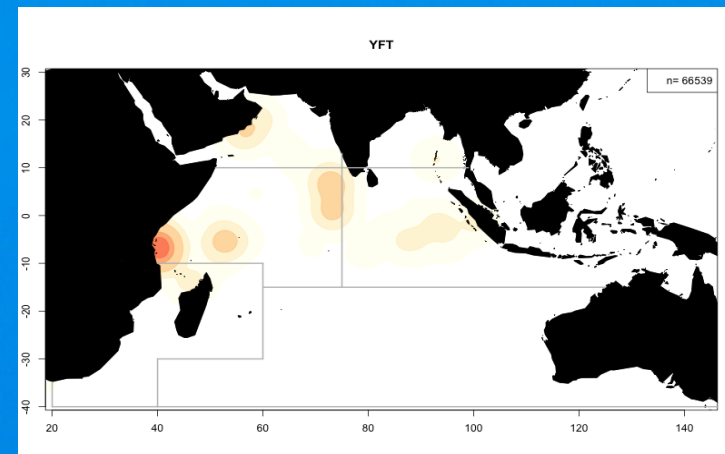
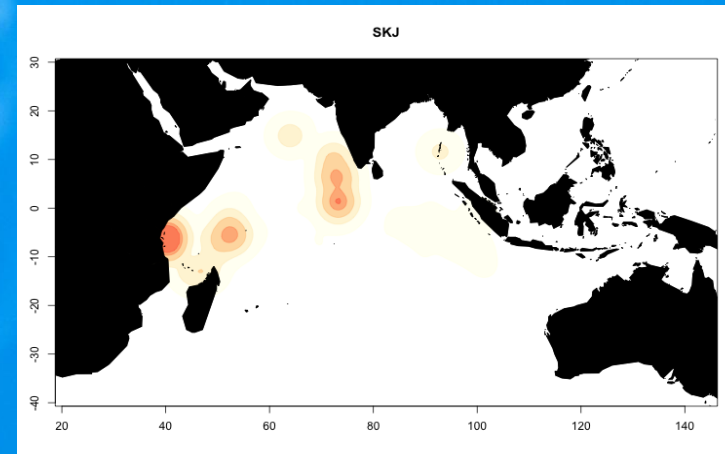
- Gear: pole-and-line
 - 99.6% of the tagged tuna caught with pole-and-line
 - RTTP-IO : two pole-and-line vessels chartered from the Atlantic ocean
 - Small-scale: local pole-and-line vessels, and other vessels
- Dart “spaghetti” tag implanted in the tuna pterygiophores
 - Conventional yellow tags (single and double)
 - OTC + conventional white tags
 - Archival + conventional red tags



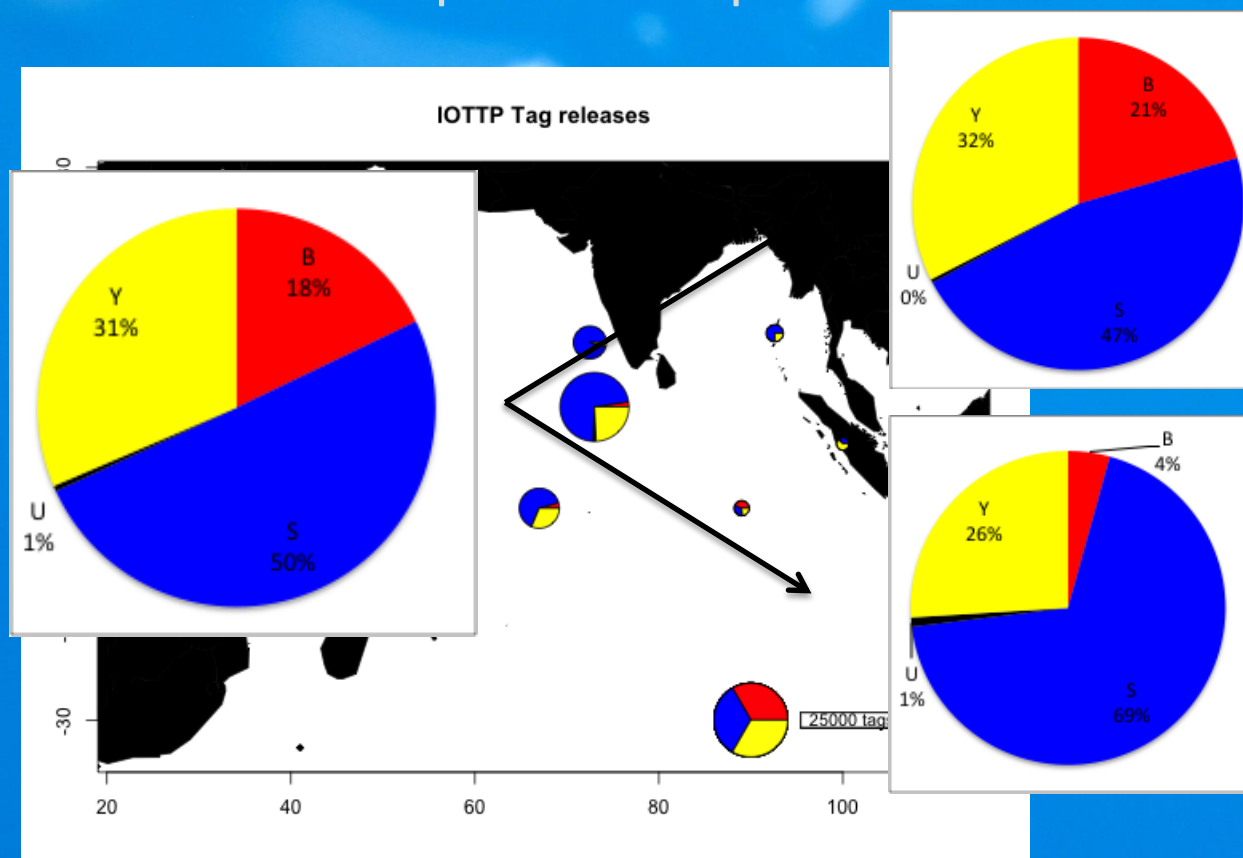
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- The figure consists of three vertically stacked area charts, each representing a different type of message: IOTTP (top), SS (middle), and RTTP-IO (bottom). The x-axis for all charts represents time in months, with labels for years (2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009) and specific months (1, 3, 5, 7, 9, 11). The y-axis represents the number of messages per month. A grey shaded region highlights the period from approximately March 2005 to March 2007.
- IOTTP Chart:** The y-axis ranges from 0 to 25,000. The chart shows a significant increase in activity starting in 2005, peaking in 2007. The legend indicates four categories: UNK (black), BET (red), SKJ (blue), and YFT (yellow). The total number of messages peaks at over 20,000 in early 2007.
- SS Chart:** The y-axis ranges from 0 to 6,000. The chart shows a significant increase in activity starting in 2005, peaking in 2007. The legend indicates four categories: UNK (black), BET (red), SKJ (blue), and YFT (yellow). The total number of messages peaks at over 4,000 in early 2007.
- RTTP-IO Chart:** The y-axis ranges from 0 to 25,000. The chart shows a significant increase in activity starting in 2005, peaking in 2007. The legend indicates four categories: UNK (black), BET (red), SKJ (blue), and YFT (yellow). The total number of messages peaks at over 20,000 in early 2007.

Releases: areas

	Releases
Mayotte	122
Andaman (India)	1340
Indonesia	748
India (LL)	17
Japan	1665
Lakshadweep (India)	4977
Maldives	21918
South Africa	26
RTTP-IO	168163
SEAFDEC	2294
Spain	89
TAGFAD	66
TOTAL	201145



Releases: specific composition



- 50% of yellowfin and bigeye
- Larger proportion of skipjack in Small-scale projects
- Good numbers of bigeye only tagged in Kenya and Tanzania
- Tagging of medium and large yellowfin in Oman

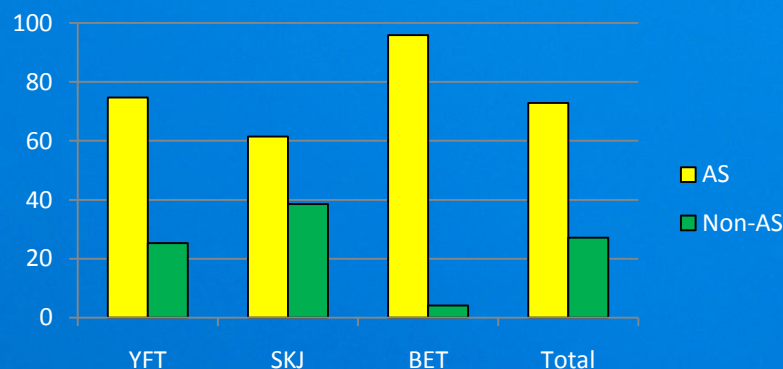
Releases: the Associated School Fishing Technique

Off Mauritania and Senegal in West Africa, pole-and-line fishermen have developed the « **Associated School Fishing Technique - ASFT** » in which an association of a tuna school with a tuna fishing vessel is maintained day and night during weeks and months while fishing, drifting or slowly steaming.

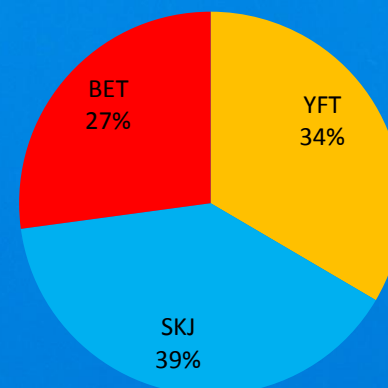
During the RTTP-IO, the tagging vessels implemented this ASFT off Tanzania and 122,615 were tagged or 73% of all RTTP tagging as illustrated below.

Furthermore, with this technique all the three species were tagged in a well balanced proportion.

Importance of the tagging into the Associated School and the other school types (non-AS) of the RTTP (in % of total)

