

ICCAT GBYP STEERING COMMITTEE MEETING – PHASE 6

30-31 July 2016

REPORT

The meeting of the Steering Committee was held at the ICCAT Secretariat in Madrid on 30 and 31 July, 2016, with the participation of Messrs. Sylvain Bonhommeau, David Die, Gary Melvin, Driss Meski and Tom Polacheck. Paul de Bruyn (ICCAT Statistical Department), Antonio Di Natale (GBYP Coordinator), Laurie Kell (ICCAT Population Dynamics Expert), Miguel Neves dos Santos (ICCAT Scientific Coordinator) and Clay Porch (SCRS ABFT Chair) also attended the meeting, invited by the Steering Committee.

- A)** The tentative agenda for the meeting, as proposed by the GBYP Coordinator (Annex 1), was approved and each SC member was provided with the documents prepared by the GBYP Coordinator, for their revision. **election of Chair and rapporteur**
David Die (SCRS Chair) was elected for chairing the meeting.
Miguel Neves dos Santos and Paul de Bruyn were appointed as rapporteurs.
The draft agenda of the meeting was adopted and it is attached to this report as **Appendix 1**.

B) Summary and Revision of the activities in Phase 5

1) Coordination activity – Review of the project activities

Considering that almost all data and reports have been already presented and approved by the EU, the GBYP Coordinator will provide in advance a short summary report concerning all the activities carried out in Phase 5, with budgets details by item.

The GBYP Coordinator provided the summary report for all activities carried out in Phase 5. All activities that have been planned were duly carried out. The effective expenditures have been about 1,996,000 euro, against a budget of 2,125,000 euro. The Steering Committee held one meeting. The GBYP participated to the Bluefin Tuna Future Symposium. All activities are summarized in the short report provided by the Coordination (attached as Appendix 2) and the results have been duly provided to the SCRS and the Commission.

a. Data Recovery (calls and results);

The only data recovery activity planned in Phase 5 concerned historical genetic samples and the results provided very interesting outputs, including the absence of any evident genetic erosion over the centuries and the lack of evidence about separate BFT populations over the centuries.

b. Aerial Survey (activities, total cost, analysis report):

Not all participants in survey operation were at the training course provided by GBYP, but several of those that were not present had already participated to previous GBYP training courses. The only one national observer (Turkey) did not attend, because he was identified after the course by the Government.

The problem of contemporary sightings is not explicitly mentioned in the protocol and shall be included, including how to record these data on the forms; the Coordinator informed that this point was anyway covered during the training courses, since the beginning of the aerial survey

activities. Logistic problems were noted. This has improved over time but still needs to be fully resolved. Some are due to complexity of using different companies and no overall direct monitoring of surveys. Lack of more detailed information on how data was captured makes it complex to model around the problem. The Coordinator invited the SC to have a better look of the current forms, which include 25 fields for the sightings, 22 fields for the effort and operate over a total of 104 variables/codes to be used. An improved protocol is needed to further standardize the way the information is collected and then how the data are analysed can be addressed. The Coordinator remind that both protocols and sighting forms were circulated to the Steering Committee for comments and the current version is the revised one.

No independent estimates between observers/pilots as they communicated verbally during operation, no rotation of observers between aircrafts was possible, so no calibration was possible and this should also be clearly addressed.

No peer review papers have been drafted on these data, possibly due to time constraints, but also possibly due to the problems inherent in the dataset or the strategy (i.e. same reason the surveys were paused by the Steering Sommittee).

Clear message needs to be passed on to Commission regarding aerial surveys. Possible explanation required why surveys were stopped. This is needed to amend both the budget and programme with the EU for Phase 6. Explanation will be included as an appendix to this report or GBYP report to SCRS and Tom Polacheck offered to draft the text.

c. Biological and genetic sampling (activity, total cost)

The Call for tenders for the Cost benefit analyses didn't receive any tender and this may have been due to lack of expertise to conduct study due to complexity of data and/or lack of time to conduct the study given the timeline given for the work. There appears to be a continuing need for these tenders and they should be possibly revisited in the next phase.

d. Tagging activity (activities, total cost)

It was clarified that several tags were not recovered despite clear tracks indicating capture, mainly in Turkish waters. Despite rewards, tags were not returned to GBYP by fisherman in that region, but also in others. Possible reasons could be because tags are not being reported by crew to skippers, and/or tags have become so small that recovery information cannot be put on tags and therefore they do not know how to report them. High apparent catch rate of tags would indicate that fishing mortality might be high in some areas, but some tagging activities were possible only at the end of the fishing season, when other fishery activities were still active. Possible future activity in next Phase would be to analyse exploitation rate based on tag capture information. Possible future contract and TORs to be developed.

e. Tag awareness programme

It continued on regular basis.

f. Modelling approaches (activities, total costs)

General comments.

Is there sufficient peer review output using this GBYP data? The contractors have indeed published peer review papers using the data collected, however, some contractors have expressed reluctance to release data to species group until they have published data. This data

belongs to GBYP and shall be made available to the SCRS, as clearly requested by the GBYP Coordination. Summary of papers should separate SCRS and peer review documents.

Not clear how everyone can access data. Fishery data is part of ICCAT stats database. Other datasets should be included in specific data banks to be developed for making available all different data not just on request, but the heterogeneity of the data is an issue to be resolved. Biological data have been included in a database from the Consortium, as requested by the contract. Plan in phase 6 to develop further databases, which was not strictly followed due to unforeseen problems with historical fishery data. This is being resolved with Stats dept. Electronic tagging data (as well as most other sets) have been provided on request by the GBYP team. Is there a more open solution to make the data available directly from the GBYP website? This is difficult for data that has not standardized structure as no clean database exists for this information. This is the task of the GBYP data manager who is already busy consolidating these datasets. Bluefin tuna tag release and recovery data are duly provided by GBYP to the ICCAT Statistical Department and regularly included in the ICCAT Tag data base. A progress report on this work should be provided to the SC showing state of data processing, what backlogs exist and how data can be stored. Possible short term assistance needed to process the outstanding datasets or explore the availability of specific data sets products possibly developed by other institutions.

Collaboration has been carried out to provide datasets for certain key issues (eg. Tagging, ageing, stock ID etc.), however this is fairly *ad hoc* and not easy to reproduce in future assessments although all files were produced and presented to species group, which are maintained by Secretariat. All requested data sets were provided in real time to the modelling experts by the GBYP Coordination.

2) Discussion on the only activity still pending for Phase 5: feasibility study for CKMR, report.

There were complications closing the close kin genetic tagging feasibility study. The contract had a long and complex story, documented by hundreds of e-mails in the last months; the schedule established by the contract for providing the deliverables was never fulfilled by the contractor, all biological information provided by GBYP was not even considered and the various versions of the report included some tables and figures with evident problems and mistakes, even if the statistical science behind the CKMR approach was acceptable as a first step.

Contents of report – The SC **accepted** in general the content of the report. Highlighted that there was a misunderstanding as to what was required under the first part of the feasibility study. CSIRO looked at whether method could work in complex multi-stock structure whereas expectation by GBYP (as agreed by the SC for the TORs of the contract) is that something more complete would be included to provide advice on what should be done to realise this study. The SC recognized this misunderstanding and expressed its support for the work that was done in a limited time. They viewed the work as valuable and useful for advising on this technique and whether the next step should be taken to view how the technique should now be implemented. So the methodological theory has been accepted, and now it needs to be reviewed how it can be implemented. It was suggested that some feedback should be again provided to contractors to further improve the report and this can be provided by the SC. It was generally agreed that this may not be productive and the comments from the SC should be passed with the report to the next step, to improve the next study. Future TORs must reflect even more clearly what is expected from the contractor and the contract should be given enough time to avoid past problems.

