



Evaluation of ICCAT's e-BCD and other CDS system to determine if they could be adapted to meet CCSBT's requirements in a cost effective manner

Background

The Seventh meeting of the Compliance Committee (CC) requested that the Secretariat conduct a cost benefit analysis of an electronic Catch Documentation Scheme (eCDS) for the CCSBT for CC8. In order to develop the cost benefit analysis, the Secretariat prepared an eCDS concept proposal and presented it to CCWG2. Following this, the Secretariat prepared specifications, obtained preliminary quotes, and presented a cost-benefit analysis to CC8.

CC8 agreed to delay final recommendations on an eCDS for one year to allow the CCSBT to learn from The International Commission for the Conservation of Atlantic Tunas' (ICCAT) experiences with their e-BCD¹ system, and for the Secretariat to work on practical aspects of implementation with respect to issues that had been identified. The Secretariat wrote to Members during 2014 to obtain further details of their concerns, and also wrote to ICCAT to learn of their experiences with their system.

The Secretariat presented a paper to CC9 that provided a summary of concerns raised by Members on implementation of an eCDS, information on ICCAT's experiences with the e-BCD project, and suggested recommendations for an eCDS. CC9 agreed to continue to evaluate ICCAT's progress with its e-BCD and to review the existing CDS Resolution prior to developing an eCDS system as the next step towards an eCDS, to enable the CCSBT to be ready to proceed with an eCDS regardless of whether it decides to utilise ICCAT's system or follow a different approach.

Introduction

This paper looks at some of the existing tuna fisheries software systems that could potentially be used, with modifications, by the CCSBT for its future eCDS. There are several advantages to using existing software systems and the CCSBT is fortunate that there are a few systems currently being used by regional organisations, national authorities, and the tuna industry. The Secretariat has reviewed two systems in some detail: the ICCAT e-BCD project, a system built specifically for ICCAT's Atlantic Bluefin Tuna CDS; and FIMS, a system used in the Pacific by a range of users that has much broader scope and manages many types of data, including CDS.

The paper is divided into three sections:

1. Overview and review of the ICCAT e-BCD project;
2. Overview and review of FIMS;
3. Other possibilities – FFA and Traceall ; and
4. Conclusions and recommendations.

¹ Electronic Bluefin Catch Document

Section 1: Overview and review of the ICCAT e-BCD system

Overview

The ICCAT e-BCD system has been developed for ICCAT specifically to provide an electronic CDS for ICCAT and its Members. ICCAT formed a working group in 2010 with the initial goal to have the e-BCD implemented in time for the 2012 season, but issues encountered during development and implementation delayed the project and it is still not fully deployed nor considered to be fully completed in 2015. The total cost of the system is currently close to three times the original quote.

The e-BCD operates via an online web interface, accessible via any web browser with an internet connection. This includes Android or Apple tablets with 3G/4G connection. There is little need for at-sea use of the system and this is not possible without internet access on-board.

Functionality of the e-BCD system includes the following:

- User management
- Catch entry
- Catch tagging entry and bulk import from CSV files.
- Live trade transactions, including cage towing and transfers, and farm transfers.
- Trades (exports / re-exports)
- BCD hard copy generation
- Validation

System Users

- ICCAT Members
- ICCAT Secretariat

Scope

Types of data that are accessible via the e-BCD system:

- ICCAT CDS (BCD) data
- Authorised vessels and farms

Developers and development environment

The developing company, Tragsatec, is a subsidiary company of the TRAGSA Group, with its main headquarters in Madrid. It is a consultancy company with expertise in fisheries, forestries, agriculture, health, and information technology with a team of about 500 IT experts. While largely operating in Spain TRAGSA has international activities in Central and South America, Africa, other parts of Europe, the Middle East, and Asia.

Tragsatec's teams are multi-disciplinary that include experts appropriate to the project, such as fisheries, as well as software development experts and developers. The development environment for the e-BCD project is one that is very professional and follows well-developed practices in the design, implementation, and testing phases. This type of development is expensive but can be more robust and carries less risk than small development teams.

