Tagging programs, stock assessment and management advices

I Risks of available data "overfishing", and the need for new types of data

II Peculiarities which favor tagging within the IOTC context

III What can be expected from tagging

IV What could be feared from tagging projects

V Research funding and tagging programs

I Overexploitation of existing data sets

- Fish stocks can be overfished, data sets too, thanks to computers and to the lack of statistical expertise (the questioned prisoner analogy).

- Models must be confronted with facts and figures, on the basis of appropriate data sets which make it possible to rigorously assess the reliability of the final outputs, in our case first of all management advices.
- Beware of the excessive confidence of most experts in their own expertise, and of consensus within “closed “groups of experts (nomenklaturas’ soft despotism). Not only true in fisheries (see economics) but also true for stock assessment.
- Excessive confidence in so called »modern statistical techniques and associated softwares » (e.g. Enlarged Bayesian approach and GLM) – loss of critical sense about underlying assumptions - the « answer is 42 » syndrome. Double risks: people who do not know enough in probability and statistics, and statistician in love wit their favorite technique.
- In many fisheries it could be observed that experts have come to erroneous conclusions, although they were not accompanied with the appropriate caveat.
- Only new data, and often new types of data will lead to the appropriate breakthrough. Tagging data have obviously been instrumental in tuna stocks assessments if I refer to the situation that prevailed a few decades ago, when we were torturing catches at length and simplistic CPUEs

Two examples of an erroneous consensus

- **The Irish Sea cod stock and the eggs and larvae survey**
  - *The spawning biomass estimated on the basis of this survey was far above the values obtained year after year by the ICES W.G. through the analyses of commercial catches at age.*

- **European hake and the unexpected results of a tagging program**
  - *Hake had been considered for years as almost « impossible »to tag with a reasonable survival rate (despite Belloc 1935)*
  - *Assessment were based on length cohort analysis, then age reading. There were initially strong disagreements between age (otolith) readers, which had been overcome, leading to a consensus among experts.*
  - *A successful tagging program has been implemented (de Pontual et al, 2003/- Duval Mellon et al 2009), which lead to a much faster growth than previously admitted, and a totally different diagnosis about the exploitation rate*

II Why tagging is especially useful for tropical tunas

- II- 1 Why tagging is necessary

- II-2 Why tagging is less difficult than for other stocks

II-1 Why tagging programs must be considered

- Impossible to rely on direct estimates through research surveys at sea, which are crucial for a number of other stocks

  (Trawl surveys, acoustic techniques..)
- Very difficult and expensive age reading
- Limited or difficult to use changes in catches at length histograms

  The challenge in your case is more about explaining stability than explaining changes which could be related to changes in exploitation rates and patterns.

- *Possible to get estimates of crucial parameters (e.g. M) before the stock has been overfished for years – timeliness possible?)*
- *It can boost real cooperation between research teams*

II-2 Why tagging programs are easier/less difficult to implement within the IOTC context than for other fisheries

- **Biology**
- **Fishing techniques and fishing fleets**
- **Available experience and cooperation framework**
- **Economic and political importance of the fisheries**

- **Biology**
  - Tunas are big enough (see sardinella)
  - They do not molt (see lobsters)
  - They come close to the surface (see orange roughy or even hake fore which the swim bladder must be perforated)
- **Fishing techniques and fishing fleets**
  - Pole and line/ bait boats make it possible to catch, tag and release fish with minimum harm (see fisheries where the only gears are deep waters long lines and gillnets).
  - The corresponding vessels are big enough
  - It has been possible to stay and go on tagging fish for long enough periods
  - An important part of the catches are due to a limited number of large vessels which are used to cooperation with scientists, including through observers programs
  - A single harbor covers a significant part of the landings

- **Available experience and cooperation framework**
  - expertise among scientists of large scale tuna tagging, including the practical know how for tagging fish and the experience of recoveries monitoring and data storing
  - IOTC provides the proper international framework
- **Economic and political importance of the fisheries**
  - Lot of money and jobs at stake
  - Fishing fleets including distant ones, and flying various flags ,which favor political attention.
  - Potential conflicts of interests between the various fleets associated to specific fishing techniques and fishing mortality patterns, including so-called gauntlet fisheries
  - Public opinions awareness about oceanic tuna fisheries and interactions between artisanal /coastal fishermen and large fishing vessels.