Secretariat will now deal with administrative process of resolving payment for contract so that report can be used/referenced and distributed. SC noted that there are few teams who can conduct this work and therefore relationship with this team who carried out the first part of the study should be fostered again and the team should clearly respect deadlines. The pending issues will be discussed further with the ICCAT Executive Secretary.

C) Summary and Revision of the activities in Phase 6

1) Budget – approved budget and components

The budget was presented by the GBYP coordinator along with the deviations from the initial proposal, that were recommended by mail by the Steering Committee over the time (Appendix 3). Some additional comments include:

- Travel will be adjusted under 5.1 (A.2) as not all this fund will be used, so will be reduced.
- Under B – Workshop on international indices of abundance (5.7 and B1). According to the lack of agreement, the GBYP did not covered this expense and thus the 8,000 € can be used for other purposes.
- Data recovery under point B – The amount of 42,880 € used so far was distributed among 3 contracts as presented by the coordinator (4.1 and B.5).
- Under B - This item was not originally included in the budget. E-tag data recovery recommended by the SC relates only to data being recovered from Barbara Block (B.3). There appear to be a few ongoing issues with the data that was provided the night before the SC meeting but there has not been time to fully review the submission.
- Analysis of e-tagging data (4.4 and D.3) shall be moved to point B (B.3), for covering the above described data recovery..
- All aerial survey budget mostly moved to tagging (point D) and biological studies (point E).
- 4.4 of the budget is cost for deploying tags, 4.5 is the purchase of the tags and related services. These SC noted that these costs are extremely high for the number of tags deployed and varies greatly between regions.
- 5.7 of the budget (D.6) is the GBYP on-going awareness campaign (posters etc) and rewards.
- 4.7 of the budget (D.7) is an external publicity campaign conducted by a contractor. This will not be effective for 2016 as fish have already been caught for this year. There has been a 3 months delays since phase was approved and tender was released.
- Electronic tagging will further increase as more money will be distributed to this task. (to be discussed under point 2 below).
- Workshop for building modelling capacity (5.8 and F.2) needs to be updated in this table as it may still be further funded.
- The budget for the External Expert for DPM and assessment under 4.11 (F.5) was very partly utilized and can be redistributed to other items

2) Coordination activity – Review of the project activities

After cancelling the aerial survey in Phase 6, according to the recommendation made by the SC, it was necessary to readjust all budget components; this has been done agreeing all steps with the SC by mail:

A summary of all GBYP activities conducted so far was provided by the GBYP Coordination and it is attached to this report as Appendix 4. The Steering Committee provided the following comments:

- The contract for the external member of the Steering Committee to be resolved –The Executive Secretary informed the contract will be immediately signed
- Need for additional database support to resolve backlog in data processing. Priority should be assigned to the data processing for use in assessment.
- The monthly summary table for the SC is urgent to see what work still needs to be done and how long it will take to do it, so that resources can be planned and dedicated to resolve issues; it will be provided by the Coordinator at the early beginning of August, as originally planned. Processing of fisheries data is very high priority. This will be done in coordination between GBYP and secretariat. The processing of these data for inclusion in the ICCAT DB should be the priority for the GBYP data assistant. The SC recommends that these data be processed and carried out prior to September. No additional resources required for this task.
- Tagging database. Stasa to look together with Antonio at Block's data. No short term hiring can resolve this issue because data sets provided by different entities were created with different formats. SC recommends GBYP works with AOTTP and secretariat to solve issues of data format and standardisation as concerns at least the electronic tag data base for the programmes under the ICCAT responsibility.

a. Second external review (report, comments). The Steering Committee duly received the final draft report submitted by the external reviewers.

The SC acknowledges the external reviewers' report. All agreed that the report provides very important suggestions and committed to provide their comments by August 2 to the reviewers. However, a few aspects were mentioned as of concern:

- i) Item 3.6 Coordination, there is a contradiction as the reviewers mentioned that the program coordinator to be included as a permanent member of the SC, but following stating that the Program coordinator should be left *"with the responsibility of the management of many of the day-to-day management aspects of the program and having the ability to make these decisions without SC approval."* (page 46, parag. 4)
- ii) Table 11 (page 48), indicates that Thomas Polacheck has not been member of the SC in periods of 2012, 2013 and 2015, which is not the case. This might have been due to the fact that due to administrative issues, during those periods he was not under contract, but he was always a full member of the SC
- iii) Concerns were also expressed to the provision of a greater degree of freedom for the program as regards administrative issues (page 50, parag. 5)

b. Data Recovery (calls and results; e-tags recovery, other meetings, costs, data elaboration in-home);

The paper SCRS/2016/142 reports how market data were partly used for the size data revision as it was requested by the SCRS BFT Species Group (related only to the first 2 market data sets, the only ones already validated by the SCRS). The work was done by GBYP staff.

However, the third market data set is very messy and data comes from multiple sources which are not easy to deal with. This data may still need to be re-analysed. The SC recommends to analyse all the three data sets possibly in an external contract to examine possible overall removals of the Bluefin tuna stocks, fully using these data at least for this specific purpose. SC

recommended to draft a Call to analyse the 3 market dataset (for total removals) starting in phase 6 (a sort of feasibility analysis) and extending into phase 7 the full work. This is consistent with the comments provided in the external review of the GBYP.

c. Aerial Survey (motivation for cancelling the survey in Phase 6):

Tom Polacheck, on behalf of the SC, will draft an appendix motivating the cancellation of the aerial survey in Phase 6. This will be based on conversations already had electronically between SC members as well as the findings of the cost/benefit analysis and the power analysis. The additional problems with the survey (eg seasonal variation, distribution of survey effort etc..) will be discussed and included. Also, the SC discussed what the aim of this index is, if the index should be covering the number of spawners, actively spawning in a given year, or the entire potential spawning stock. The intention seems to have a consistent index between years of the full spawning stock biomass in which case the current methodology as explained in the cost benefit analysis does not suite that purpose, due to the impossibility of surveying all the potential spawning areas at the same time and to accessibility problems for some areas. The text was provided after the meeting and it is now attached to the report as Appendix 5.

d. Biological studies (sampling adults from spawning areas; call and activities; workshop for larval studies, costs; main problems)

The SC was informed by the GBYP Coordinator about all issues regarding the biological studies in Phase 6 and particularly about the various additional issues that were requested by the SC during the discussions by mail in the last months, specifically concerning the additional sampling of both adults and YOY for practically testing the feasibility and the costs of a sampling to be used for CKMR studies in the future. The costs for biological sampling activity per fish seem quite high but not unreasonable. However, the confirmation of the feasibility of the sampling scheme particularly for adults, is valuable.

The SC noted that the contracts for sampling adult spawners at the harvesting specify the number of otoliths to be provided, so presumably the contractors should recommend the farms to pay more attention (than in the past) when shooting the fish to preserve the otolith. How they will provide the otoliths is not the worry of the GBYP as long as the correct number are provided. The farms have contracted biologists directly or subcontracted biologists to ensure sampling is done correctly. The agreements with Turkey have been complicated in the first approach, while now it is included under the biological sampling contract with the Consortium.