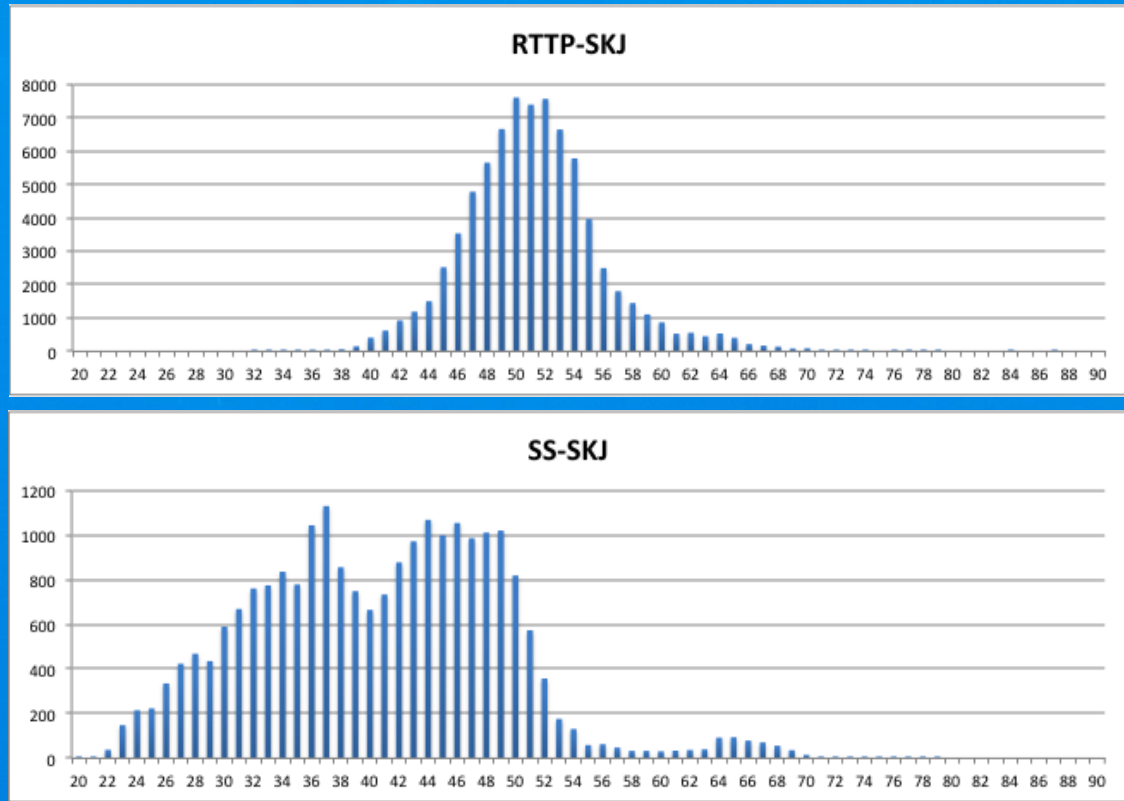


Species composition of the fish tagged in the AS

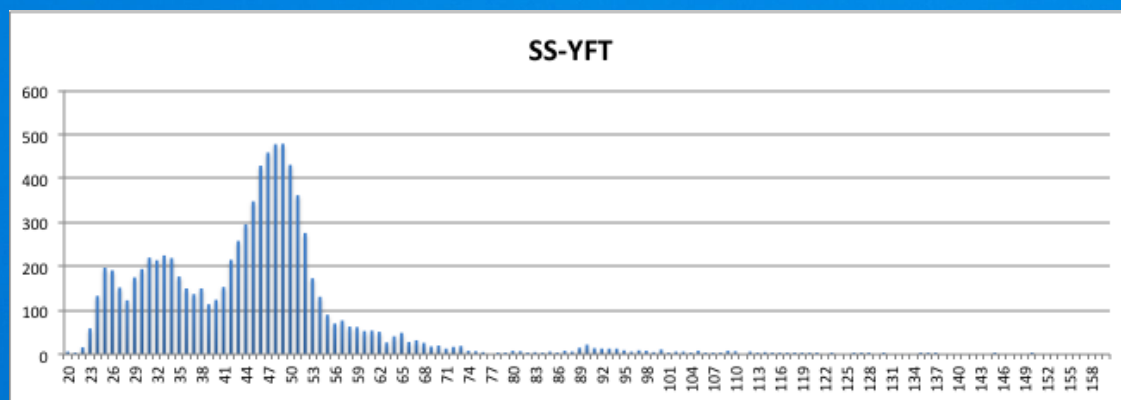
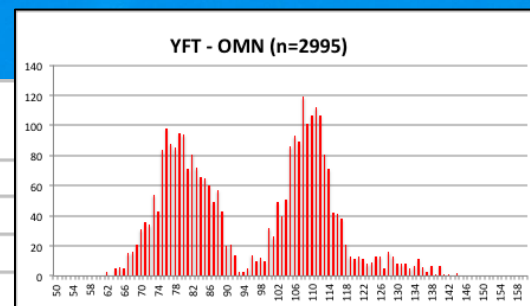
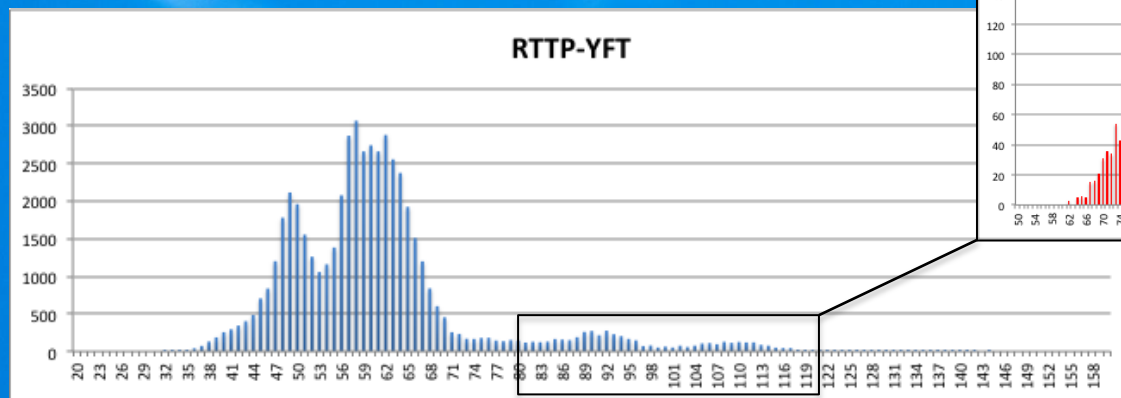


Releases: size frequency

Length of the SKJ tagged different between RTTP-IO and Small-scale
=> Smaller and larger fish tagged during small-scale



Releases: size frequency



Larger yellowfin tagged during the RTTP-YFT

Smaller yellowfin tagged during small-scale

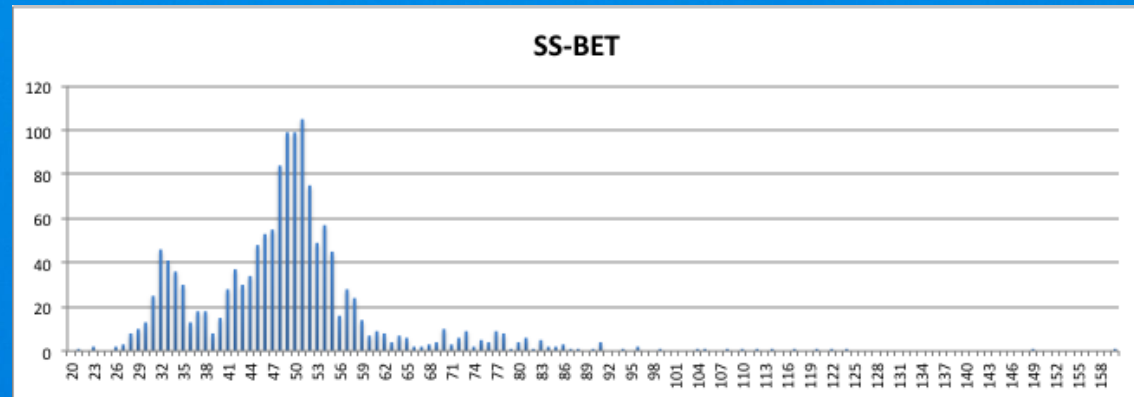
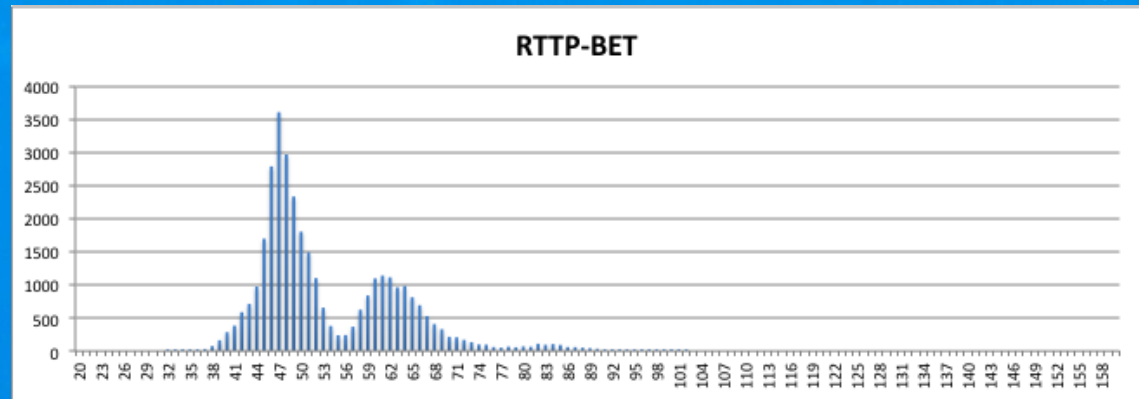
=> Tagged fish covering all size classes

Releases: size frequency

Larger bigeye tagged during the RTTP-IO

Smaller bigeye tagged during small-scale

=> Tagged fish covering all size classes under 100cm



Releases: type

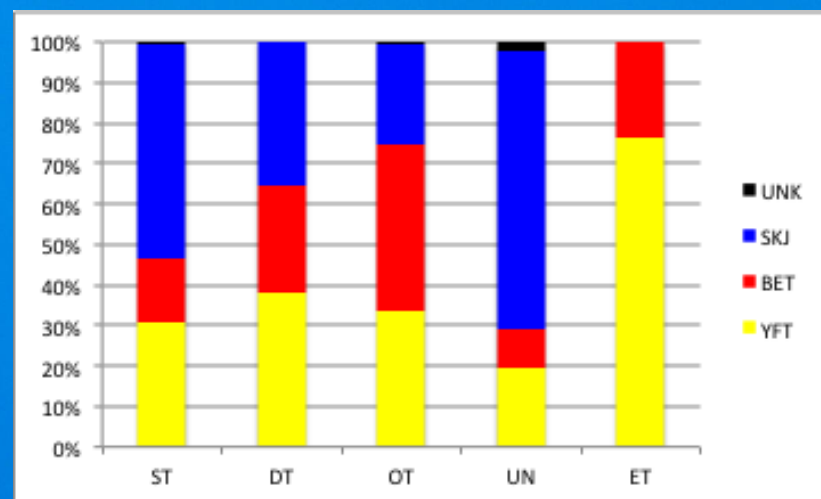
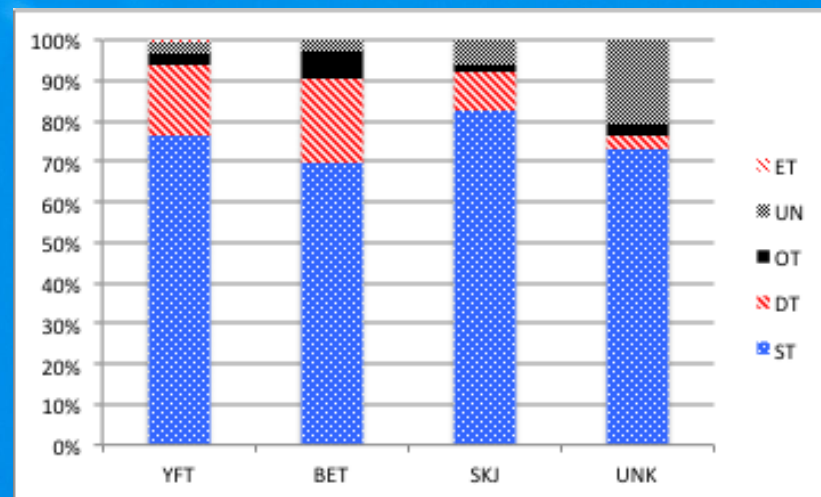
	ST	DT	OT	UN	ET	TOTAL
YFT	48306	11009	2019	1761	233	63328
BET	25035	7578	2443	868	73	35997
SKJ	83364	10151	1500	6197	0	101212
UNK	646	33	22	187	0	888
TOTAL	157351	28771	5984	9013	306	201425