III Potential outputs

- Science
- Dialogues with the fishing industry
- Credibility of scientists' conclusion (public opinions / managers and political masters)

III-1 Scientific potential outputs

Population dynamic models fitting

Science free from «Preexisting models»

Fitting models and estimating parameters

Models parameters estimations

- ***Stock(s) structure and exchange rates***
  - Tagging is the only way to get clear cut answers and quantitative estimates of exchange rates between areas (not only for tunas but also…)
- ***Growth***
  - Tagging is made necessary by the previously mentioned difficulties about age reading and the monitoring of changes in catches at length distribution, and by « complicated" (two stanzas) growth curves
- ***Mortalities***
  - Without large scale tagging programs, and due among others to the absence of direct estimates of stock sizes, all attempts to assess the relative levels of fishing and natural mortalities would remain mainly speculative

Cross Checking and combination

- Tagging provides data which are **really independent** from the other sources of data, first of all the monitoring of commercial catches. This makes it possible to perform crosschecking of independent estimates of the same parameters, and/or to look for combined use of data from different origin in order to build better estimation processes.

Beyond the fitting of existing models

- Fisheries science is now legitimately focused on existing models, and on the estimation of the associated parameters. This is legitimate since there is a real need and a lot to do.
- This was not true 50 years ago, and many “old timers”(*) biologists announced that fish would never be constrained by equations. There is however a real risk of a “Procustus bed situation” with model based research: loss of curiosity/creativity. We do need open minds able to think beyond existing models
- Tagging can bring a lot in this respect. This is the case for “smart” electronic tags but also for simple dart tags

Two examples of unexpected results from tagging programs out of the tunas world

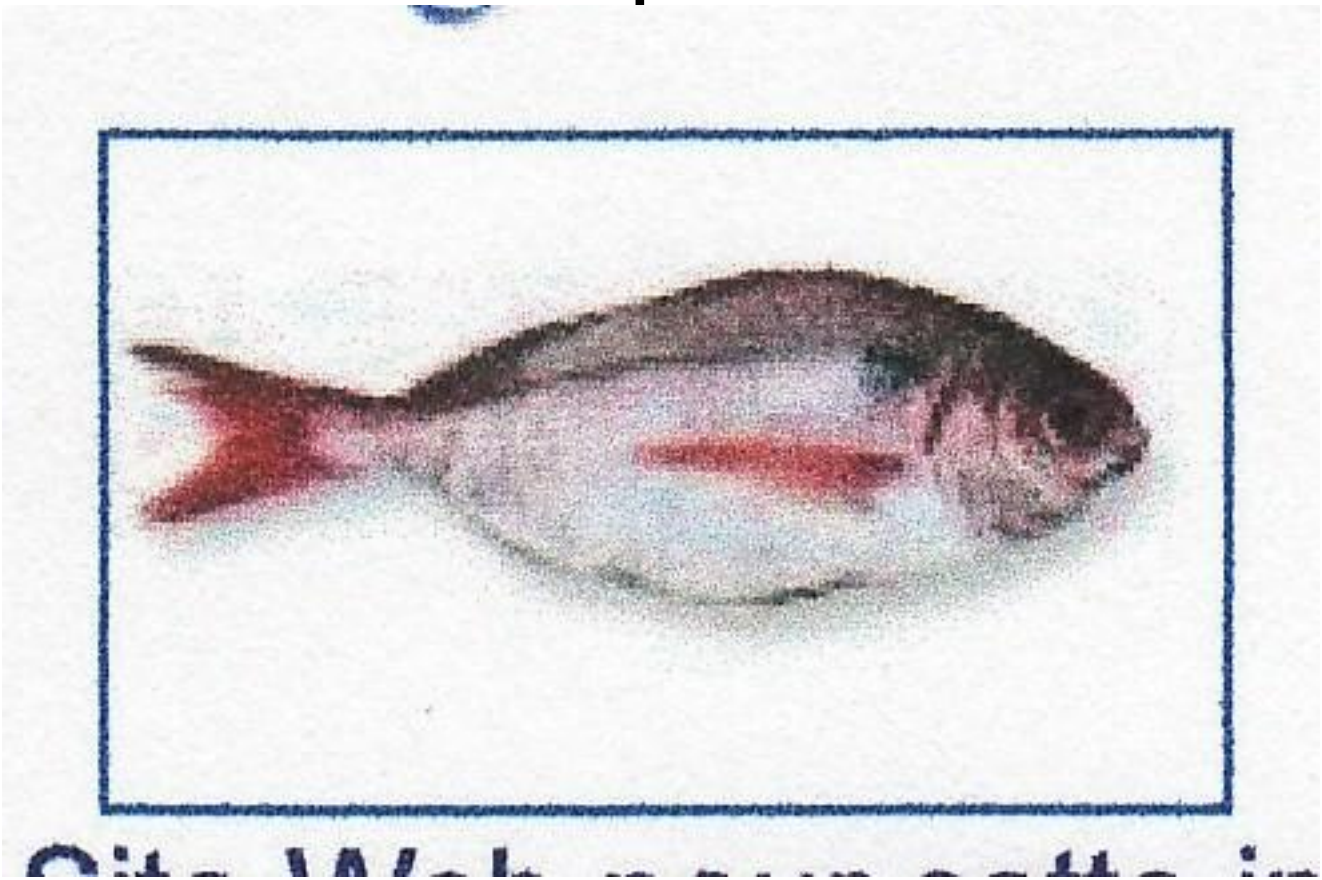
- **Tagging program (dart tags) of Pagellus borograveo(*) in the Bay of Biscay – East Atlantic in the seventies**
  - *It revealed that the fish were not following a single common migration pattern: some of them were caught far away (in the Celtic Sea) from the place they had been tagged (off Galicia in Spain) while at the same moment other ones were recaptured very close to the tagging site*