The SC was informed in detail about the developments regarding the sampling for YOY, the difficulties in some areas and the related costs. No solution has been found at the date for sampling more YOY in the Balearic area within the Consortium and so samples for this area will be limited. Only 125 samples will be collected, according to the current proposal from the Consortium. It appears that the GBYP has sought a solution outside the Consortium, possibly providing a small contract to another group to improve the number up to 300 YOY samples. The SC agreed that this can be acceptable, under the condition that the Consortium will accept these additional samples and provide to analyse them. The SC also recommended that when any proposal do not cover all the sampling required, the GBYP should exclude these activities from the contract and seek alternative sources of sampling.

The SC was made aware of an issue concerning the development of the ALK. The SC initially requested ALKs be developed by year. The Consortium has expressed that will in fact not be done, and instead, 2011 and 2012 samples only will be aged, even if for a substantial number of otoliths. The GBYP Coordinator asked the SC how to deal with this negotiation with the Consortium as the contract was not yet been awarded. It was noted that in 2013 – 2015 there are significant gaps in the otoliths collection that may create problems for developing the annual ALK. Data for 2013 appears to be suitable for analysis. It was noted that other Labs could conduct the ageing studies and therefore this should be explored for the samples the consortium is unwilling to analyse. The SC therefore recommended that 2013 samples will be sent to Canada (and maybe others, i.e.: Miami) for ageing; of course, the GBYP should receive a written confirmation of this availability before proceeding. The ageing component of the consortium offer will therefore possibly not be awarded and ageing will therefore be negotiated separately by the GBYP under another contract. Another call should be made to request reading of additional batch of otoliths (maybe 1000) to supplement the information for the assessment. Cross validation studies on the readings already done should also be conducted. Every otolith that is read should also have high quality images taken for comparative reading purposes. This will be communicated in future protocols and agreements.

The SC recommended to possibly limiting the biological sampling contract to the Consortium up to a maximum of about 365,000€ (roughly a 10% reduction on the overall cost), though keeping all planned activities, taking into account what was recommended above and the need to have more funds available for those additional actions.

As concerns the BFT Larval Workshop, the SC requested the GBYP Coordinator to explore the possibility that BFT larval surveys should be also carried out coordinating the activities with other surveys conducted in the Mediterranean Sea in the same period, to maximize potential data collection. This recommendation should be passed also to the scientists attending the workshop.

- e. 1- Tagging activity (calls and activities; costs; tag recovery, in-home analysis, discussion about re-elaborating the tracks)

Electronic tagging:

The discussion was regarding the proportion of PSAT tagged and released fish that were subsequently caught in the following times. Appears that about 75% of the fish were possibly recaptured which is an extremely high percentage. The SC recommended that this data be further analysed and the methodology that estimate whether the fish has been possibly caught or not should be revisited. Otherwise these data would suggest extremely high exploitation. **SC recommended that CPCs experts should be contacted as to whether they could run this analysis or, a contract should be drafted to accommodate this analysis.**

The SC was made aware of a technical issue with the tags, which is resulting in the pins breaking and therefore causing a premature detachment. Another problem is that the tags, once detached from the harpoon, if they are not inserted properly in the fish, will sink if deployed at more than 6 m depth (i.e. if the barb and the tether are still attached to the tag).

These issues need to be addressed but the Coordinator informed that the information about these problems has been already passed to the manufacturer (Wildlife Computers).

The SC was made aware of an issue with tagging off Ireland which appears to have been addressed by the tender by including the Irish national institute in Galway into the consortium to conduct the tagging; the GBYP received the information from the Irish authorities which would like to help the process. It is still uncertain as to whether this tagging can take place this year due to logistical issues. Due to budgetary constraints the SC recommended suspending the contract (currently waiting for the signature by the contractor) and to postpone the tagging off Ireland to the next phase.

Some members of the SC expressed their concern over the overall cost of the electronic tagging. There was concern that the information received from the tagging may not justify the cost. The fact that the tags provide at maximum one year data was also considered problematic. It was acknowledged that this is an expensive activity in general as deployments are no longer being carried out opportunistically, but rather through hiring vessels/traps to conduct the activities, as it was previously recommended. The SC discussed whether these costs are justified and whether this money could be better utilized elsewhere, such as for close kin genetic tagging. Archival tags do not seem feasible as no returns of GBYP tags have been received so far although it was clarified that some of the farms are reporting tags (either conventional or archival) from other projects. A brief discussion was held regarding acoustic receivers. It was noted that this would be complicated in the Med, although some of the hurdles have been resolved, there are still military concerns. Glider technology does not appear to be suitable for this circumstance. It was suggested that military authorities could be contacted by national scientists to obtain data or reach an agreement regarding obtaining data on fish signals. The SC suggested that this avenue should be pursued and the feasibility of obtaining this information be examined possibly under phase 7.

Conventional tagging

The SC queried whether additional conventional tagging be conducted by traps/vessels that have been specifically contracted to conduct electronic tagging exercises. It was clarified that this was indeed conducted so far whenever it was possible. The opportunistic tagging of fish during other fishing operations should be further explored. Opportunistic and complimentary tagging activities has been carried out in all GBP Phases so far.

SC was informed about tag shedding which appears to be high (almost 30%), even if all fish were properly double tagged by experts on board. This may partially explain (along with natural mortality) why the reporting rate has been so low.

In the context of the assessment, scientists are using the tagging data. It was raised as to whether a contract should be drafted to further analyse these data (biological parameter estimation, etc.). It was generally agreed that this work is already taking place for the assessment.

2 – Tag awareness programme (call, activity, cost)

The GBYP coordinator informed that a short (50'') and medium (about 4') video will be produced and shall be distributed to media and stakeholders, to advertise on awareness and

reporting of tag data. The videos should be possibly ready by September, in 7 different languages.

The SC acknowledges it and noted that due to late production date, the videos will be useless for this year fishing season.

3 – Second part of CKMR (discussion and decision)

The SC recognized the merits of the study, though it was submitted late and a few problems in some of the information contained therein. The SC approved the report, requesting few final refinements, and suggested that a detailed sampling design shall be made, since the feasibility study demonstrated that the technique has potential to provide the information needed to enhance the management advice. However, prior to that it is essential that geneticists discuss and agree on the best methodology to analyze the samples. This could be done by GBYP organizing a workshop in close coordination with CSIRO, which could be eventually be held in January/February 2017, within Phase 6, if experts and CSIRO will be available; the SC recommends to extend the contract signed in Phase 5 to Phase 6, for covering this external expert support from CSIRO for the workshop on the genetic aspects of the CKMR.

- f. Modelling approaches (contract, discussion about the coordination, plan for the meeting, activities, costs)

Modelling coordinator position had been suspended in phase 6 by the SC. The need for this position is not only to coordinate the modeler expert work, but also to disseminate and promote the concepts of the work to the Commission. The last coordinator was probably under-utilised in this latter respect. The SCRS chair will be tasked with this during the Commission plenary, but he may not be able to carry out this task at other inter-sessional meetings nor with specific delegations. The SC considered that a modelling/MSE communicator is at this stage more important than a coordinator. The SC briefly discussed potential candidates for filling this role. Kathy Dichmont was proposed as a possible candidate and the SCRS chair agreed to contact her regarding any potential interest for this task. A candidate could also be identified at the next tRFMOs MSE meeting. This person should be appointed as soon as possible, preferably within phase 6.