- Double tagging: TAG SHEDDING

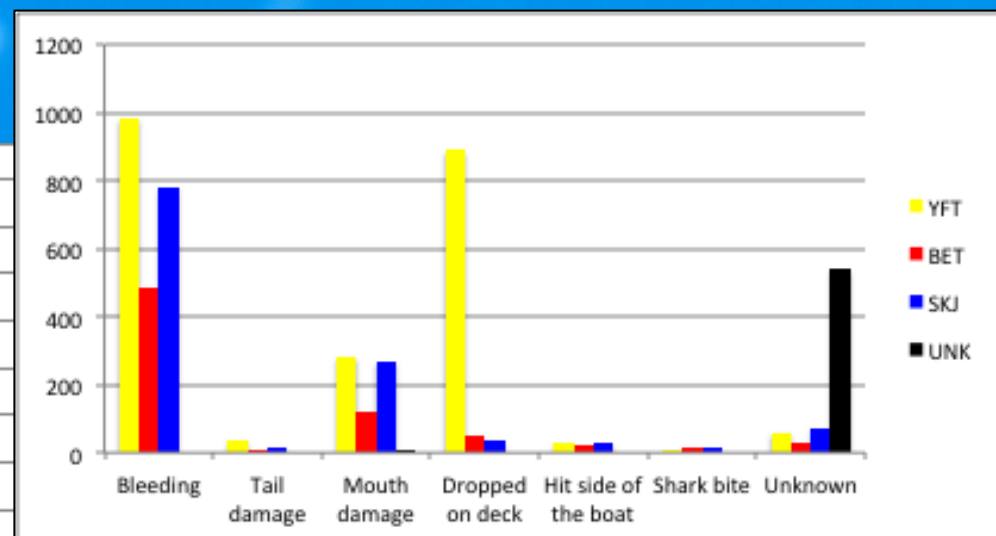
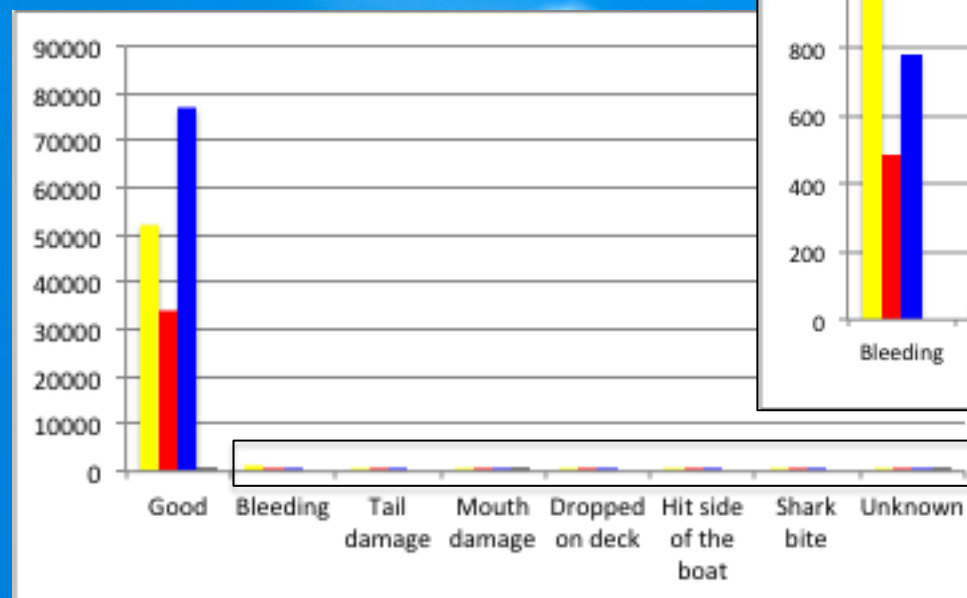
- YFT: 17% | (97% RTTP)
- BET: 21% | (99% RTTP)
- SKJ: 10% | (95 % RTTP)

- OTC tagging: GROWTH

- YFT: 3% | (100% RTTP)
- BET: 7% | (100% RTTP)
- SKJ: 2% | (100% RTTP)



Releases: quality



RTTP-IO

- 97.2% of the fish released in GOOD condition
- 94.9% of the fish measured with GOOD accuracy
- 94.6% of the fish tagged in GOOD condition

=> The quality of the tagging has been ensured through the whole duration of the RTTP-IO

Involvement of coastal countries

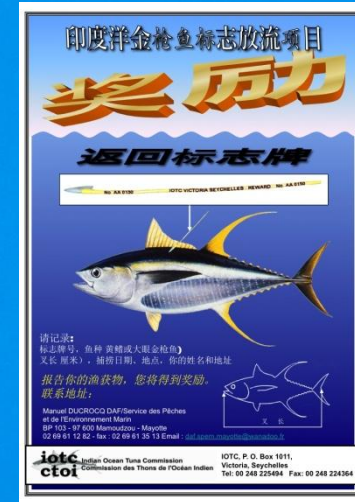
- 27 Regional Tagging Technicians (RTTs) from 11 countries trained to tagging technics and data collection onboard the tagging vessels
- 4 semi-permanent RTTs from Seychelles rotating onboard the vessels
- All small-scale projects implemented in collaboration with local research centers with training in tagging technics and data collection

II. Recovery activities



Building a recovery network

- Identification and prioritization of recovery platforms
- Development of a recovery network in the Indian Ocean
 - => National Focal Points and Recovery Officers
- Development of publicity campaigns and reward scheme
- Training given in recovery data collection and sampling



Collecting reliable data

- Need to ensure recovery data is of good quality
- Large amount of the recovery made by stevedores when unloading purse seiners
 - ⇒ recoveries needed to be linked to the logbook data
- Day to day verification and validation
- Data in the public domain and available upon request to IOTC

The TAGRETURN software interface displays a comprehensive data entry form. Key sections include:

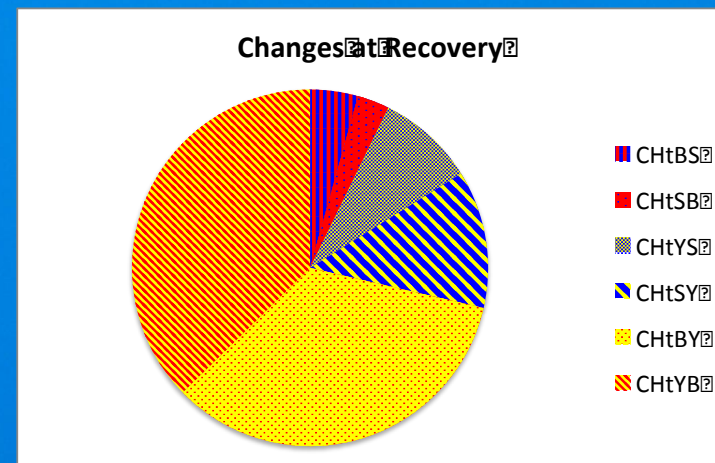
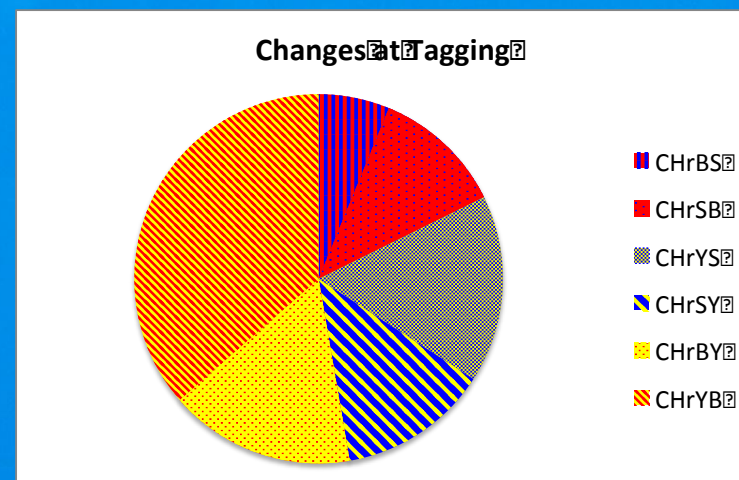
- Top Section:** TAG NUMBER (EE454 07), search bar (ee454), and a 'Go to tag' button.
- Measurement Section:** Length (67.00 cm), Measure type (FL), Measurement reliability (Good), Measuring tool (Caliper), Weight (4.60 kg), and Weight reliability (Weighted).
- Species and State Section:** Species (Y), Fish state (Frozen), Where found (Fishing boat), Process when found (Transfer), and SEX ().
- Fishing Method Section:** Fishing method (Purse seine), Recovered while fishing, and Recovered after capture.
- Finder Information Section:** Finder name (Michel Banane), Finder's address (Au Cap), Country of recovery (Seychelles), Reward (50SCR), and Receipt details (ReceiptNo: 00737, Date Paid, ReceiptNo2, Date Paid2).
- Date and Unloading Section:** Date found (11/21/2006), Date returned (11/21/2006), Date unloaded, Reeler, Hatches, and Date unloadedR.
- Comments Section:** A text area for additional notes.
- Bottom Status Bar:** Record: 1 of 16639 of 34341, Unfiltered, Search.

The Form1 software interface displays a data entry form with a multi-step navigation system. Key sections include:

- Top Section:** Tag Number (AA170 59), Tagged on, and a 'Go to tag' button.
- Measurement Section:** Length (), Measure type, Species (Other), Measuring tool, Fish state (Fresh), Weight (), Weight reliability, Where found (Fishing boat), Process when found (Fishing), Fishing method (Hand line), Country of recovery (Seychelles), Reward (50SCR), Finder name (Paul Bastienne), and Finder's address.
- Navigation Section:** List 17: Vessel/unloading combinations (STEP2), Navigate (STEP1) with 'Go to tag' and 'Remove Possible Sets' buttons, and Editor's details (STEP4) with 'Data Editor' (JNR), 'Edit Status' (Artisanal), and 'Previous/Next' buttons.
- Species and Found Status Section:** Species, WFound, and PWFFound.
- Bottom Section:** List 23 (STEP3) with 'Sort Side', 'Sort Well', and 'Records' buttons, and a 'Select all' button.
- Bottom Status Bar:** Record: 1 of 34341, No Filter, Search.

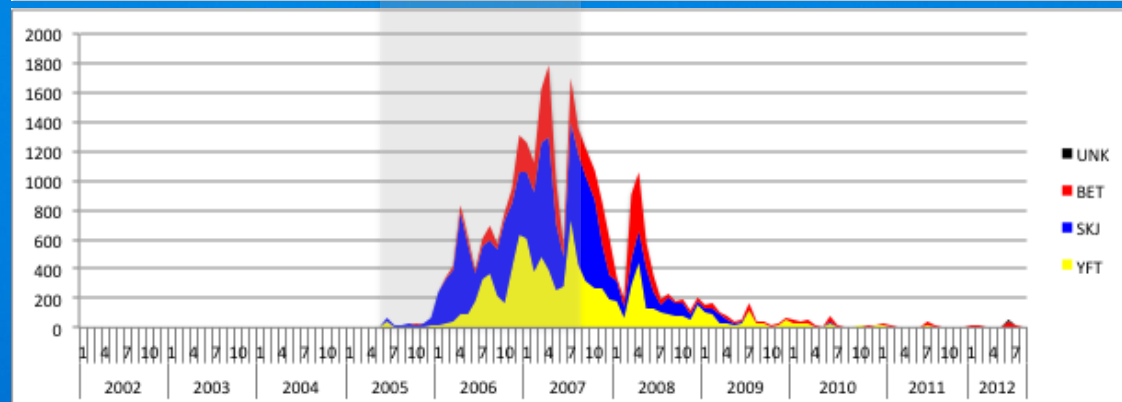
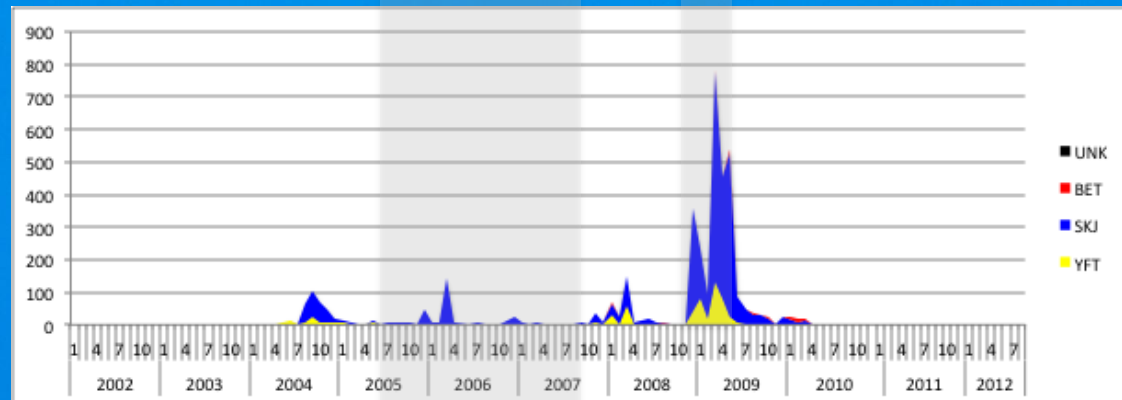
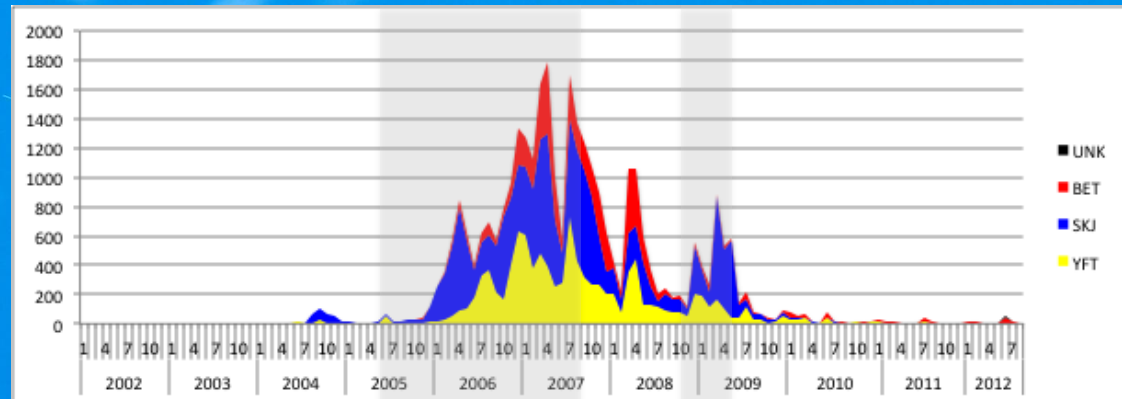
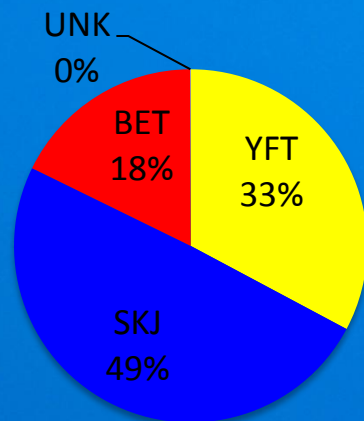
Collecting reliable data