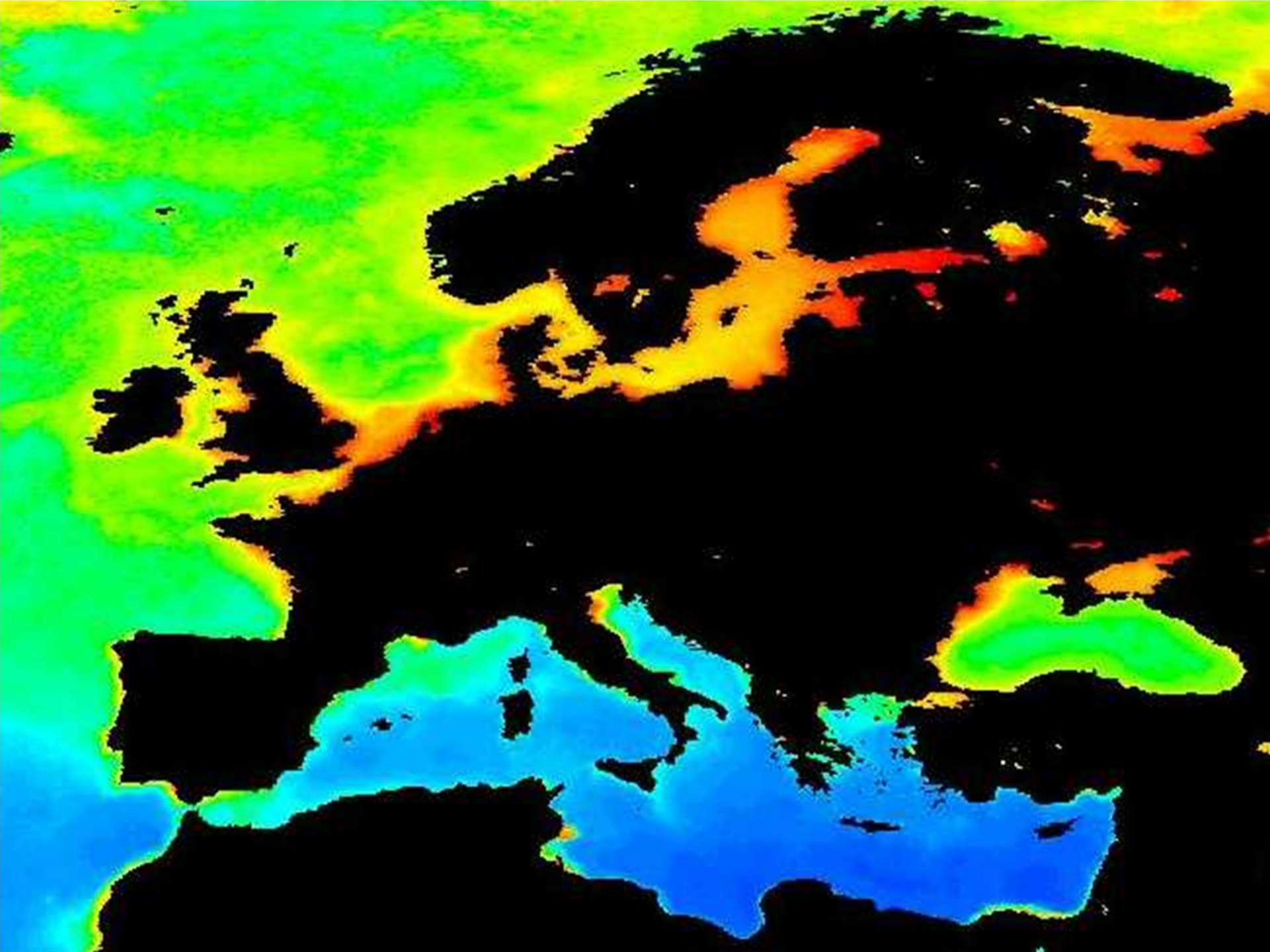
- **On going tagging of Sea Bass Dicentrarchus labrax(**) in the English Channel**
  - *Electronic tags revealed a homing behavior on feeding grounds, at a very detailed geographical scale (examples on other fish Plaice in Iceland Solmumdsson et alson 2005)*