When does core modelling group need to regroup? The SC recommended a third meeting should be held in Phase 6 and this could be done after the Commission meeting once feedback has been received from SCRS and Commission or immediately after the joint tuna RFMO meeting. The meeting of the GBYP Core Modelling MSE Group could be held in Madrid, back-to-back with the t-RFMO MSE WG meeting (Nov 1-3, 2016).

Workshop to improve modelling capacity – The SC recommended that this course should address the understanding of the modelling process. Attendance to this course should be selective. The core audience needs to be identified. A better use of funds could be to identify a few key scientists (up to four) and use the money to train those individuals (week training at an agreed lab) to be able to run the assessments. This will require a change to the original GBYP budget table and an increasing should be included in phase 6.

The SC recommends a trade/market data analysis to be made in Phase 6 for tentatively assessing the total removals during the years covered by these data. A Call for tenders is to be launched as soon as possible (1+3 months duration, estimated cost: about 40,000€), only to provide estimates of stock removals. This shall be made available before the next SCRS BFT SG meeting for the data preparation (March 2017?)

External expert for DPM and assessment – this budget item will be mostly delayed to phase 7 as it is too late for phase 6.

3) Need to re-define the general programme, revise the budget accordingly, present the request for amending the EU Grant and get a new approval by the Commission.

Ageing – The SC recommends to keep the proposal submitted by the Consortium and release another call for tenders for reading about 1000 otoliths (max. cost 60,000€). The otoliths should also be used for microchemistry study, and therefore need to be duly preserved after the age reading. Gary Melvin volunteer another 1000 otoliths to read in his lab (Canada), for comparison purposes. All otoliths shall be photographed according to the best techniques. The GBYP Coordinator will contact the Consortium in order to provide the samples as soon as the contractor will be selected and the Canadian availability will be officially confirmed.

Sampling YOY – Initially, the SC suggested additional sampling of YOY at the Balearic (200 samples), Croatia (300 samples) and North Africa (Med cost, off Morocco, Algeria and Tunisia; 300 samples in each site). After looking at the budget constraints, the SC recommends to limit this additional sampling to the North African countries, after contacting directly the CPCs scientists and verify their availability for carrying out this sampling.

4) Funding from other CPCs or entities.

The Coordination informed that about 94,000 euro committed by Libya, confirmed by several mails, were never received; the SC recommends the Secretariat to further explore if there is any possibility to recover this important amount of money.

The Executive Secretary informed the SC of the currently received or communicated voluntary contributions, which included a recent communication from USA amount for 125,000 US\$.

D) Planning of activities for Phase 7

Discussion on the *Second external review* outcomes and 2015 Commission comments: redefining GBYP activities and coordination:

- Coordination structure (including SC composition);
The SC agreed again to provide to the Secretariat within 2 days comments on the report of GBYP performance review. The following comments were made for the report summary:
 - Biological sampling – SC agreed that an operation system should be implemented. For that purpose, in phase 7 a detailed proposal should be developed.
 - Operational streams – the operational system is way to achieve the regular provision of information to improve the quality of the stock assessment and management advice.
- ✓ Reliable abundance index for E-BFT;

SC considers CKMR work should be continued, as currently appears to be the most promising methodology. However, it did not discard the aerial surveys, though these suggested suspending them until the currently constraints for the extended one are not solved.

- ✓ MSE – SC considers the work so far developed is relevant and should be continued.
- ✓ Tagging – SC agreed that more time is needed to further analyze the cost-benefit of this activity due to its high cost and relatively limited provision of information to relevant questions, even if all GBYP data are currently used in the MSE approach for improving the mixing understanding. A proper tagging design should be developed to assure the information gathered can effectively improve the stock assessment.
- ✓ Program management – The SC acknowledged that funding is problematic, but that being a Commission issue, rather than a science one. Harmonization related to methodologies used on EBFT and WBFT should be promoted (e.g. workshop on larval surveys), while there is a wide space to harmonize sampling. As an example, sampling activities should be better considered on both sides of the Atlantic Ocean, trying to cover all areas which are currently not covered.

SC believes an additional external expert should be admitted as member of the SC. This proposal shall be reviewed during the SCRS meeting. It was suggested that a better preparation of the SC meetings should be envisaged, particularly in terms of making available at least a week before the meeting all relevant background documents (e.g. GBYP coordinator to prepare proposals), with external members having more responsibility on reporting the SC work. External members should attend the intersessional BFT SG meetings.

- ✓ Budget outlook;

The SC was informed that the estimated budget for Phase 7 might be on the same order (2,125,000€) of the current one used in Phase 6.

The ICCAT Secretariat overhead should be doubled (20,000€), as currently it does not reflect the considerable workload of the Secretariat on the program.

The SC considers that the budget for the external expert should be doubled if the Commission would improve the composition of the Steering Committee.

- ✓ Data recovery (priorities, budget);

Data mining budget to be reduced to about 50,000€.

- ✓ What tagging (decision about the activities and strategies, including CKMR, budget);

The SC recommends to keep the overall tagging budget in the order of about 400,000€.

The costs for CKMR (feasibility + dedicated additional sampling) is assessed at about 215,000€; the Coordinator will assess whether a part of these costs should be included in the Biological studies.

Tag Awareness and rewards: the SC proposes to decrease this budget item at about 15,000€

Electronic tagging: the SC recommends to keep the budget at about 170,000€

- ✓ Biological studies (plan, strategy, and activities, budget), particularly aiming stock discrimination (spawning ground origin) and mixing;

The SC recommends keeping the overall budget on the order of 350,000€ and should focus, besides the necessary sampling, on micro-chemistry studies and ALK (ageing). The GBYP coordinator should manage the needs for the CKMR between the two budget items.

- ✓ MSE and data modelling (strategy and activities, budget);

The SC recommends setting the overall budget on the order of 350,000€, including the capacity building activities with a budget of 110,000€ (i.e. workshop basics of MSE + develop a framework/software for managers to play with MSE).

E) Other issues

The next meeting of the SC should be in February 2017 or back-to-back to the next BFT SG intersessional meeting

ICCAT GBYP STEERING COMMITTEE MEETING – PHASE 6

30-31 July 2016

DRAFT AGENDA

A) election of Chair and rapporteur

B) Summary and Revision of the activities in Phase 5

3) Coordination activity – Review of the project activities

Considering that almost all data and reports have been already presented and approved by the EU, the GBYP Coordinator will provide in advance a short summary report concerning all the activities carried out in Phase 5, with budgets details by item, including the followings:

- g. Data Recovery (calls and results);
- h. Aerial Survey (activities, total cost, analysis report):
- i. Biological and genetic sampling (activity, total cost)
- j. Tagging activity (activities, total cost)
- k. Tag awareness programme
- l. Modelling approaches (activities, total costs)

4) Discussion on the only activity still pending for Phase 5: feasibility study for CKMR, report.