- Correction of species misidentification at tagging and recovery
 - 1830 corrections in total: 5.7% of the recoveries with a modification
 - RTTP: still 17 YFT, 10 SKJ and 16 BET recovered as another species
 - SS: still 290 YFT, 125 SKJ and 84 BET recovered as another species
- Most of the changes between YFT and BET at tagging and recovery



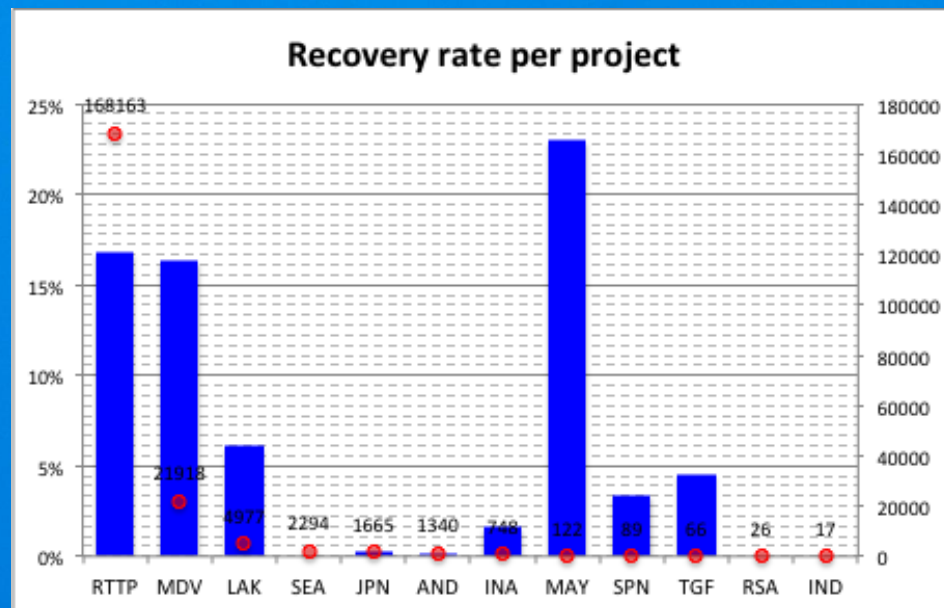
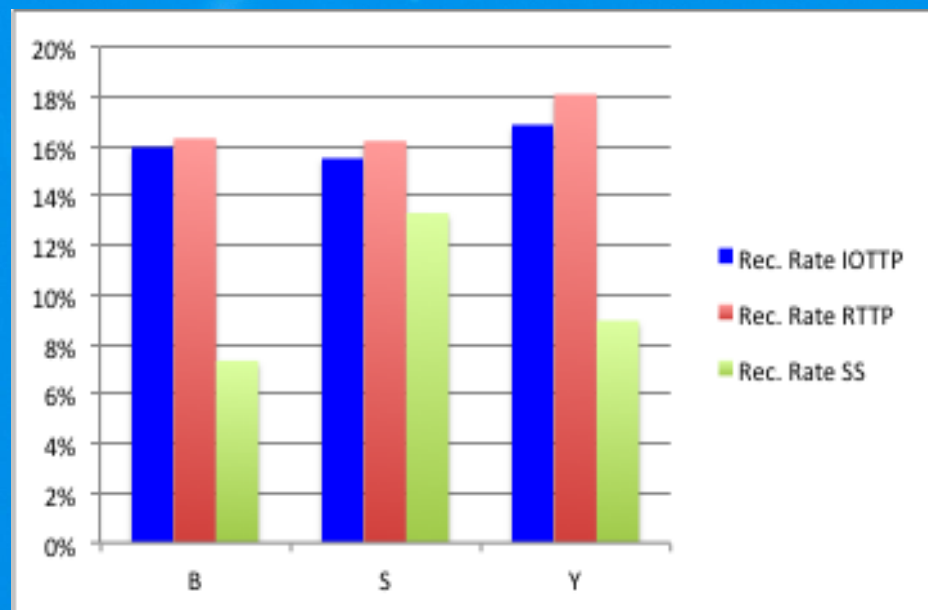
Recoveries

- 32 232 tagged tuna were recovered... until now
- RTP: large number of recoveries after the end of the tagging operation... until today
- SS: recoveries reduce fast after the end of tagging activities

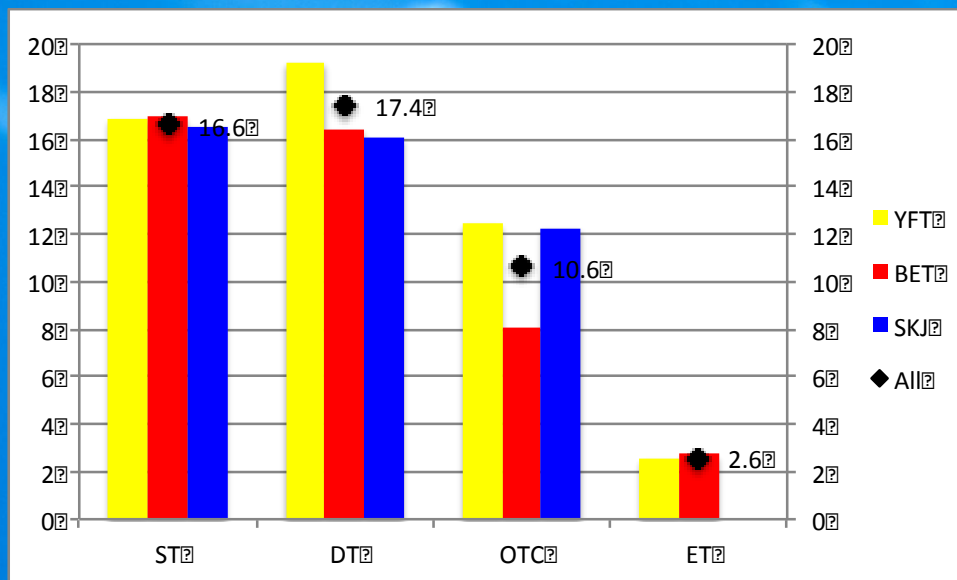


Recoveries: rates

- Recovery rate over 15% for all species
- RTTP Recovery rate over 16% for all species
- Some small-scale projects have very low recovery rate
 - High tag induced mortality?
 - Low reporting rate in coastal fisheries?

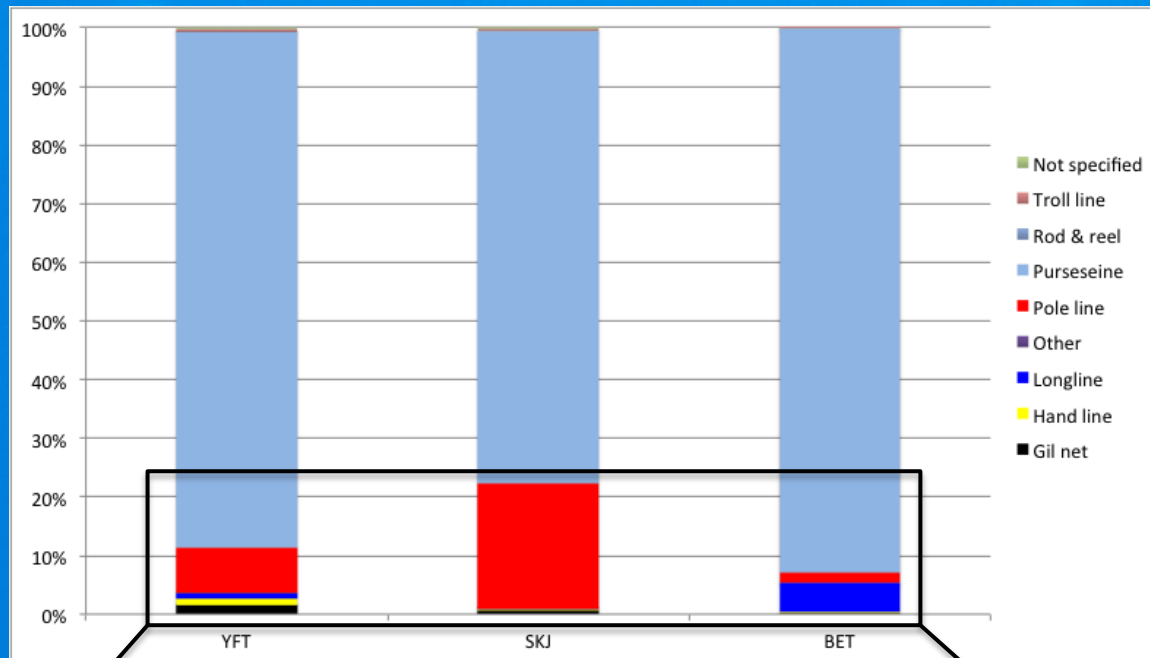


Recoveries: tag type



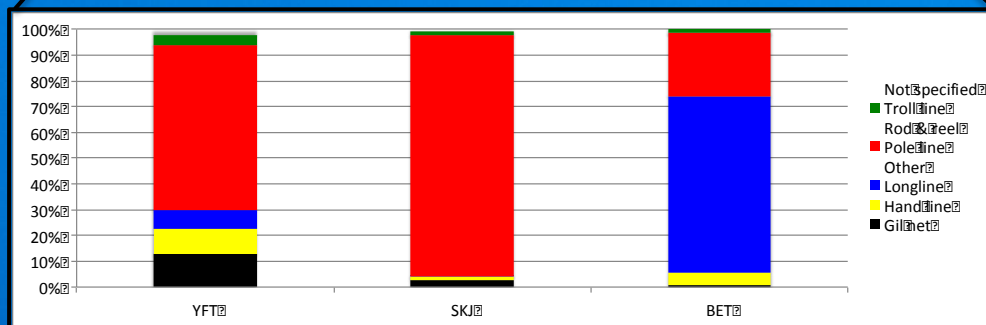
- Overall recovery rate: 16%
- Double tag with higher recovery rate:
⇒ More chances to detect the tag if one has shed
- OTC tagged fish with lower recovery rate (10.6%)
- Electronic tagging not successful with very low reporting rate