***** *A valuable and fragile sparid – partially deep water fish*

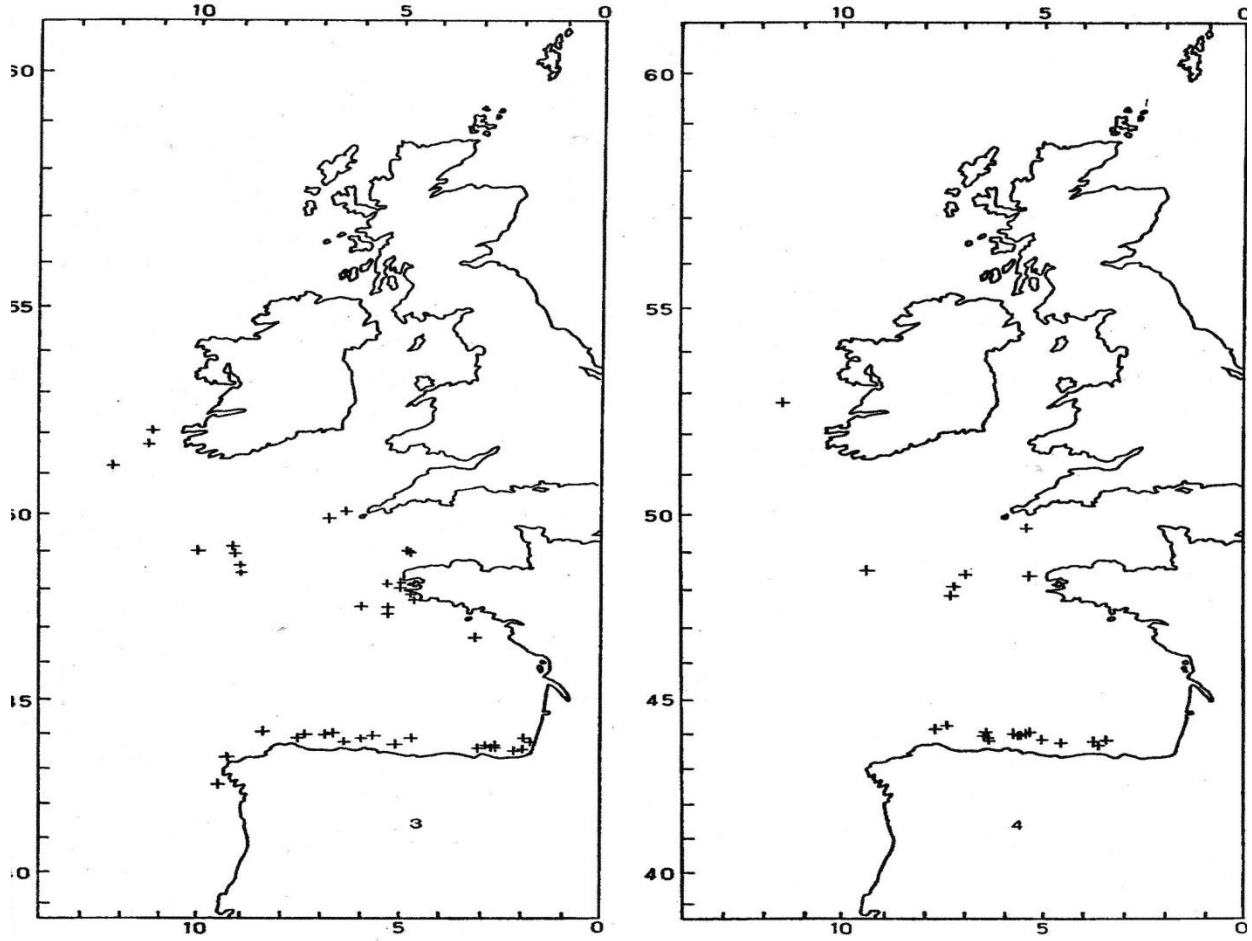
* M. Drogou Ifremer-Brest – Personal communication