C) Summary and Revision of the activities in Phase 6

5) Budget – approved budget and components

6) Coordination activity – Review of the project activities

After cancelling the aerial survey in Phase 6, according to the recommendation made by the SC, it was necessary to readjust all budget components; this has been done agreeing all steps with the SC by mail:

- g. Second external review (report, comments)
- h. Data Recovery (calls and results; e-tags recovery, other meetings, costs, data elaboration in-home);
- i. Aerial Survey (motivation for cancelling the survey in Phase 6):
- j. Biological studies (sampling adults from spawning areas; call and activities; workshop for larval studies, costs; main problems)
- k. 1- Tagging activity (calls and activities; costs; tag recovery, in-home analysis, discussion about re-elaborating the tracks)
2 – Tag awareness programme (call, activity, cost)
3 – Second part of CKMR (discussion and decision)
- l. Modelling approaches (contract, discussion about the coordination, plan for the meeting, activities, costs)

7) Need to re-define the general programme, revise the budget accordingly, present the request for amending the EU Grant and get a new approval by the Commission.

8) Funding from other CPCs or entities.

D) Planning of activities for Phase 7

- ✓ Discussion on the *Second external review* outcomes and 2015 Commission comments: redefining GBYP activities and coordination
 - ✓ Coordination structure (including SC composition);
 - ✓ Budget outlook;
 - ✓ Reliable abundance index for E-BFT;
 - ✓ Data recovery (priorities, budget);
 - ✓ Biological studies (plan, strategy, and activities, budget), particularly aiming stock discrimination (spawning ground origin) and mixing;
 - ✓ What tagging (decision about the activities and strategies, including CKMR, budget);
 - ✓ MSE and data modelling (strategy and activities, budget);

E) Other issues

Appendix 2 – Short summary of GBYP activities in Phase 5

ICCAT GBYP STEERING COMMITTEE MEETING 30-31 July 2016

Agenda point B) 1):

Very short summary of the Coordination activities in Phase 5 provided by GBYP Coordination:

I. Coordination:

- All activities have been done
- Budget: total budget was 2.125 MEuro; costs have been about 1.996 MEuro.
- One meeting of the Steering Committee
- Participation to the BFT Future Symposium
- Papers and documents are on: <http://www.iccat.int/GBYP/en/overview.htm>

II. Data mining, recovery and analyses:

- Recovery and genetic analysis of historical genetic samples
- Cooperation for the BFT Data Preparatory Meeting (3 papers)
- Documents and papers are on: <http://www.iccat.int/GBYP/en/Drecovery.htm>

III. Aerial survey:

- New extended survey design, updated survey protocol, updated and revised sightings and reporting forms.
- Training course (no official national observer participated)
- Extended survey (three contracts, 7 areas).
- Survey analysis (one contract)
- Power analysis and cost-benefit analysis
- Report to the SCRS (3 papers).
- Documents and papers are on: <http://www.iccat.int/GBYP/en/asurvey.htm>

IV. Tagging:

- Only electronic tagging, 3 contracts (Morocco, Sardinia, Turkey).
- Complimentary conventional tagging continued
- Cost benefit analysis (1 contract)
- Tag recovery and rewarding regularly continued
- Report to the SCRS (6 papers).
- Documents and papers are on <http://www.iccat.int/GBYP/en/tagging.htm>

V. Biological studies:

- Biological sampling and analyses: 2 contracts
- Cost-benefit analysis: no bids received, no potential candidates.
- Close-Kin Genetic Tagging feasibility study (1st part): 1 contract (separate discussion)
- Report to the SCRS (13 papers).
- Documents and papers are on: <http://www.iccat.int/GBYP/en/biostu.htm>

VI. Modelling:

- Modelling coordinator (1 contract)
- Modelling MSE external expert (1 contract)
- Meeting of the Core Modelling MSE Group
- Report to SCRS (5 papers)
- Documents and papers are on: <http://www.iccat.int/GBYP/en/modelling.htm>

Agenda point B) 2): Report for the first part of CKMR

- The Contractor never respected the terms of the contract or even the terms they were proposing; a long time was requested for discussing and sign the contract; they started working too late and they never asked for biological info to the Coordination; all data provided were not considered in the first draft. The sequence of the most relevant e-mails is available.

- The latest draft is clearly an improved version of the previous one, several parts have been fixed.
- Some problems are still in the report (two Mediterranean spawning areas only, not four, tables out of date, etc.) and it is difficult to understand why.
- The conceptual CKMR approach can be potentially shared, but there are still problems which are there. The estimated costs (1M\$ including analyses) for the level of sampling which is required (30/40,000 fish) is too much optimistic compared to the current costs (286000 Euro for 2325 samples, analyses not included).

Appendix 3 – GBYP Phase 6 Budget situation at 31/07/2016

BUDGET AND ACTIONS FOR ICCAT-GBYP PHASE 6 UP TO 31/07/2016								
ACTIONS		ALLOCATION	PHASE 6 APPROVED BUDGET		BUDGET SITUATION AT 31/07/2016 committed or contracted amounts		BUDGET CHANGES UP TO 31/07/2016	
GBYP	EU		detail	total Phase 6	detail	total Phase 6	difference	total difference
A		Coordination						
A.1	1.1.1	ICCAT staff	10.000,00 €	390.000,00 €	10.000,00 €	380.950,00 €	- €	- 9.050,00 €
A.2	1.1.2	Coordinator + support staff salaries	258.000,00 €		258.000,00 €		- €	
A.3	5.1	Travels and subsistence (including SC)	45.000,00 €		25.000,00 €		- 20.000,00 €	
A.4	2.1	Computer hardware and software	5.000,00 €		6.000,00 €		1.000,00 €	
A.5	5.2	Consumables and supplies	7.000,00 €		7.000,00 €		- €	
A.6	3.1	Contracts for external Steering Committee member	15.000,00 €		15.000,00 €		- €	
A.7	3.2	2nd external review of GBYP activities	40.000,00 €		49.950,00 €		9.950,00 €	
A.8	5.3	ICCAT Secretariat overhead	10.000,00 €		10.000,00 €		- €	
B		Data mining, data retrieval and data elaboration (external contracts)						
				48.000,00 €		142.880,00 €	- €	94.880,00 €
B.1	5.7	Workshop for multinational indices of abundance	8.000,00 €		- €		- 8.000,00 €	
B.2	4.1	BFT data recovery in Mauritania, including training	10.000,00 €		10.000,00 €		- €	
B.3		e-tags data recovery	- €		50.000,00 €		50.000,00 €	
B.4		Reanalysis of market data (total removals)	- €		40.000,00 €		40.000,00 €	
B.5	4.1	Data recovery	30.000,00 €		42.880,00 €		12.880,00 €	
C		Aerial survey (note 1)						
				483.000,00 €		- €		- 483.000,00 €
C.1	4.2	Design revision, training assistance and traditional data analyses	20.000,00 €		- €		- 20.000,00 €	
C.2	5.4	Training course	13.000,00 €		- €		- 13.000,00 €	
C.3	4.3	Aerial survey activity	450.000,00 €		- €		- 450.000,00 €	
C.4		Aerial survey improved analyses						
D		Tagging						
				659.000,00 €		769.705,00 €		110.705,00 €
D.1	4.4	conventional and electronic tagging	290.000,00 €		- €		- 290.000,00 €	
D.2.1	4.4	Tagging in eastern Mediterranean	- €		140.425,00 €		140.425,00 €	
D.2.2	4.4	Tagging in central Mediterranean	- €		55.000,00 €		55.000,00 €	
D.2.3	4.4	Tagging in Morocco	- €		116.125,00 €		116.125,00 €	
D.2.4		Tagging Strait of Messina	- €		77.655,00 €		77.655,00 €	
D.2.5		Tagging Portugal	- €		27.500,00 €		27.500,00 €	
D.2.6		Taggin Ireland	- €		- €		- €	
D.3	4.4	Analysis of electronic tag data	50.000,00 €		- €		- 50.000,00 €	
D.4	4.5	Electronic tags & related services	174.000,00 €		240.000,00 €		66.000,00 €	
D.5	4.6	Conventional tags and applicators	10.000,00 €		- €		- 10.000,00 €	
D.6	5.7	Tag rewards	25.000,00 €		15.000,00 €		- 10.000,00 €	
D.7	4.7	Field awareness campaign	60.000,00 €		63.000,00 €		3.000,00 €	
D.8		Workshop for CSMR	- €		- €		- €	
D.9	4.4	Study for close-kin genetic tagging feasibility 2 part	50.000,00 €		35.000,00 €		- 15.000,00 €	
E		Biological Studies (external contracts)						
				305.000,00 €		640.170,00 €		335.170,00 €
E.1	4.8	Biological studies	285.000,00 €		370.000,00 €		85.000,00 €	
E.2		Sampling for adults	- €		172.170,00 €		172.170,00 €	
E.3		Additional sampling for YOY	- €		30.000,00 €		30.000,00 €	
E.4		Additional otoliths reading	- €		60.000,00 €		60.000,00 €	
E.5	5.5	Larval workshop	20.000,00 €		8.000,00 €		- 12.000,00 €	
F		Modelling						
				240.000,00 €		194.000,00 €		- 46.000,00 €
F.3	4.9	Coordinator Operating Model & travels	53.000,00 €		25.000,00 €		- 28.000,00 €	
F.4	4.10	External expert assistance for initial mod.devel. & travels	125.000,00 €		119.000,00 €		- 6.000,00 €	
F.5	4.11	External expert assistance for DPM and assessment	16.000,00 €		- €		- 16.000,00 €	
F.1	5.6	Technical meetings on modelling/MSE meeting	30.000,00 €		30.000,00 €		- €	
F.2	5.8	Workshop for building modelling capacity	16.000,00 €		20.000,00 €		4.000,00 €	
Total revised reduced minimum budget					2.125.000,00 €		2.127.705,00 €	2.705,00 €