Recoveries: gear

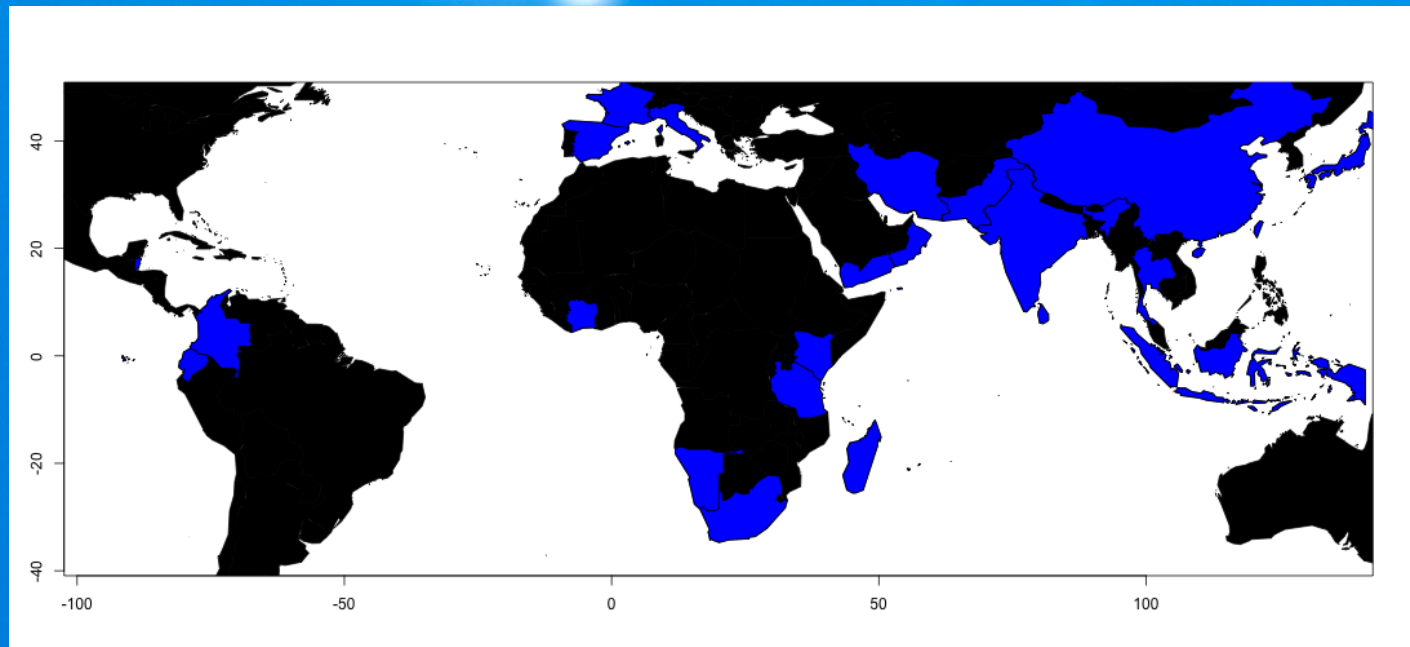


- 83.5% recovered on purse seiner
- 13.4% recovered on pole-and-line
- 1.19% recovered on longline

⇒ Probably large under reporting of the longline and artisanal fleets

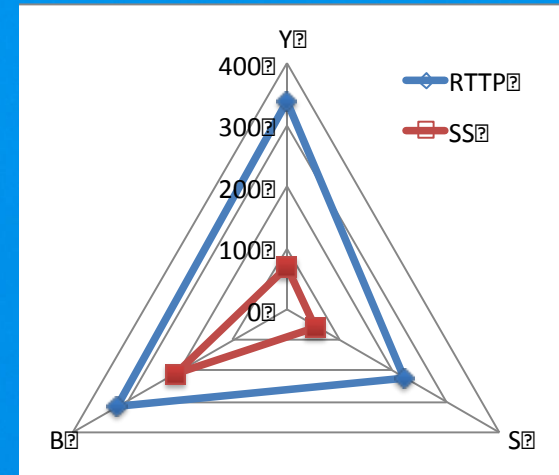
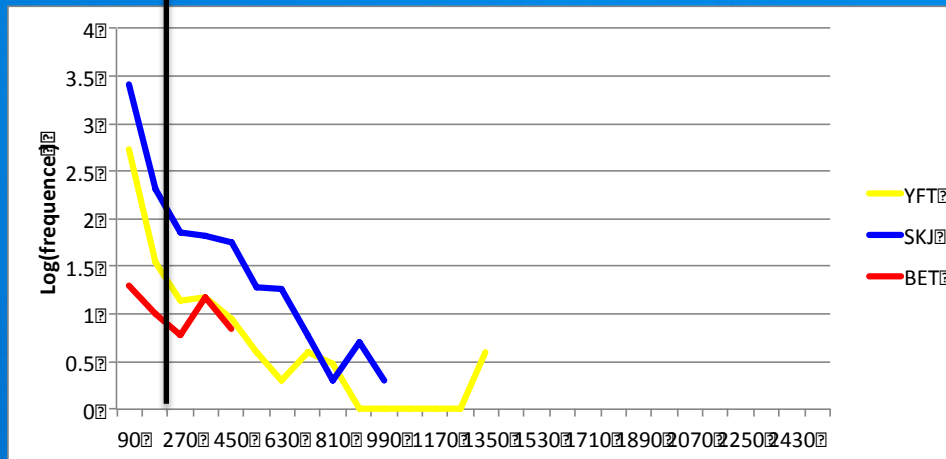
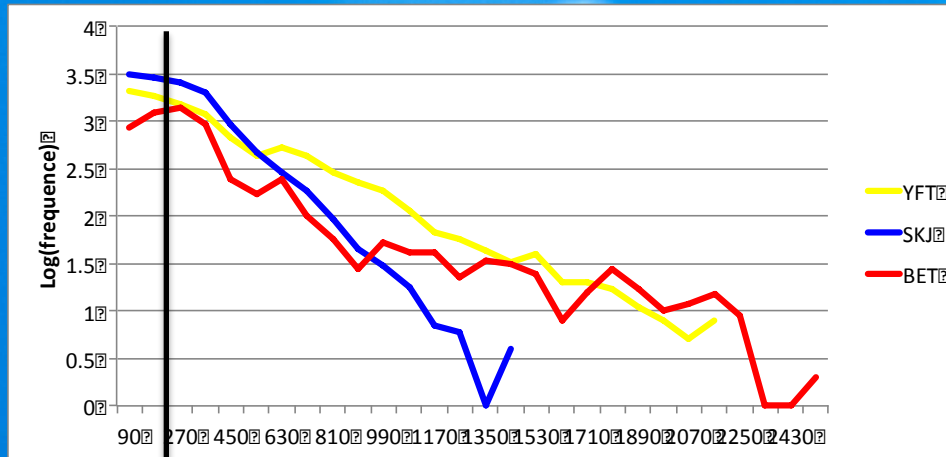


Recoveries: where?



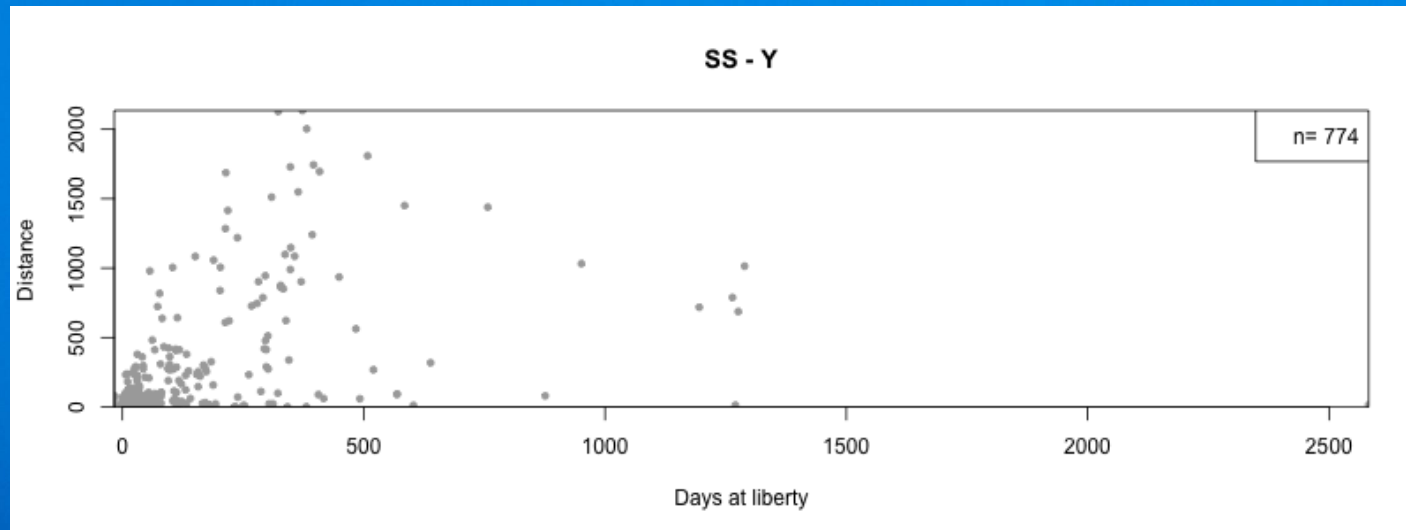
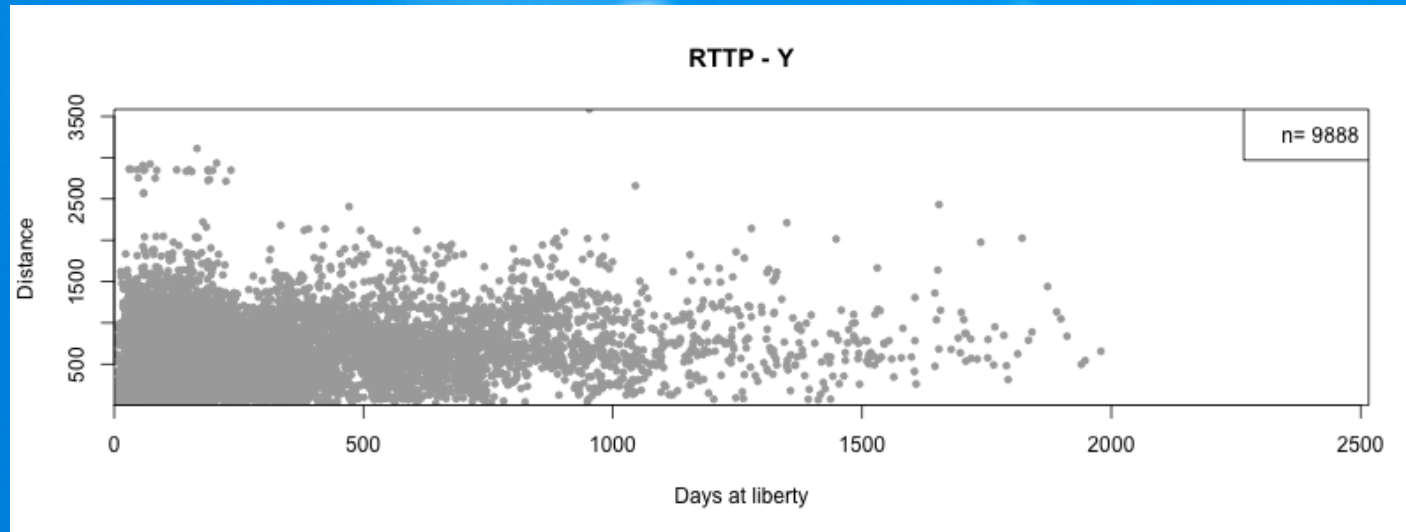
- Tag recovered from 30 countries
- 25.7% of the purse seine recoveries recovered At sea (while fishing)
- 63.3% of the purse seine recoveries recovered in Seychelles