Read seam bream according to wikipedia





Recoveries mapping (Gueguen 197)



III-2 Benefits for the dialogue with the fishing industry

The key to efficient management often is not to get the best possible science, but to ensure that the fishing industry accepts the key conclusions about the status of the stocks.

Tagging is in this respect very useful

III-2 Benefits for the dialogue with the fishing industry

- Many fishermen are interested in tagging, and not only in electronic tags, because tagging directly addresses questions they often ask themselves about for instance growth, migrations and stock structure.

- Successful tagging programs require active involvement of the fishing industry, of course from the (few) vessels that participate in the tagging operations, but also from (the numerous) vessels involved in the recoveries .

- Most techniques used by scientists remain difficult to understand for non scientists , while tagging may lead to (almost) non disputable results, at least for some key parameters (growth, migrations…).
- Working at sea with fishermen give scientists a credibility bonus

III-3 Public opinions and decision makers

If public opinions are more and more worried about fisheries management and the associated marine ecology problems, civil society can be strongly influenced by simplistic views, often backed up by so called “independent experts” and famous “spin doctors”.

Here again results from tagging programs may be instrumental for providing clear cut and difficult to challenge results.

Involving other stakeholders than fishermen (see ICCAT and WWF) can also give them more confidence in real science

Whenever tagging contributes to bridging a gap between scientists and the fishing industry, and/or to between (real) scientists and public opinions this will make life easier for fisheries managers, including political authorities.

In terms of management of straddling stocks and highly migratory fish, tagging results about migrations are of course of paramount importance.

IV What can be feared about tagging programs

- Non properly designed programs (recovery) leading to anecdotal results
- Underestimation of the importance of work non related to tagging
- Never ending and constantly growing tagging programs

Non properly designed and/or non properly implemented tagging programs

- Of course this does not applies to the IOTC tagging programs, as revealed for instance in the recent review by A. Fonteneau and JP Hallier.
- There has been however (and I have seen some of them) less productive tagging projects:
  - Not large enough ones leading to almost anecdotal results (scale effect)
  - Insufficient attention paid to the monitoring of recoveries, including their proper documentation
  - Unbalanced use of smart and simple tags
  - Not properly prepared data storing and access to data banks for scientists
  - Lack of final conclusions
- If you ask funds in the future, do not hesitate to prove that you do not fall into such traps