System Review

The Secretariat visited ICCAT in June, 2015 to perform a technical review of the e-BCD. This review was quite comprehensive and included:

- Overview of ICCAT e-BCD requirements
- Overview of the e-BCD system architecture and design
- Standard and administrator user training and practice in a test environment
- Technical discussions relating to the implementation and technologies used
- Discussions with the developers (Tragsatec), including discussions on the feasibility of the system being used by the CCSBT.

User Interface

The user interface is very modern, attractive, and well laid out. There were some technical issues encountered during testing, however, where the interface did not appear to work as intended. These issues could probably be resolved fairly easily although it was surprising that there were such issues, considering that the software has been in development for a considerable amount of time already. In terms of the process of entering CDS documents, validation etc., the interface design was excellent and already quite suited to the likely requirements of the CCSBT. Some screenshots of the e-BCD are provided in Attachment A.

Technical Implementation

ICCAT was not willing to let the Secretariat view the code or the e-BCD development project, so no review was possible in that regard. Discussions with the developers were possible with respect to how the system may be modified to suit the CCSBT's requirements, which are summarised in a later section. Given the nature of the development company and the resources it has available, it is assumed that the software has been well-designed and uses best practice, which should not cause issues with respect to redevelopment.

Database documentation were made available, and this showed a well-designed and appropriate database that could be adapted to suit the CCSBT without major structural changes.

Data are entered directly into the main e-BCD data server by users of the system, via the web interface, which is hosted by Amazon Web Service (AWS). The ICCAT Secretariat have access to the database and can extract data directly from it. Certain information, in particular authorised vessels and farms, are entered at ICCAT and synchronised to the e-BCD cloud database.

Documentation

User documentation is excellent with comprehensive user manuals specific for fishermen, farmers, observers, traders, and validators. There is also a training handbook and a series of exercises that can be completed using an online training version of the e-BCD.

Security

The security of the system seems to have been well-defined and implemented, with each defined 'user role' only able to access data and perform operations appropriate to its role. There are also 'profiles' which can have a number of roles. These are very well documented in the e-BCD Training Handbook.

Technical Details

Item	Details	Comments
User interface platform	Any web browser	Compatibility issues have been encountered by the developers among different browsers, especially between countries
Database technology	SQL Server	
Data server	Amazon Web Service (AWS)	AWS is a flexible and scalable solution where the user pays per transaction and can allocate extra resources as required. The service provides backups and complete server replication so that in the case of main server failure a secondary server is available (which is located in a different country). The e-BCD main server, which is located in Ireland, has 2 replicates.
Software development platform	Microsoft ASP.Net, in Microsoft Visual Studio	
Website host	Amazon Web Service (AWS)	See AWS notes above
Code ownership	ICCAT	Will be handed over on completion of the project

Considerations related to using the system for the CCSBT

Tragsatec believe that it would not be straightforward to convert the e-BCD to a CCSBT eCDS. While the CDS principles are similar, a large part of development of a system such as this is devoted to the ‘business layer’, which is where most of the CDS rules are programmed, checking of validity of data, document flow, etc. This layer would have to be redeveloped for the CCSBT and would be easier to redevelop from the beginning than to modify the existing e-BCD business layer, since it is quite complex. However, there would be many components of the system that could be reused, so the cost of developing an eCDS for the CCSBT, using the e-BCD as a base, would be significantly less than the cost to ICCAT of developing the e-BCD.

Some extra points after discussions with Tragsatec on the feasibility of modifying the e-BCD for the CCSBT are:

- e-BCD supports multiple languages, and adding other languages should not be an issue as long as the reading layout is similar to English (i.e. left to right)
- Tragsatec is located in Spain which is quite distant to the Secretariat and would pose some difficulties, but is possible with video conferencing and other remote technologies such as Skype.
- In developing an eCDS for the CCSBT, Tragsatec would develop it as a separate project to the e-BCD, so the systems would diverge and would not be maintained together (but may still share some common components).

A possibility for future use of the e-BCD code by the CCSBT would be for the CCSBT to obtain the code and contract another party to modify it. It is difficult to know the feasibility of this without having seen the code itself, but it is likely that the system is too complex for this to be a viable option. In addition to this, ICCAT are not willing to share the code until the project has been completely finished, which they expect to be the case in another year, but there are no guarantees that they will share the code at all. In any case it would be far more

cost-effective to have Tragsatec work on a modified system since they have the knowledge of the e-BCD development.