Recoveries: time at liberty

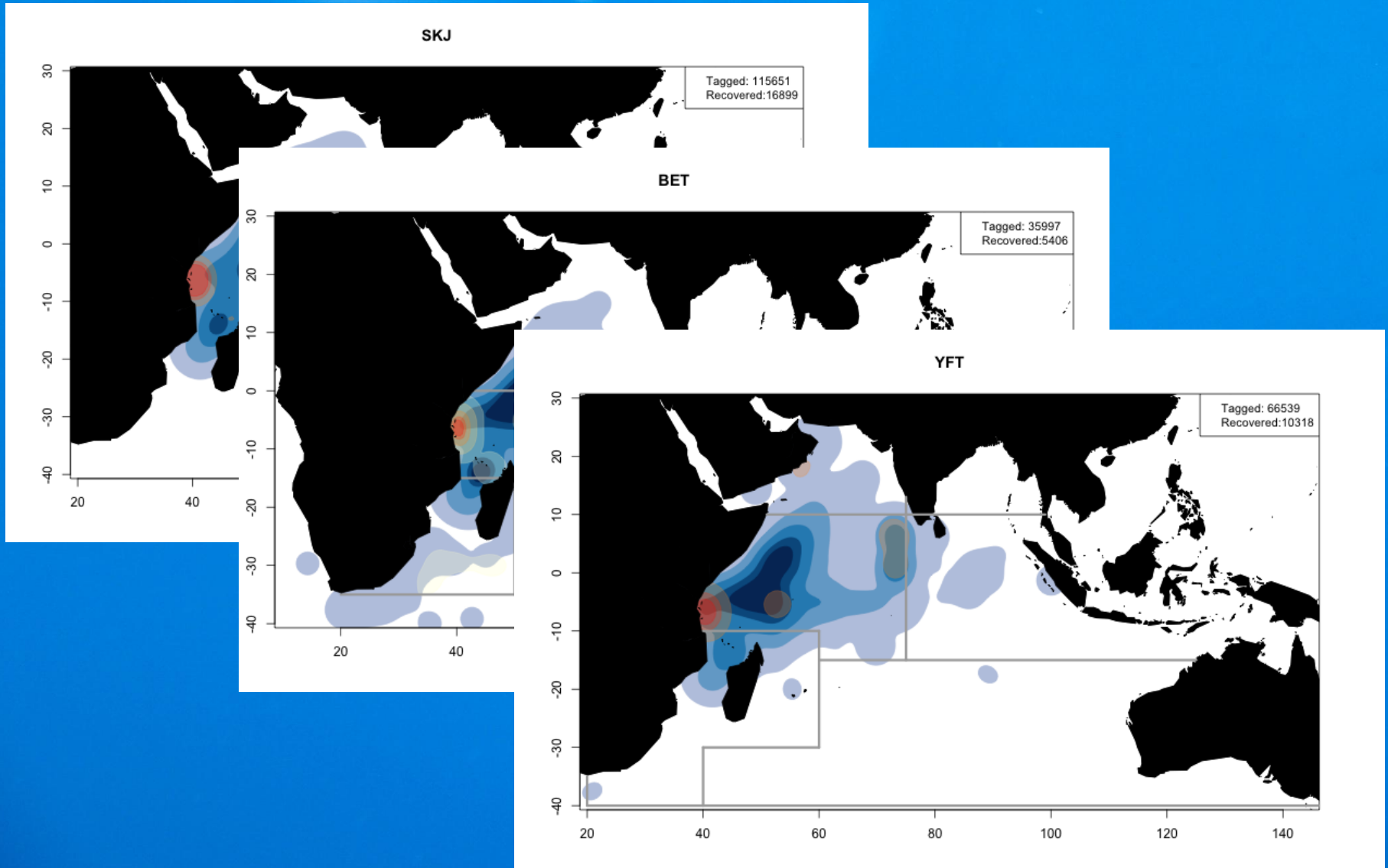


- TAL longer for RTTP
 - YFT: 337 days
 - SKJ: 222 days
 - BET: 317 days
- TAL short for SS
 - YFT: 69 days
 - SKJ: 55 days
 - BET: 208 days