Appendix 4 – Short summary of GBYP activities in Phase 6

ICCAT GBYP STEERING COMMITTEE MEETING 30-31 July 2016

Agenda point C)

Summary and revision of activities in Phase 6 provided by GBYP Coordination

1) Original Budget: Total 2,125,000 euro

Coordination:	390,000
Data Mining and Analyses:	98,000
Aerial Survey	483,000
Tagging:	609,000
Biological studies:	305,000
Modelling:	98,000

2) Coordination activity – Review of the project activities

VII. Coordination:

- Three staff always on duty
- Continuous control of all activities
- Budget control
- Second review of the GBYP (tbd under a separate item)
- SC meeting
- BFT Intersessional Meeting: 1 presentation

VIII. Data mining, recovery and analyses:

- Data mining (LL & TRAP data, Canary Islands data): 3 contracts have been awarded; all have been concluded at the date. The preliminary report is available on SCRS/2016/150.
- Recovery of electronic tag data: 3 invitation have been released; one had no result; Prof. Lutcavage kindly provided the data sets to the SCRS experts; Prof. Block has been recently contracted and the data will be available at the end of August.
- Analysis of GBYP PSATs data (recommend by the Reviewers) (in-home work): the report is available on SCRS/2016/138.
- Revision of trap data, as agreed by BFT SG and Subcomstat (in-home work). The report is available on SCRS/2016/139.
- Review of old literature on BFT maturity (requested by the BFT SG) (in-home work): the report is available on SCRS/2016/141.
- Review and selection of the best trade, market and auction data (requested by the SCRS and the BFT SG) (in-home work): the report is available on SCRS/2016/142.
- Analysis of conventional tags for growth and displacements (requested by the BFT SG and the Reviewers) (in-home work): the report is available on SCRS/2016/143.
- BFT Data recovery in Mauritania (requested by the Commission and the SCRS): a contract was released, a short training course was carried out in July; the activity is going on; the report will be provided to the SCRS.
- Workshop for multinational indices of abundance (requested by the SCRS): carried out without the GBYP support.

IX. Aerial survey:

- Suspended after the opinion of the Steering Committee.

X. Tagging:

- Only electronic tagging, 3 contracts for the first call (Morocco-15 tags, Sardinia-20 tags, Turkey-20 tags); 2 contracts for the second call (Portugal-25 tags, Strait of Messina-21 tags); one contract still pending (Irish area-25 tags); number of tags includes 6 from WWF and 10 from other donors.

- Complimentary conventional tagging continued
- Tag recovery and rewarding regularly continued
- Real-time updating of tag deployments (17,819 fish tagged; 25,567 tags deployed) and tag recoveries (428 tags)
- Field awareness campaign: 1 contract. The videos shall be available for the SCRS in September.
- Close Kin Genetic Tagging (second part of the feasibility study): to be discussed.

XI. Biological studies:

- Sampling adults in the spawning areas (recommended by the Steering Committee): 3 contracts (Balearic area, 170+150 samples, S. Tyrrhenian Sea and C. Mediterranean, 600 samples). The Turkish part received no offers.
- Biological studies: after a Call for tenders, one offer was accepted, including sampling for adults in Turkey. To be contracted.
- Larval workshop: it was finally agreed and it will be held on 12-14 September 2016 in Madrid.
- Study on BFT YOY in the Mediterranean in 2015_(in-house work): the report is available on SCRS/2016/140.
- Several papers have been presented by contractors to the SCRS BFT Intersessional Meeting.

XII. Modelling:

- Modelling coordinator (contract suspended, SC decision)
- Modelling MSE external expert (contract renewed)
- Workshop for building Modelling Capacities_(requested by the SCRS): to be further discussed.
- External expert for DPM and assessment_(requested by the SCRS): to be discussed.
- Technical meeting on Modelling - GBYP Core Modelling MSE Group_(recommended by the Steering Committee): approved, date and place to be decided.
- Support for providing the necessary data to the modelling-MSE experts (recommended by the SCRS BFT SG): all available data have been provided.
- One paper presented to the SCRS BFT Intersessional meeting.

Appendix 5 – Motivation for suspending the aerial survey in Phase 6

Summary of the Reasons for Recommending Suspension of the Aerial Survey in Phase 6

The GBYP Steering Committee recommended that the aerial survey be suspended in Phase VI of the GBYP. This decision was based on consideration of the power and cost-benefit analyses of the aerial survey completed in Phase V (Cañadas and Ben Mhamed, 2016) and the reports and results of the aerial survey in 2015 (Cañadas and Vázquez, 2016) as well as from the previous ones. It should be noted that the timeframe for the SC to review and consider its recommendation was very limited. Thus, a draft report of the power and cost-benefit analyses was first distributed to the SC on March 7, 2016 and the deadline for the SC recommendation was initially set as March 17 but subsequently extended to the 31st. All discussion on this matter had to be done by e-mail correspondence.