Conclusions

The e-BCD is a well-designed and polished CDS-specific product that seems structured in a way that would suit an eCDS for the CCSBT.

Positives

- Developed in a highly professional environment
- Nice interface and design
- Data centre is excellent and robust
- Comprehensive CDS functionality
- Excellent documentation
- Multilingual

Negatives

- Costs to modify could still be high
- Developers are remote to the Secretariat
- Probably not feasible for another company to take over the project and modify it
- Web browser compatibility issues have been encountered

Section 2: Overview and review of FIMS

Overview

FIMS/iFIMS (Integrated Fisheries Information Management System) started as a licensing system for the National Fisheries Authority (NFA) of Papua New Guinea in 2008. The project soon expanded to include Vessel Monitoring System (VMS), Catch Documentation Scheme (CDS), Alerting, Observer management, Electronic Forms (eforms) with active links to Licensing, Vessel registers and Fisheries Management, and was contracted to the Parties to the Nauru Agreement (PNA) in 2011 to manage the Vessel Days Scheme (VDS). e-Reporting for purse seine vessels was rolled out in 2013, with e-Reporting for observers and CDS port officers in 2014. eCDS FIMS was rolled out to the Flag States fishing in PNG waters in June 2015 and will continue to be developed and expanded based on the FAO CDS guidelines.

The system is quite complex and covers a large number of data sources and types, which are all integrated and linked (see below). The main interface is web-based which accesses the cloud database and provides various ways to view and report on the data, including mapping that can plot positions of vessels, observers, etc. and provide information such as the catch on board or any other related information. The main data inputs to the system are the VMS data received from the vessels VMS service providers, information entered by national authorities, PNA, fishing companies, near real-time information entered by vessels or observers, plus it integrates information received from other regional organisations such as the Forum Fishery Agency (FFA) and the Secretariat of the Pacific Community (SPC). It virtually integrates all relevant tuna fishery related information.

Near real-time information is entered on-board vessels or at port via an Android application running on a tablet. This interface allows for the entry of catch information, manual positions, activity reports such as zone entry and exits, transshipment notifications, sightings, CDS information, full observer reporting, etc. The data can be entered and stored for later transmission when internet is available. For example, via Wi-Fi on board or in port, or by a satellite data transmission unit (the Delorme InReach SE which costs \$USD400 and has fairly inexpensive data plans). The application has a backup option with restore to a USB stick.

Clients of FIMS can choose to have information sent to national authorities and Regional Organisations. As an example of this, a fishing company could have its vessels registered with FIMS and use the Android application to enter logsheet and vessel activity information each day. Once information is submitted, the company verifies the information and which can then be forwarded to the national authorities that the company has selected in the FIMS notifications sections, who can then have the information sent to Regional Organisations. The information sent is tailored appropriately to suit the requirements of the recipient. This feature is very interesting since it has the potential to allow a company to satisfy all of its reporting obligations automatically, and is a reason why fishing companies that operate in the Pacific are signing up to FIMS.

There are too many features of the system to describe and they are less relevant to the CCSBT at this stage, but they do show the usefulness of an integrated system and an approach such as this is something that the CCSBT should seriously consider for the future.

System Users

- National Fisheries Authority of PNG
- PNA Office
- PNA Members
- Companies / associations in the tuna industry

Scope

Types of data that are integrated in the FIMS/iFIMS system:

- VMS
- VDS
- Licensing
- Logsheet data
- Observer management and observer trip data
- Port sampling data
- CDS data
- Asset tracking (FADs, observers, small craft)
- MCS
- Forum Fisheries Agency (FFA) vessel register

Developers and development environment

The FIMS development company is Quick Access Computing, a small company based in Australia that was established in 2003. Being a small company, they have less overhead costs than larger companies but perhaps pose a risk when it comes to longevity and continuity. When asked this question, Quick Access replied that the business of the company (which has

steady, regular income and long contracts) is such that there is no threat to its viability and they would simply replace staff whenever required.