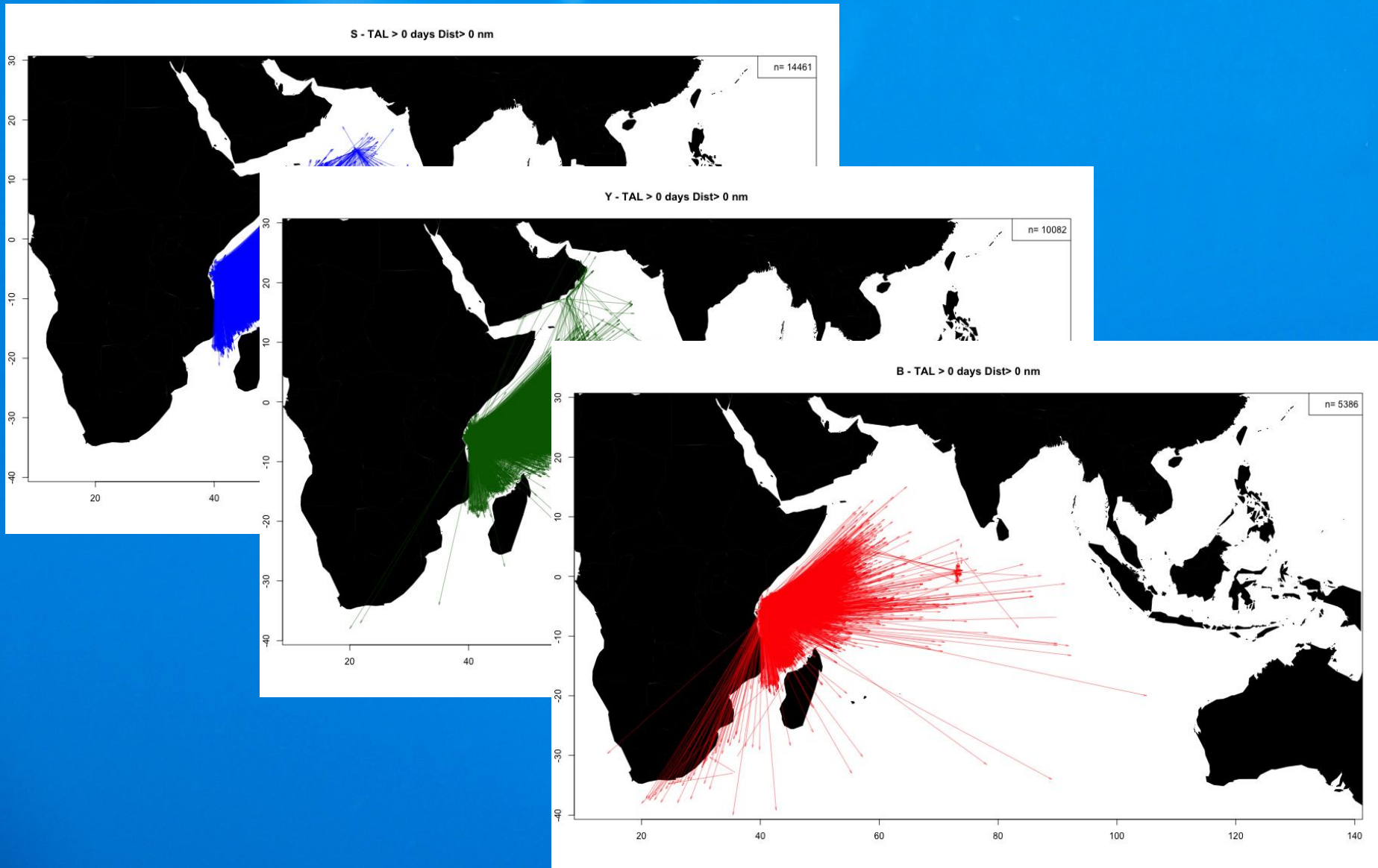
Recoveries: distance



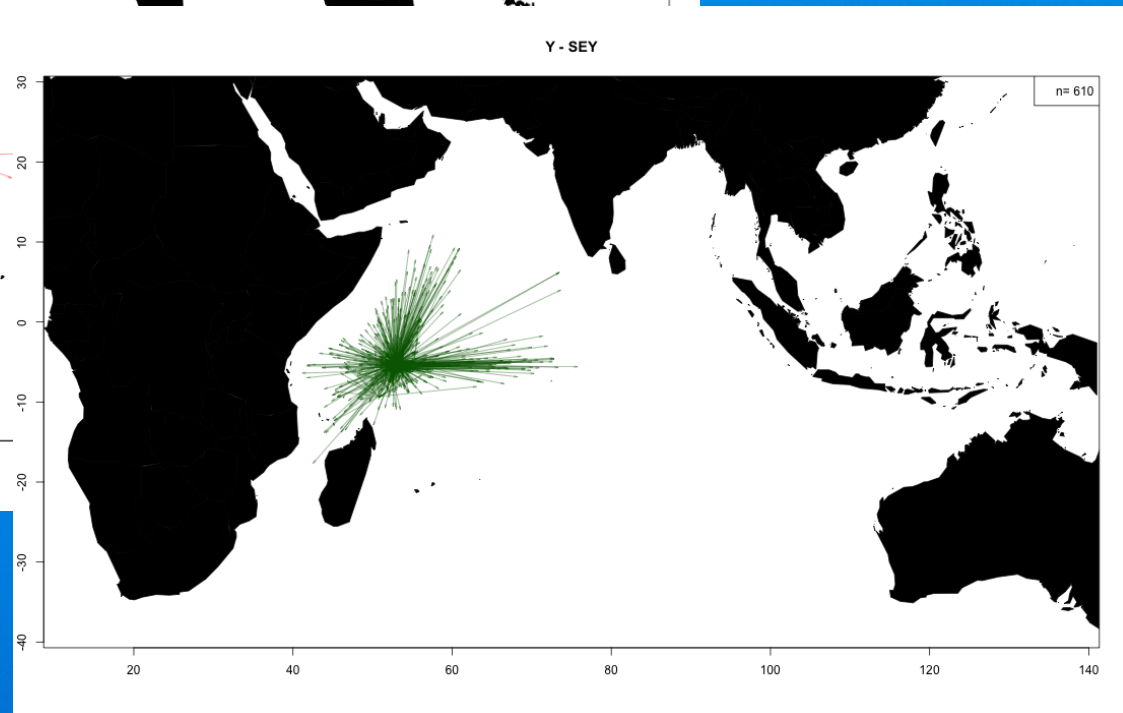
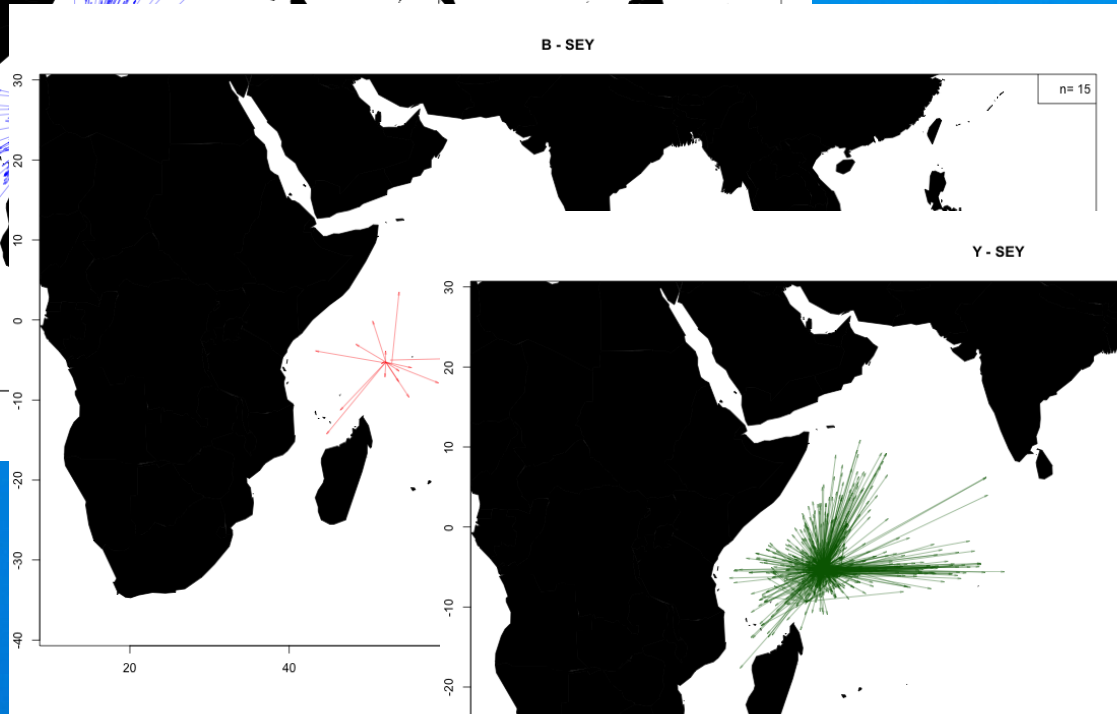
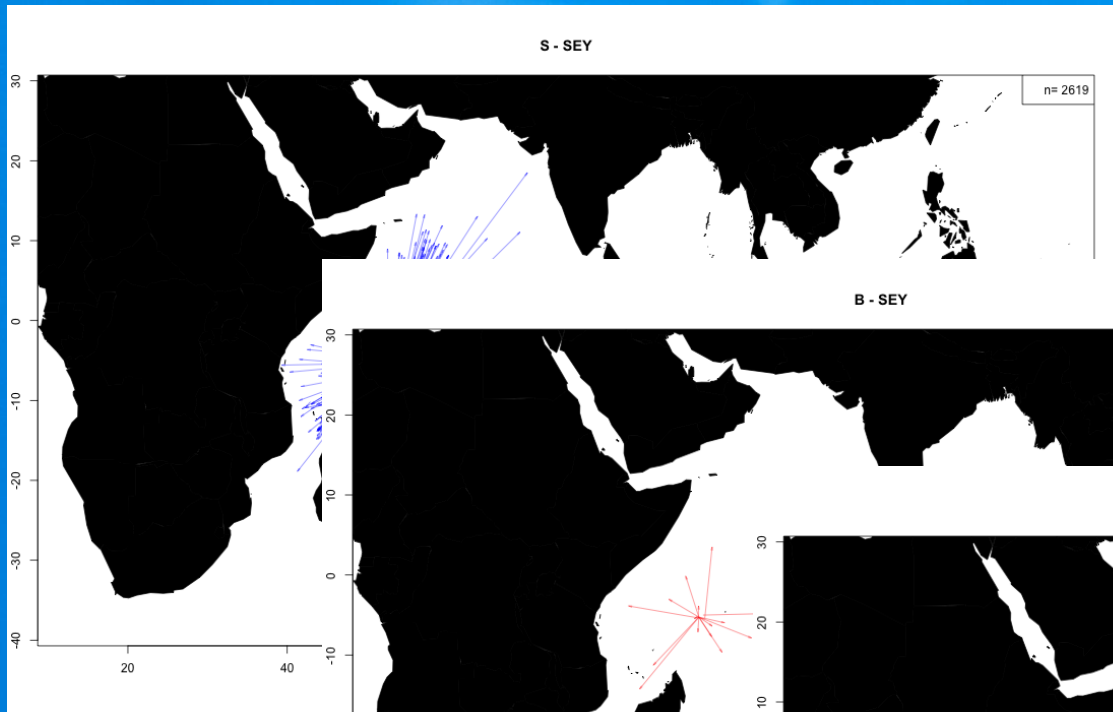
Movements



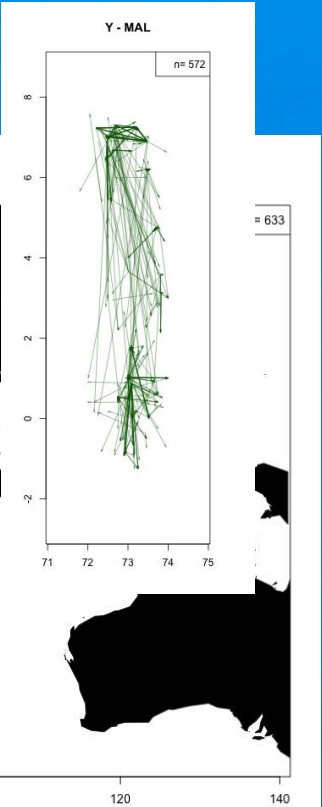
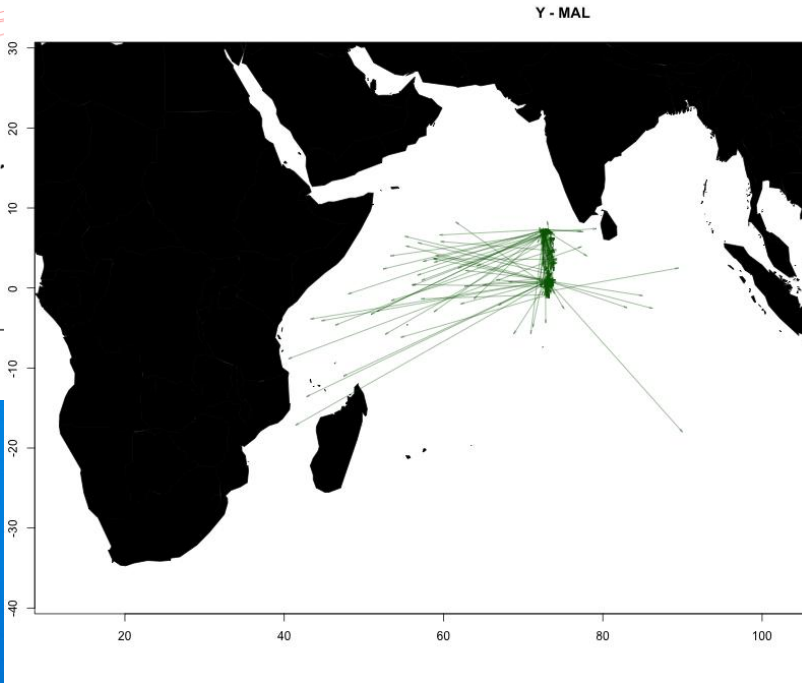
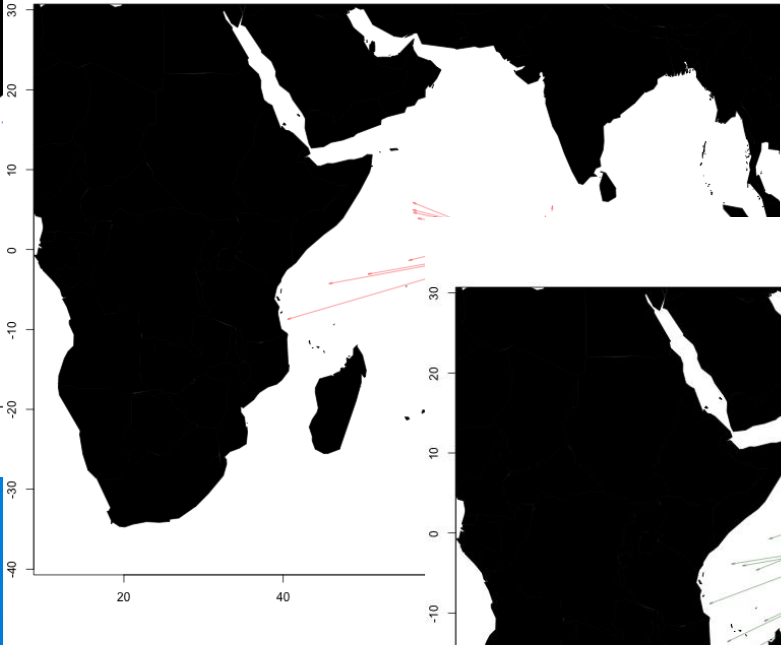
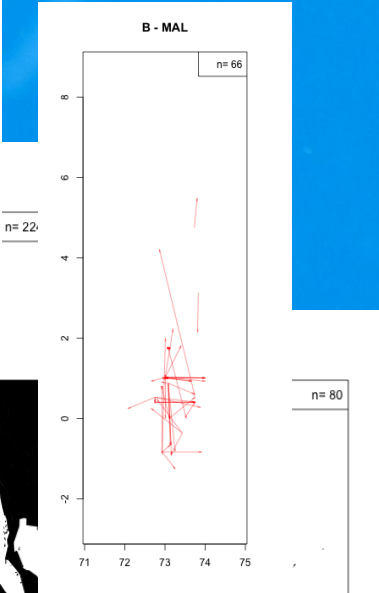
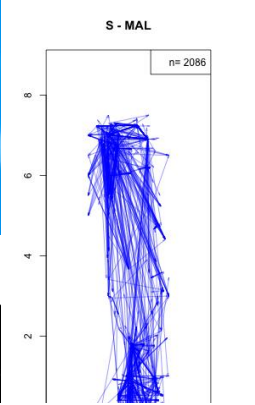
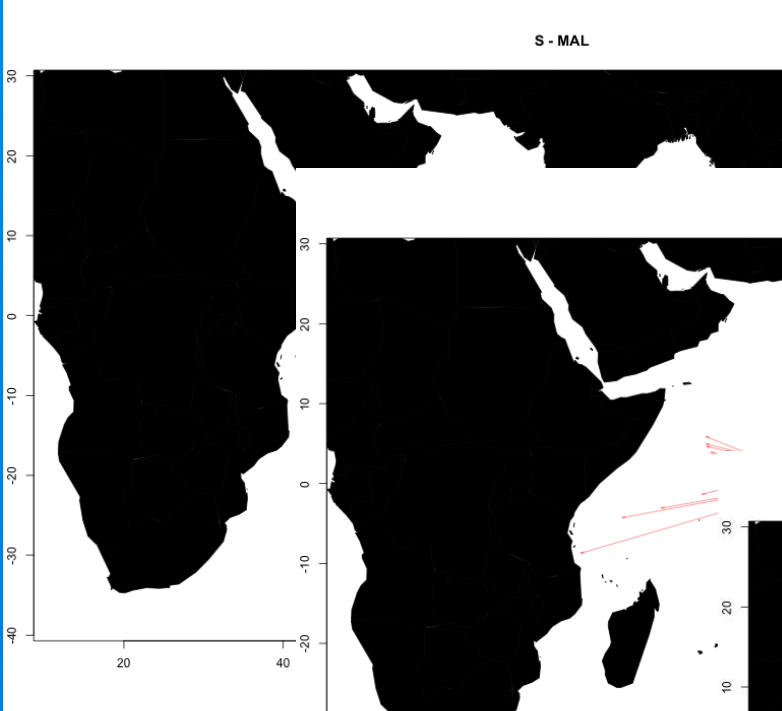
Movements