The SC noted that it is clear that the financial resources do not exist to carry out an adequate survey (i.e. in terms of survey effort that would be required to achieve a reasonable CV) of the entire or most of the area in the Mediterranean Sea where spawners/adult occur. Moreover, based on the two previous attempts to conduct comprehensive surveys (i.e. in 2014 and 2015) there are large logistical, political and administrative constraints that more than likely would prevent such a survey from being adequately implemented even if very much larger financial resources were available.

The alternative to conducting a comprehensive survey is to restrict the aerial survey to a relatively limited areas within the Mediterranean that can be adequately surveyed with the available resources. In order for this approach to provide a useful index of abundance, the proportion of the adult stock within the survey areas during the survey needs to be relatively constant. This is essential so that changes and trends in the actual size of the population can be distinguished from inter-annual variability in the utilization of the areas being surveyed. The SC considered the recommendation that this alternative be adopted and the surveys be restricted to the four core, overlapping areas that had been included in all the four previous surveys. It noted that there are several issues and concerns with this approach. These include:

- (1) the high variability among years in the estimates in each of the core areas (process error);
- (2) the high estimation error (e.g. CV) associated with the past estimates from these areas and
- (3) abundance related changes in the relative proportion of the spawning stock within the areas surveyed (e.g. density dependent habitat effects).

The last of these is probably the least significant as it can be dealt with at least to some extent by considering alternative scenarios within the assessment models. Nevertheless, it is of some concern as the proposed core areas are in the areas to be the areas with the highest spawner adult density based on available information. If the stock significantly increases, it would not be unreasonable for spawners to change their behaviour in space, time and/or duration.

The CV's associated with the abundance estimates in weight or numbers¹ for each of the core areas are high from the previous surveys (e.g. none of the CVs are under 40% in Cañadas and Vázquez, 2016²). This is

¹ It is not clear whether the abundance estimates in weights or numbers would be the most reliable for stock assessment purposes in terms of their underlying uncertainty and issues in using them as a tuning index (e.g. whether numbers and mean weight are likely to be more or less consistently estimated from the air than total weight of a school while use of mean weight as an index in the stock assessment generally entails assumption or additional estimates of mean weight at age)

in spite of the fact that the amount of search effort and estimated coverage has generally been high. The distance between transect has been on the order of xx miles and two replicate within areas have been generally been conducted. Estimated "real" coverage has exceeded 10% of the area within each of the core areas except in 1 year in Areas E and G (Table 1.7 in Cañadas and Vázquez, 2016) . and in some cases has been extremely high (e.g. in excess of 70%). Greater amounts of searching effort or high coverage rates have not necessarily resulted in any substantive reduction in the estimated CVs (e.g. Figures 1 and 2), although the very high CVs are associated with low coverage and relatively small amounts of searching effort. These high CVs even with high coverage rates may reflect the fact that the surveys are not synoptic and that there is large amount of variability during the course of the survey in actual abundance, surfacing behaviour and detectability. Thus, there is large inherent variability associated with the average abundance of detectable schools (e.g. what the surveys are measuring) within the survey period that is a result of the biology of BFT and environmental variability. There is also the problem that the density of sighting is low. Thus, substantial effort and coverage is required to even obtain what could be considered a minimal number of sightings for estimating the detection function (e.g. 20). Only Area E in three of the four surveys and area G in one have greater than 20 sightings. Increasing the amount of survey effort is likely to provide a more reliable estimate of the variance associated with these but will not necessarily substantially improve the CVs of the estimates (e.g. there is a lot of within season process error as well as the unaccounted variance from pooling sightings across areas for estimating the detection function). Given the resources that were available for the survey in Phase 6 (e.g 483,000 Euros), it is not clear that concentrating all of the effort in the four core areas would result in substantial improvements in the CVs. Thus, the power analyses in Cañadas and Ben Mhamed (2016) indicate that with the available level of resources the CVs would be over 40% if all the effort were concentrated in the four areas (Table 21) and this was based on pooling sightings from all areas when estimating the detection function.

The third of the issues noted above is the most significant of the Steering Committees concerns with restricting the survey to the four core areas. The inter-annual variability in the abundance estimates for each of the four areas is extremely large. It is much larger than would be expected based on the associated estimated CVs (e.g. the estimates have varied by over a factor of 7 between years). As noted in Cañadas and Ben Mhamed (2016):

It is practically impossible to conclude whether differences observed among areas or years are due to real differences in abundance, or to differences induced by different types of aircrafts or/and by the individual observers (different experiences, different skills, ways of dealing with the protocols, criteria to read the inclinometers, criteria to estimate school sizes and weight, etc.). Furthermore, the variables linked to the environmental conditions (in a broad comprehensive sense) and to the both fast-moving platform and target are factors very difficult to duly assess.

To the extent that the inter-annual variability is due to implementation issues (e.g. differences in airplanes/observers), theoretically this could be reduced, However, it is not clear that given the logistic and financial constraints that it is possible to implement the survey and collect the necessary data that would allow for this (see below). If most of the inter-annual variability is associated with process error (i.e. inter-annual variability in abundance of adults at the surface in these core areas), this could be due to variability in the areas/habitat being utilized during the survey, inter-annual variability in the timing of spawning relative to the time of the survey or inter-annual variability time spent near the surface or a combination of

² There are substantial discrepancy for some of the abundance estimates depending upon whether one pools sightings from all areas within a year to estimate the detection function or separate detection functions are estimated for each area. In the latter case, there are minimal number of sightings for estimation in many cases, while in the former one is likely to be introducing substantial biases given the different planes and spotters in each arear.

the these. In any case, whatever the cause, simply increasing the amount of searching effort in the core areas cannot reduce this. Cañadas and Ben Mhamed (2016) developed a model to estimate the process error based on the four previous surveys in the core areas. The estimated amount of process error is very large - so large as to suggest that surveys based on current core areas and month will not be able to provide an index with anything but a very large CV and with little statistical power no matter how much additional survey effort was undertaken.

To date there has been no data collected that would allow for calibration of either school size estimates and sighting efficiency among the large number of different observes and across the various plane types used in the survey. The Steering Committee has repeatedly stressed the need for and recommended that such data be collected. However, it appears to be logistically and administratively very difficult, if not impossible to undertake the work required to collect data that would allow for any calibration and standardization for sighting efficiency and school size estimates. The Steering Committee did recommend in 2014 an approach involving rotating spotters and observers among planes that could provide data that would allow for some standardization of school size estimates across observers at minimal additional expense. However, this approach, while simple conceptually and used in other surveys, appears to be very difficult, if not infeasible, to implement in the case of the GBYP given contracting arrangements, flying regulations and permit complications within the Mediterranean. The short lead time for contracting and implementing the survey exasperates these problems. The alternative of conducting dedicated experiments involving planes simultaneously surveying the same area and estimating school sizes for the same sightings is difficult to implement, has regulation and permits issues and would be very costly to conduct. Neither the budget nor time that was available for implementing an aerial survey in Phase 6 would have allowed implementation of any such experiment. Also, given the number of years since the first survey, it would be difficult to apply any standardization retrospectively.