Being a small team, the development environment is likely to be less formal than with a larger company. The lead developer is very experienced, however, and there is no reason to suspect that the project development is not robust and professionally done, although no review of the code has been done at this stage.

System Review

The Secretariat met with the FIMS developers, Quick Access, in August 2015 to get an overview of the system and have discussions on the CCSBTs requirements. The overview was relatively brief and included:

- Overview of FIMS Web interface which provides access to virtually all of the integrated data listed under the 'scope' section.
- Overview of FIMS Android applications for the electronic reporting of vessel catch, position and activity reports, CDS documents, and observer reporting.
- Technical discussions relating to the implementation and technologies used
- Discussions with the developers, including discussions on the feasibility of the system being used by the CCSBT.

User Interfaces

The main web interface looks a little basic and plain in terms of style, but it is functional and easy enough to use. Part of the reason for the plain interface has been to maintain compatibility across different web browsers by using basic features. FIMS is quite complex so training is required to use the system, depending on which features of the system are available.

Unlike the web interface, the Android applications are quite new and use a modern interface design that is clean and easy to follow, while also being quite powerful and comprehensive. The applications can function in four different languages at present, English, Japanese, Chinese, and Korea, with other languages easily added.

Some screenshots of the web-based FIMS interface and iFIMS Android application are shown in Attachment B.

Technical Implementation

The time available for the review of FIMS did not allow for any technical review, so there is not much information related to this. Since the system has been in use since 2008 it is safe to assume that it is functioning properly.

Documentation

Documentation is good with comprehensive user guides available for each of the FIMS interfaces. Training courses are conducted by Quick Access but the material and training environment for this has not been seen, but there is an online testing environment available.

Security

Security is well developed in FIMS and the developer estimates that 50% of the FIMS development effort has gone towards security. Encryption is used at a level appropriate for

banks, with ‘trip-wire’ security used on every page (so security is constantly verified) with full logging. No security breaches have occurred to date.

The setup of different types of users appears to be very flexible and already has a large number of different types of users with different levels of access, who can only see and perform actions appropriate to their role.

Technical Details

Item	Details	Comments
User interface platform – Main interface	Any web browser	No compatibility issues due to using minimum web standards
Database technology – Main interface	PostGres	
User interface platform – Android interface	Android tablet	Phones would work but would be too small
Database technology – Android interface	SQLite	
Main data server	Commercial Data Centre, located in Brisbane	The data centre has multiple internet connections using different providers, hourly backups, redundancy and full disaster recovery features. No downtime has been experienced to date.
Software development platform – Main interface	PHP	
Software development platform – Android interface	Android development SDK	
Website host	Commercial data centre	See notes above
Code ownership	Quick Access	

Considerations related to using the system for the CCSBT

While FIMS has the main elements required by a CCSBT eCDS, including CDS functionality, it would require significant modifications. The extent and cost of these could only be estimated with specifications of a CCSBT eCDS, but the FIMS framework and infrastructure is certainly a good base for such a system and would provide cost savings when compared to developing a completely new system, as well as being a tried and tested system.

Extra points:

- An Android application is a good solution for CDS but might require an additional solution in case of hardware failure, such as via a website.
- FIMS is willing to integrate with other systems, so could be considered as a component of, and/or data provider to, a different system.

Conclusions

The FIMS system goes well beyond the immediate requirements of the CCSBT, which is to implement an eCDS, but presents an integrated solution with electronic reporting that the CCSBT could definitely consider as a goal for the future.

Positives

- FIMS is well established, tested, and accepted by industry operating in the Pacific
- Security is strong and proven
- Data centre is good and is robust

- Combination of website and Android tablet interfaces works well
- Uses simple and inexpensive technologies and is not locked to specific devices
- No web browser compatibility issues
- Can use a cheap satellite data transmission unit when Wi-Fi/3G/4G are not available
- Service available to the industry as well as national authorities and regional organisations
- Data transfers to/from national authorities and regional organisations, and is willing to integrate with existing and new systems
- Running costs are paid for by fishing vessels
- Developers close to the Secretariat
- Multilingual

Negatives

- Code ownership has been kept by Quick Access
- Costs to modify could be high

Section 3: Other possibilities – FFA and Traceall

This section is by no means a complete list of alternatives, but presents two alternative solutions that are worth considering.