IV-2 When tagging programs could become abusively predominant *(Success may lead to excess – Taggology risk)*

- There are key questions for assessments and fisheries management which cannot be solved simply by expanded tagging programs (e.g. risks of recruitment failure, which could need more research about robust management strategies more than further biology-ecology – C. Walters 1983). Problems that can be addressed through tagging should not hide the other ones
- Some issues could be given in a foreseeable future satisfactory answers, which would make of limited utility further dedicated tagging programs (e.g. a high level of precision of estimates of $L\infty$ for large fish could be in the future less important than a better estimation of sex ratios at length in commercial catches)
- Yes “tag lovers” could create a too efficient lobby

V Tagging programs and fisheries research funding

- The legitimate concerns of the authorities in charge of monitoring the use of public money
- Tagging programs and so called innovative science
- Tagging programs and “routine” data collections frameworks

V-1 The concerns of “budget” people about the proper use of public money

- For many scientists such concerns only illustrate a ludicrous bureaucratic mania: “scientists are working for the benefit of mankind, and they should simply be given more money without bureaucratic harassment about 1/ why they should be given money and 2/ the way they spend it”

- Within the EU risks of “double funding” have been a major concern. Some scientists could be so convincing that they would get funds from various sources, for in a nutshell the same work. Some “funding authorities” can in fact compete for financing a potentially successful project, and/or a project which seems to be expected by public opinions. Some funding structures can also not be aware of what the other ones are doing.

V-1 The concerns of “budget” people about the proper use of public money

- Some scientists , and this in fact varies according to the experience of the various research institutes, do not properly keep track of the way they spend money, do not pay enough attention to the quality and timeliness of the due reports.

- Research funding structures must follow systematic rules about public expenditures. Call for tenders and call for proposals may not be well fitted to the needs of some specific projects. They nevertheless exist for reasons fisheries scientists will not change.

- Whether you like it or not, do not neglect the legitimate will of those who try to make sure that money which could fund future tagging programs would be obtained following the proper process, and properly spent.

IV-2 Competing for funds with “big science”

- Fisheries research project are often competing, even if this is not obvious outside funding structures, with a number of other scientific domains. Criteria for allocating research budgets are not really adapted to the specificities of fisheries research. Fisheries research appears a an expensive domain, which goes on years after years revisiting the same issues (e.g. “*are you still trying to estimate natural mortality*”(*)?).
- Even under the umbrella of “fisheries science” there are more and more projects which would appear more innovative, and more promising in terms of future peer reviewed papers than tagging programs, even experts could guess that too many of these innovative projects will not gather the appropriate data for achieving statistically sane results and/or will be of limited utility in the real world of fisheries management.
- Here again do not complain, just be aware of this reality if you want to get money from research budgets, at least in Europe

IV-3 Tagging projects and the EU data collection framework

- In order to compensate for the facts:
  - that call for proposals and call for tenders were not adapted for funding routine data collection, despite the fact that this repetitive work is a prerequisite for any serious work on fisheries
  - that budget promoting “big innovative science” cannot either fund routine data collection

A dedicated mechanism has been put in place I Europe, under the title “Fisheries data collection framework”.

It does not include however, mainly for historical reasons, tagging. If you want this to change, make sure you can reassure people worried about double funding, never ending expensive programs…

Conclusions

- I do think IOTC was right in developing a large tagging project, (*even if I was not involved in its original funding*).
- I do think it has been efficiently implemented.
- Speaking not as an ex scientist but as an ex fisheries manager, I am convinced that it has, and will, provide key results for fisheries management within the IOTC framework.
- I would be prepared to be convinced that you will still need in the near future other tagging projects, probably focussed on specific key questions *(but I have no more any part in such issues).*
- It seems to me that for a number of other fisheries where in recent years tagging did not play a significant part it would be useful to reconsider the use of tagging projects.
- This being said remember that there will also be people worried about the budgets your tagging projects require, about the way you spend the money and about the end results (better management and scientific results).