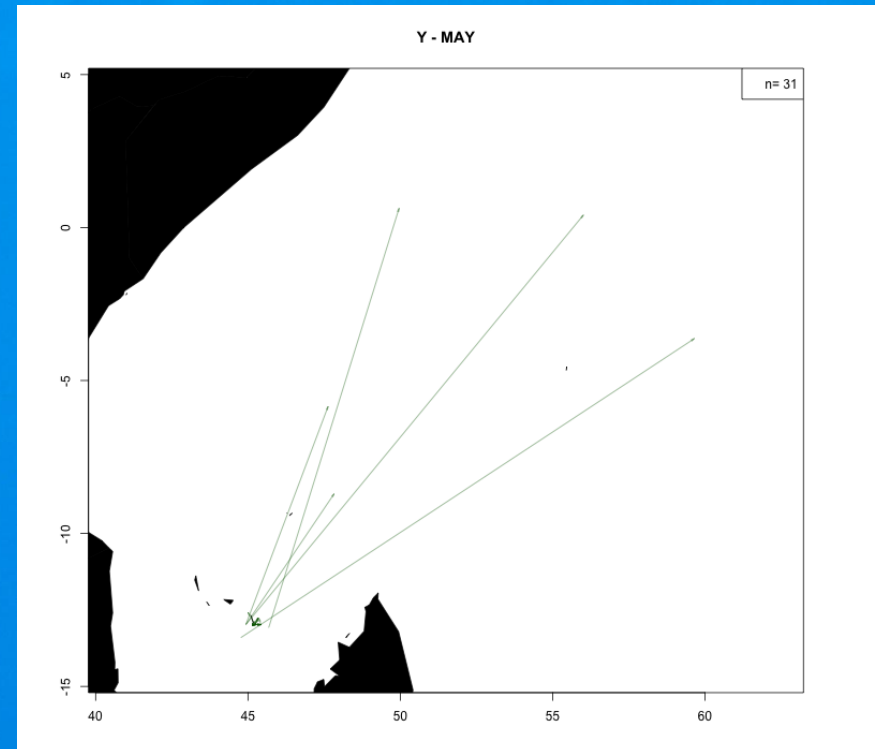
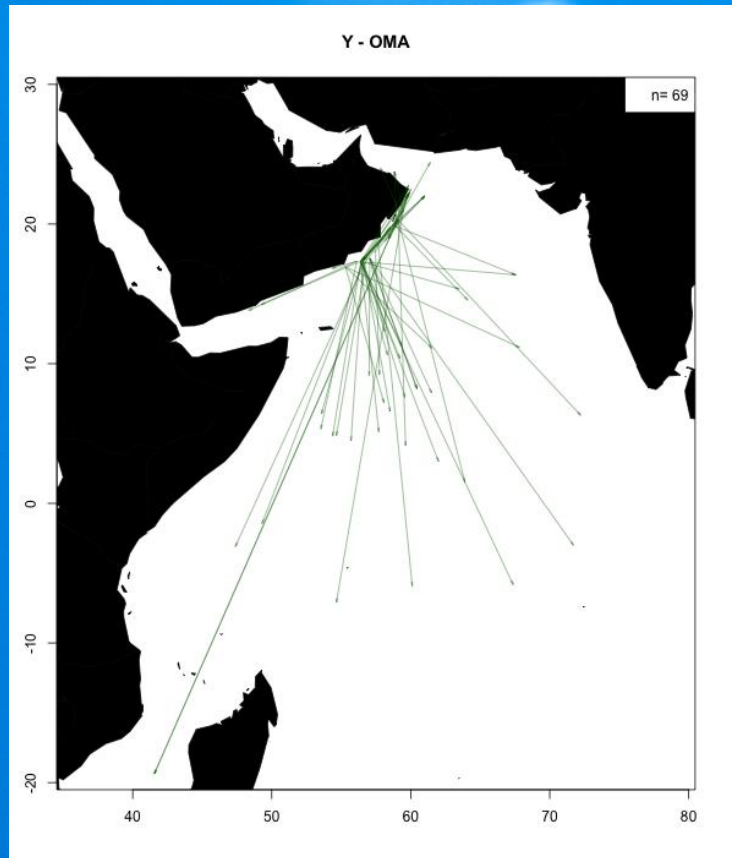
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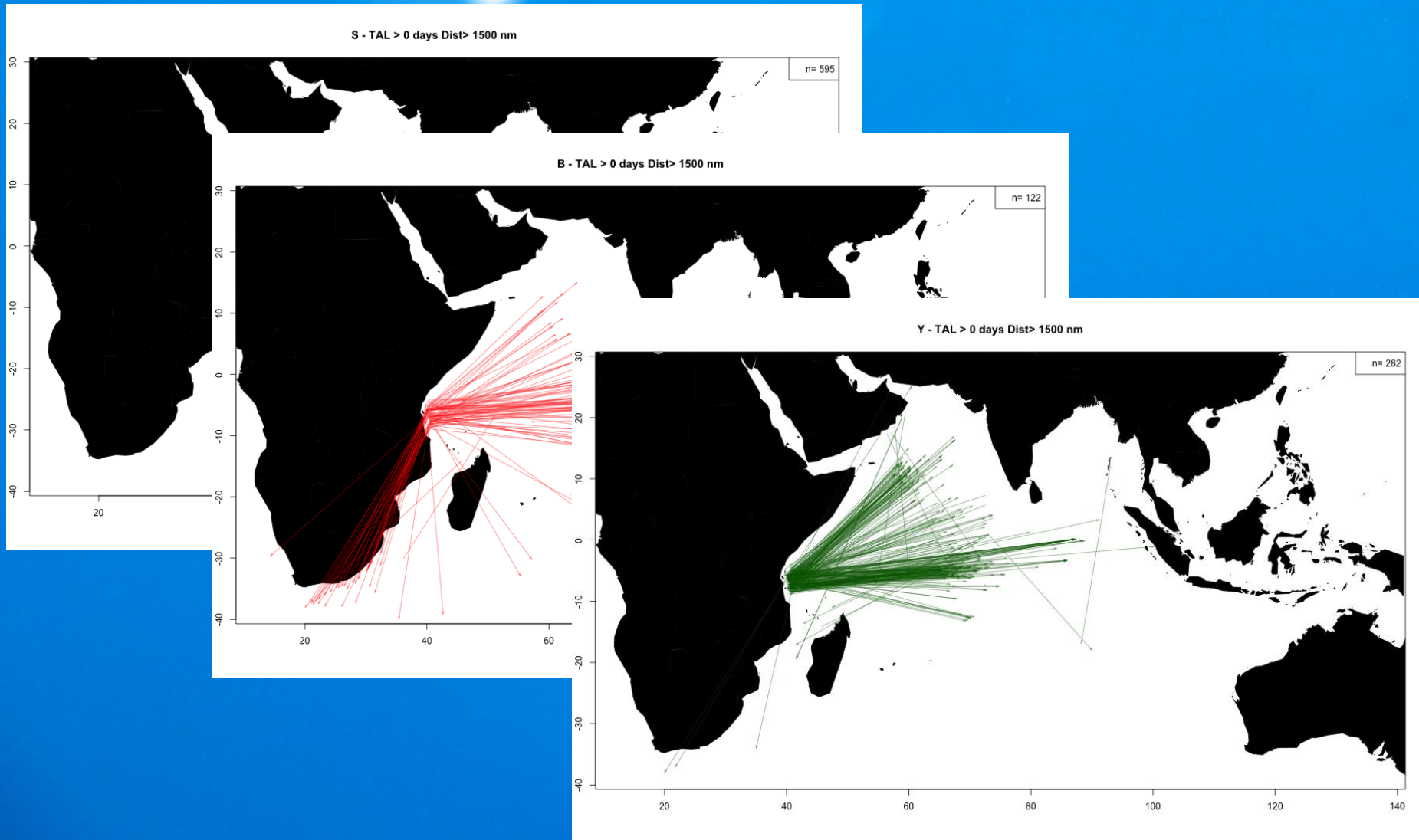
Movements



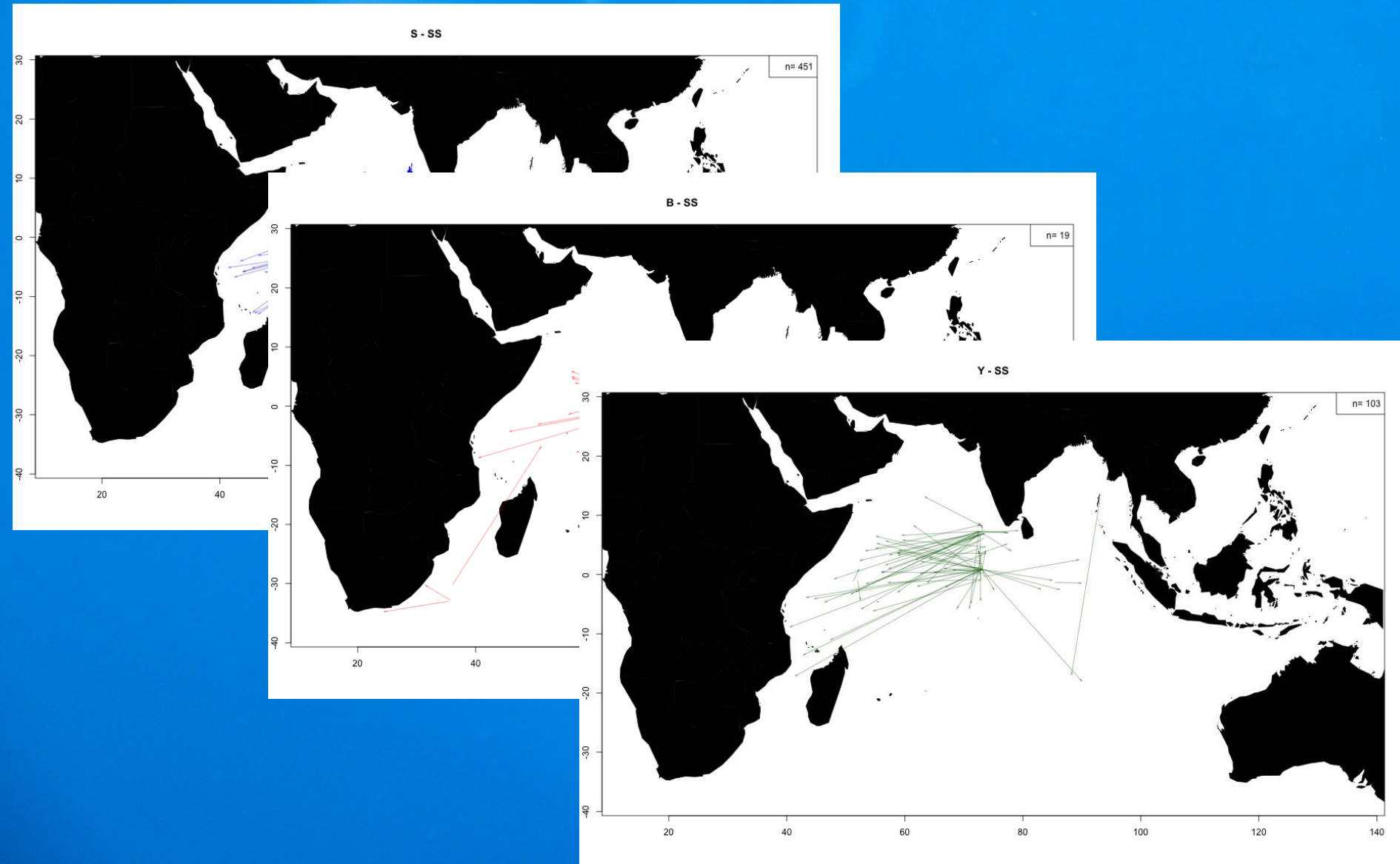
Movements: from Oman and Mayotte



Movements: >1500nm



Movements: Small-scale tagging (rec. outside Maldives)



Conclusion

- The IOTTP, and in particular the RTTP-IO, was a complete success as all its expected results have been reached:
 - Large numbers of fish released in a wide area with an unique specific composition
 - An effective recovery network that ensured large number of reported recoveries with reliable data
 - Capacity building in tagging and data collection
 - Tagging data are now used routinely for IOTC stock assessments
- Thanks to the IOTTP, lessons for future large scale tagging projects

Today...

- A large number of analysis are now carried out in order to estimate the necessary parameters for stocks assessments:
 - Growth curves for the 3 tropical tuna species
 - Natural mortality at age
 - Movement patterns
 - Exploitation rates
- This allows the specific objective of the programme and its projects to be fulfilled:

“To reinforce the scientific knowledge of tropical tuna stocks and the rate of exploitation in the Indian Ocean by obtaining the crucial model parameters for stock assessment “



Thank you