FFA

FFA has been providing support to their Members in the Pacific since 1979 in the areas of fisheries management, development, and operations. Its regional surveillance centre uses a combination of VMS, licensing, and other data for surveillance operations, but it has incorporated these data with national data and created online portals for its Members that have been integrated with data from SPC and FIMS. The online portal is built on a framework similar to that of FIMS described in section 2, and FFA has indicated its willingness to share this with other regional organisations and / or collaborate with further developments to it.

In addition, FFA is currently developing Android-based applications for Members which will be very similar in technology to the FIMS e-Reporting applications. The current focus of the FFA applications will be on Monitoring, Control and Surveillance (MCS) features but could easily be adapted to any other type of data such as CDS or logsheets, and would integrate with the web-based system.

If the FFA systems were considered suitable as a platform for an eCDS for the CCSBT then it could offer considerable cost benefits.

Traceall

Traceall is a company based in the UK that offers asset tracking and reporting solutions. They offer highly scalable solutions for e-Reporting and traceability, having been involved with the EU TraceFish project in 2001, tuna fishery traceability products for companies based in Fiji, electronic logsheet reporting, and more recently an electronic CDS for small fishers in collaboration with WWF that operates via mobile phones. The e-CDS will be used in the Philippines and allow online data collection from each fisherman, every day, which allows

for, amongst other things, catch validation and verification by government officials and local processors and buyers. Traceall have a well-developed global data transmission and storage system and can develop interfaces for any type of forms, although the exact cost of their services is unknown at this stage.

It is worth noting that WWF is not only involved in this e-CDS initiative but also the e-CDS system being developed by Quick Access in the Pacific, and the electronic observer reporting product of Quick Access, so WWF have some interest and experience with these products that might extend to other regions.

Section 4: Conclusions and recommendations

Both of the software systems reviewed in detail have the potential to be used as a base for an eCDS for the CCSBT. The ICCAT e-BCD system is specific for CDS and its functionality is close to what is required by the CCSBT. Despite this, it is expected that costs to modify the e-BCD would be significant and there are other issues to consider such as the developer's distance from the Secretariat. The FIMS system has much broader functionality and only the beginnings of an eCDS, but functionality for an eCDS for the CCSBT could be added relatively easily. The main issue against FIMS is the ownership of the code and data centres, which would most probably be kept with Quick Access. In addition to the e-BCD and FIMS, the other two systems presented, the FFA system and eCDS of Traceall, are also worth considering although less is known about these systems at this point in time.

The systems reviewed are quite different, and deciding which is the most appropriate for the CCSBT eCDS leads to a more fundamental question of what type of system and what types of data the CCSBT should adopt. In reviewing the FIMS and FFA systems, it became clear that the efficiency of electronic data collection and integration has enormous benefits. Data are collected once in near real-time, integrated with other relevant data, and can be used for many purposes, including reporting to regional organisations. The number of vessels using electronic reporting is increasing rapidly and has the potential to cover all fishing vessels in the near future, and is something that the CCSBT could plan to take advantage of. The CCSBT could plan for a system that is not only an eCDS but integrates other types of data, such as transshipments, catch and effort data, and perhaps data that would assist with monitoring of compliance. Electronic reporting is not only efficient in terms of time, since data can easily be collected at near real-time, but also offers significant cost savings.

As a trans-regional organisation that includes incidental catch, it is probably not feasible for the CCSBT to implement its own system similar to that of FIMS. What is more feasible is for Members to collect electronic data and integrate it in the manner of FIMS, and then automatically report from the integrated system to the CCSBT. In other words each Member would collect and integrate electronic data from its fishing fleets, in the manner it chooses, and report in near real-time to the Secretariat in a standard format. The CCSBT eCDS could then integrate with these systems. There is much to consider in a system such as this but it is perhaps the cheapest and most efficient solution in the long term, and is a model essentially proven by the FIMS system. Such a system would need to be planned in consultation and collaboration with Member's National Authorities and other Regional Organisations. The

system need not be developed fully straight away, but the framework could be developed that started as an eCDS and could be extended to accept other types of data in the future.