The lack of data for calibration and standardization remains a major concern. Thus, for example, estimates of school size have varied by over a factor of 5 between areas within a year and also between years within each areas. It is impossible to know to what extent these differences reflect real differences in school sizes or differences in perception and estimation among spotters. Similarly, the detection functions appear to vary greatly among planes and in many cases data needs to be pooled because the number of sightings is insufficient to estimate separate detection functions. Nor is it clear how consistent is $g(0)$ among the different planes and spotter/observer teams. The lack of calibration and standardization is further compounded by having different planes and companies operating in different areas with no overlap within a year and the lack of continuity among planes, spotters and companies across years. Again the administrative constraints that the survey operates under make difficult, if not impossible, to achieve a reasonable level of continuity across time. All of this means that there are unquantified and potentially large unaccounted for sources of additional variances in the survey estimates.

The Steering Committee has had substantial concerns about how well and accurately the survey protocols have been implemented. (Only in Phase V were written protocols provided and these still lacked full specificity and clarity in the protocols themselves). There has been issues with the searching behaviour of spotters, the extent to which the tracklines flown have corresponded to the survey design, and with the accuracy and incompleteness in data recording. Time available for training has been limited and not all personnel involved in the actual surveys have attended the training courses. While there appear to have been improvements overtime, problems and concerns still exist based on the analysis report from the Phase V survey (REF), There has been inadequate and little independent observations/verification of what goes on in the field. The issues of scientific leadership and overall responsibility for what occurs on within individual planes remains a concern (e.g. the scientist are employees of the air charter companies and have

no real vested professional interested or responsibility in the survey results). It appears that administratively and logistically this is hard, if not impossible to change (e.g. companies appear to be unwilling to take onboard anyone but their own employees). Given when the funds were available for Phase VI and the Steering Committee consultation process in Phase VI meant that the time available for tendering and implementing a survey was extremely short and it seemed unlikely that there would be little scope for dealing with these issues of implementation and scientific rigor if a survey was to have been undertaken in Phase VI.

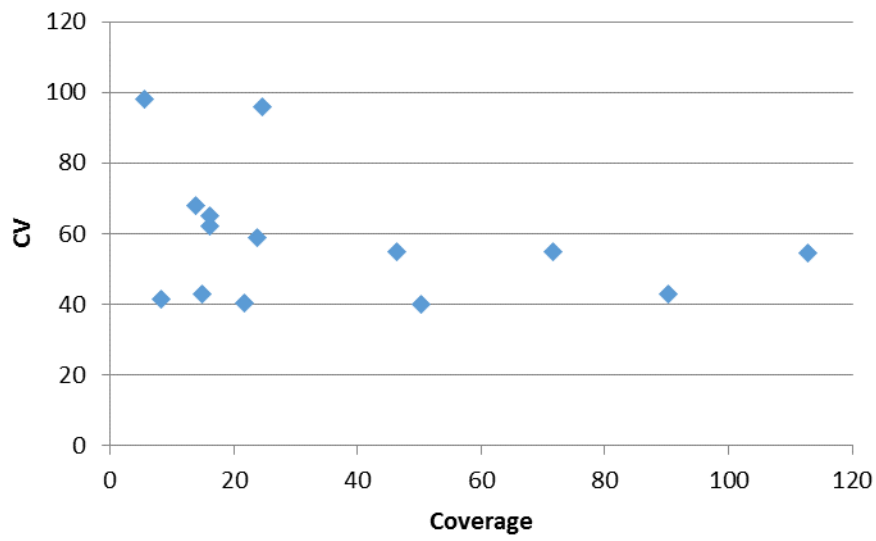


Figure 1: CV versus coverage for all core areas and years from the 2011-2015 aerial surveys. (Based on Table xx, ref)

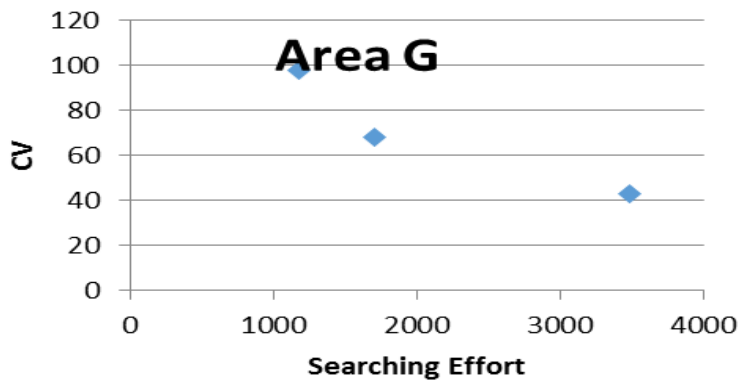
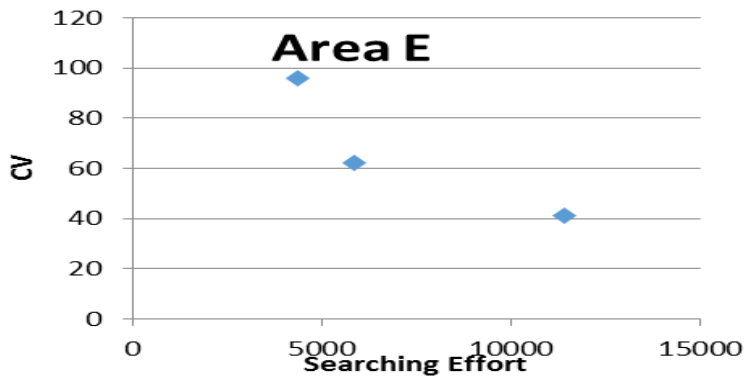
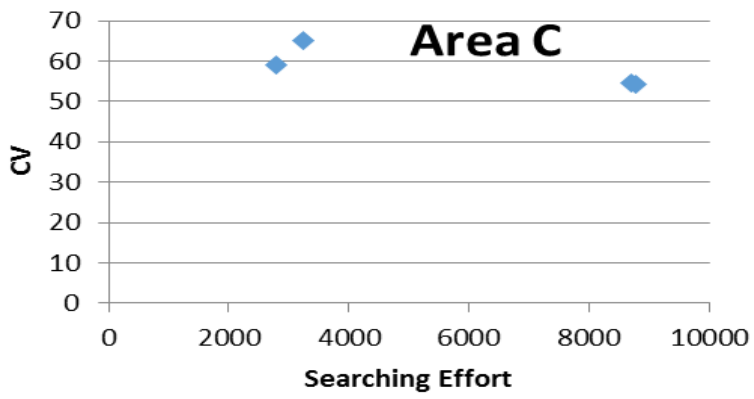
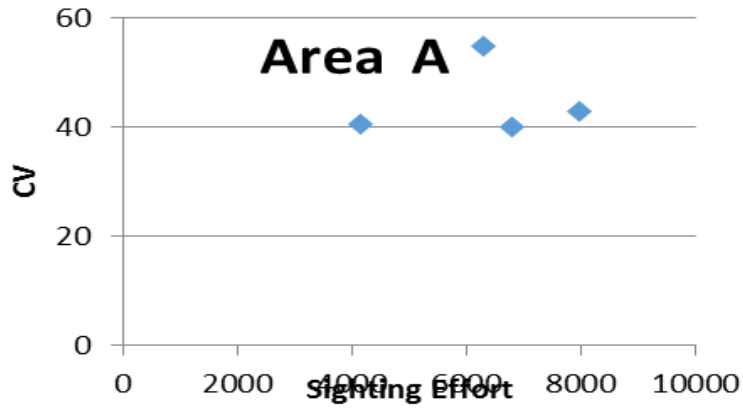


Figure 3: Versus searching Effort (ref)