Regardless of which system the CCSBT might use as a base for its own eCDS, the cost of development is expected to be high and take considerable time. It will be important to finalise the specifications and design of system as much as possible before development begins in order to avoid the problems and escalating costs experienced by ICCAT with its e-BCD.

The following recommendations should be considered by the Extended Commission in relation to its possible implementation of an eCDS.

Recommendation 1: Complete the current CDS review (see paper CCSBT-CC/1510/09 – agenda item 4.2.2) before progressing further with investigations into an eCDS

In order to avoid some of the problems encountered by ICCAT during development of its e-BCD, the CDS review should be completed before progressing to the design stage since changes to the CDS during the design and development of an eCDS would be very costly and cause delays.

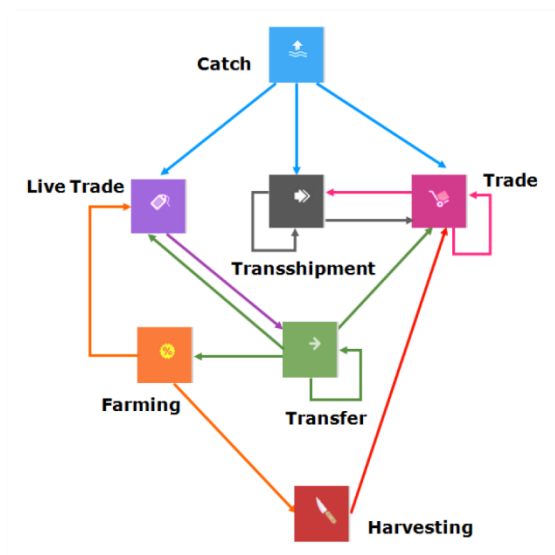
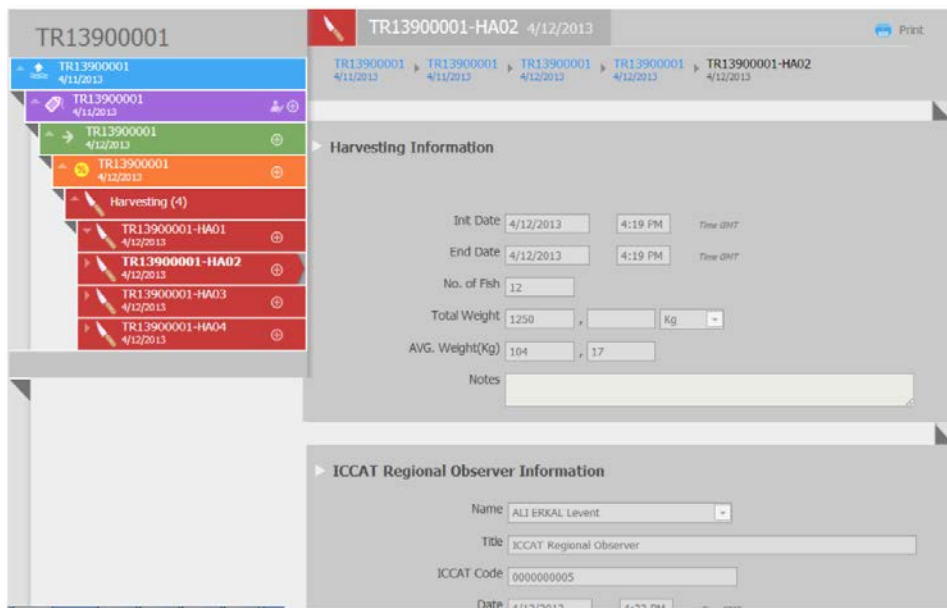
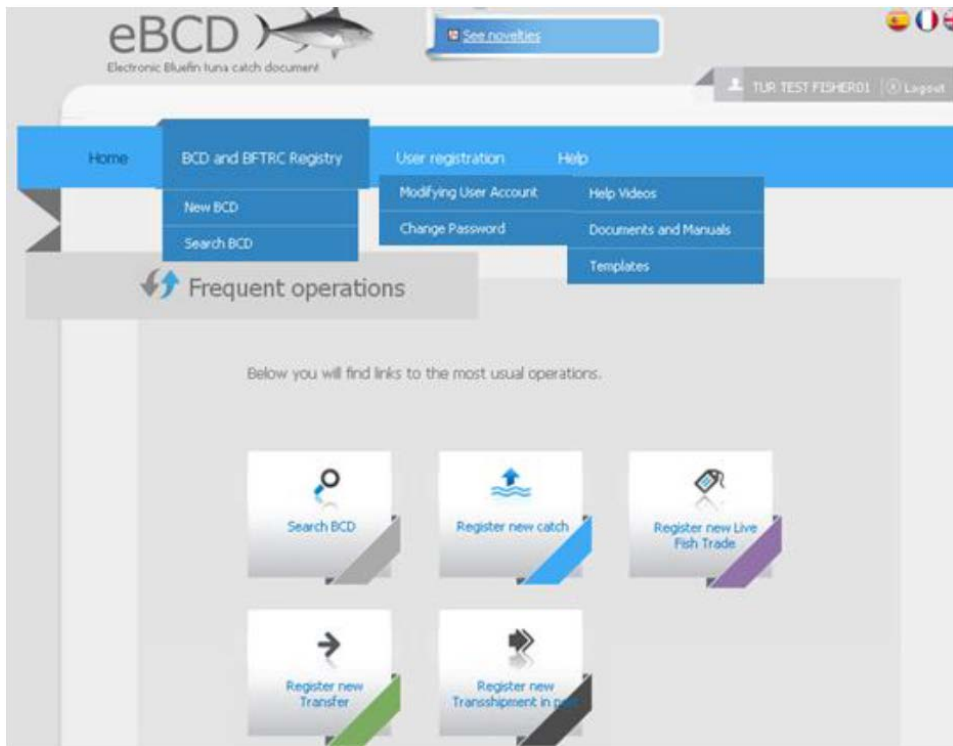
Recommendation 2: Give consideration as to whether the CCSBT would like a stand-alone eCDS or an integrated electronic data collection system before commencing the design specifications.

The FIMS and FFA systems prove the benefits of an integrated system that collects data electronically and links it together, both in terms of functionality and cost-effectiveness. Electronic reporting has already been adopted by a number of tuna fishing fleets and facilitates automatic reporting at all levels of the data chain. Agenda item 3.2.1 is concerned with data integration and efficiencies and is strongly linked to this recommendation and the development of an integrated system containing eCDS functionality.

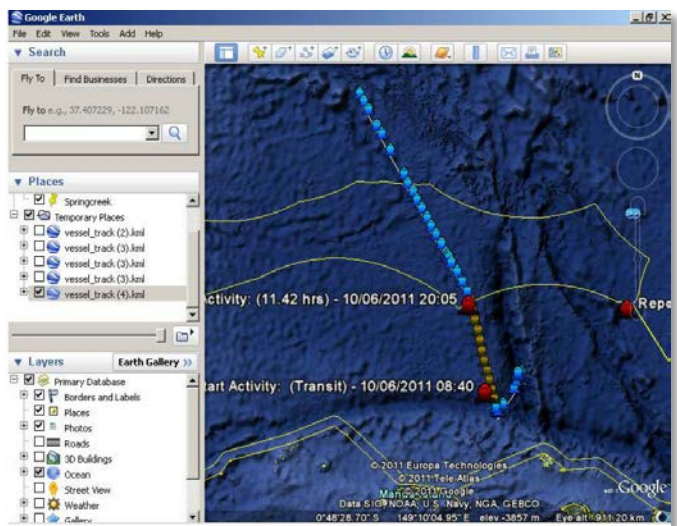
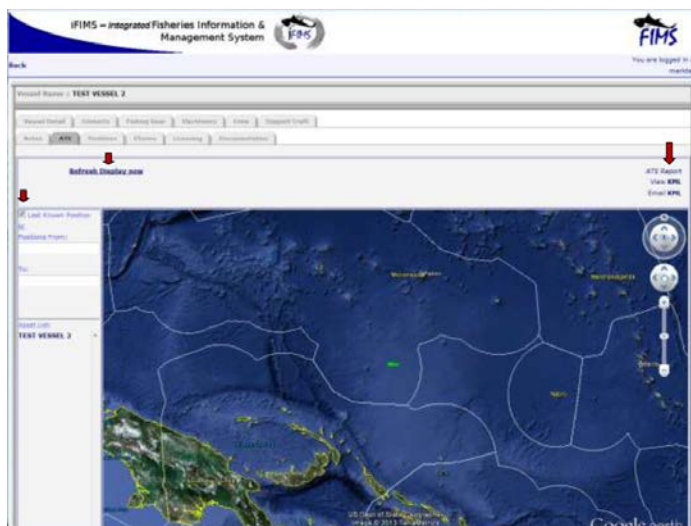
Recommendation 3: Design the eCDS or integrated system before investigating existing systems further

This recommendation follows from recommendations 1 and 2. Ideally, the CDS review and the study to examine systems/processes on CCSBT data collection and management (agenda item 3.2.1) would be completed first and then the design of the eCDS / integrated system could commence. Once the design is completed then the existing software systems could be investigated further. The data collection and management study could be fast-tracked in order to reduce the total time that this would take.

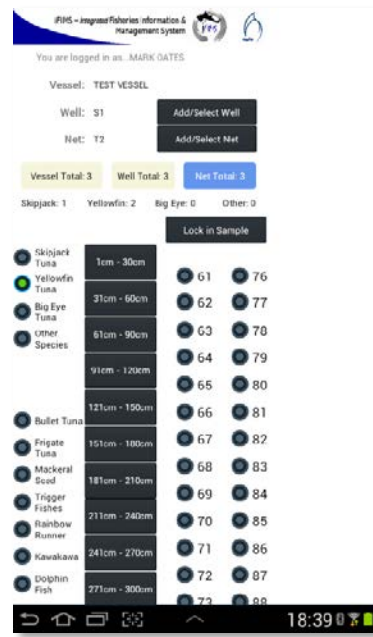
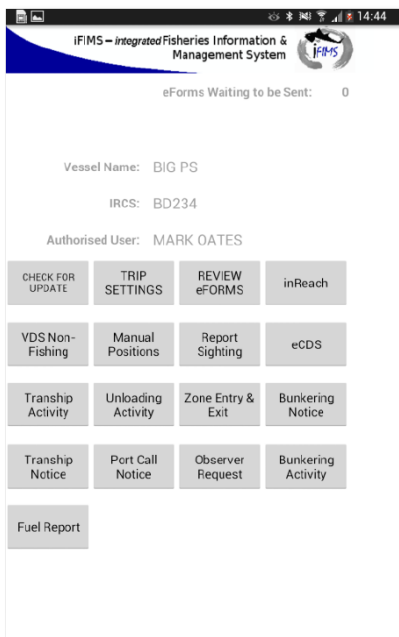
Attachment A – Sample screenshots and data flow diagram for ICCAT eBCD



Attachment B – Sample screenshots FIMS (top 3) and iFIMS (Android app – bottom 4)



Activity ID	Vessel Name	Activity Type	Start Date	End Date	Start Time	End Time	Latitude	Longitude	Depth	Speed	Heading	Altitude	Activity Status
11	TEST VESSEL 2	Primary Database	2011-06-10	2011-06-10	08:40	10:05	14.45	120.70	100	10	180	100	Active
12	TEST VESSEL 2	Primary Database	2011-06-10	2011-06-10	20:05	21:42	14.45	120.70	100	10	180	100	Active



Activity ID	Vessel Name	Activity Type	Start Date	End Date	Start Time	End Time	Latitude	Longitude	Depth	Speed	Heading	Altitude	Activity Status
11	TEST VESSEL 2	Primary Database	2011-06-10	2011-06-10	08:40	10:05	14.45	120.70	100	10	180	100	Active
12	TEST VESSEL 2	Primary Database	2011-06-10	2011-06-10	20:05	21:42	14.45	120.70	100	10	180	100	Active