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**Specification of a Database System to Manage and Facilitate Access of Information Covering  
(I) Bycatch and (Ii) Bycatch Mitigation  
on behalf of the Western and Central Pacific Fisheries Commission (WCPFC)**

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**WCPFC-SC3-2007/EB IP-2**

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**Specification of a Database System  
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(i) By-catch and (ii) By-catch mitigation  
on behalf of the  
Western and Central Pacific Fisheries Commission (WCPFC)**

## **1. Introduction**

The 2<sup>nd</sup> Regular Session of the Technical and Compliance Committee (TCC2) held in Brisbane, Australia, 28 Sept – 3 Oct 2006, agreed to allocate funds for a project to be conducted during 2007 entitled “By-catch Mitigation”. The project is intended to cover the following areas -

- a. Prepare a by-catch database, and
- b. Prepare an area on the WCPFC website dedicated to by-catch mitigation.

The main purpose of developing a “by-catch” database is to facilitate the organization and access of available information providing (i) an indication of the **species encountered** in WCPFC Fisheries, and (ii) a broad indication of the **frequency of encounters** of each species in WCPFC Fisheries.

The main purpose of developing a “by-catch mitigation” database is to facilitate the organization and access of available information on **mitigation measures or methods** relevant to the WCPFC Fisheries, the species they relate to, and how they are linked to WCPFC Decisions, where relevant.

The purpose of this document is to -

- Describe the constraints in the information available and assumptions made
- Provide an outline of the proposed structure of the “by-catch” and “by-catch mitigation” databases
- Provide a list of requirements for a database system to **manage** by-catch and by-catch mitigation information
- Provide a list of requirements for a system to **access** By-catch and By-catch mitigation information using a web-based query system
- Provide a rough schedule of the proposed work involved (**ANNEX C**)

It is acknowledged that the design of the database structure and web pages will be refined during the review, development and database-population phases of this project.

## 2. Background, constraints in the information available and assumptions made

It is acknowledged that observer data provide the only reliable means of obtaining indications on the extent of by-catch in WCPFC Fisheries. However, it is also acknowledged that the coverage of the observer data is currently very poor and insufficient to provide an absolute measure of frequency of encounters for most [by-catch] species in WCPFC Fisheries. It is not the intention of this initiative to provide a detailed breakdown of by-catch sourced from the available observer data, due to the current paucity of data. Instead, the extent of reporting can only, realistically, be restricted to providing a relative, or qualitative, estimate of the frequency of encounters in each of the WCPFC Fisheries, which is therefore the aim of this initiative.

In the longer term, observer data will be used to determine annual catch estimates of non-target (by-catch) species, and this initiative will cater for the storage of this level of information, once available. The dissemination of detailed observer data will not be covered in this initiative, but will be catered for elsewhere under the Commission's rules and procedures for the dissemination of tuna fishery data.

Mitigation measures are conceived and implemented to reduce unnecessary by-catch. This initiative aims to provide a facility which stores and organizes the "references" to work involved in the development, implementation and review of mitigation measures, and link them to WCPFC Decisions, where relevant. The intended databases (and web pages) will be designed to store "links" to information dealing with mitigation methods and studies, thereby avoiding duplication and recognizing/acknowledging the sources of the original work and information.

The following points provide further background in understanding the development of this initiative.

- This initiative will provide a relative, or qualitative, estimate of the frequency of encounters in each of the WCPFC Fisheries. The following categories have been assigned to provide a standardized measure of the frequency of encounters in WCPFC fisheries (adopted from Bailey et al., 1996).

### LONGLINE

- T - Usually a target or secondary target species for this fishery.
- A - Usually abundant, at least 1 per set on average
- C - Commonly taken, usually it would be expected that at least 1 of this species would be taken every 10 sets
- S - Seldom caught; taken on a few occasions but not considered common or rare in the catch; typically it would be expected that at least 1 of this species would be encountered every few months, 1 every 100 sets, or may only be taken at certain times of the year for that area (i.e. seasonal encounters in this fishery).
- R - Rarely taken; there may be only one taken per year, or for some species, one recorded occurrence only

### PURSE SEINE

- T - Target species for this fishery.
- A - Abundant, common in large numbers, usually > 100 per set on average
- C - Common in moderate numbers, usually 1-100 per set on average.
- S - Seldom caught, taken on a few occasions but not considered common or rare in the catch; typically it would be expected that at least 1 of this species would be encountered every month, 1 every 100 sets, or may only be taken at certain times of the year for that area (i.e. seasonal encounters in this fishery).
- R - Rarely taken, around 1 every 1,000 sets, or one recorded occurrence only.

- We have assumed that the species encounter information should be stratified by broad fishery within the WCPFC. In the longer term, when an adequate amount of observer data is available, presentation of the information at a higher resolution (i.e. annual catch estimates of non-target species by fleet) will no doubt become available. At this stage, the WCPFC Fisheries have been arbitrarily assigned as follows :

- LONGLINE
  - North Pacific ALBACORE Fishery
  - North Pacific SWORDFISH Fishery
  - Tropical/Subtropical BIGEYE/YELLOWFIN [Offshore - Shallow]
  - Tropical/Subtropical BIGEYE/YELLOWFIN [Offshore - Deep]
  - Tropical/Subtropical BIGEYE/YELLOWFIN [Distant-water]
  - South Pacific ALBACORE Fishery [Offshore]

- South Pacific ALBACORE Fishery [Distant-water]
  - South Pacific SWORDFISH Fishery
- PURSE SEINE
  - Tropical Unassociated-set
  - Tropical Associated-set
- POLE-AND-LINE
  - Tropical distant-water fishery
  - Tropical offshore fishery
- TROLL
  - North Pacific ALBACORE Fishery
  - South Pacific ALBACORE Fishery

There will be one or several Vessel Nationalities active in each WCPFC Fishery.

The WCPFC Scientific Committee (SC), Northern Committee (NC) and Technical and Compliance Committee (TCC) may consider reviewing and modifying this list of WCPFC Fisheries.

- There is a variety of work undertaken in regards to “Mitigation Measures” which need to be identified in the database and in the web-based query system. To facilitate the organization and dissemination of Mitigation Measure information, the following categories of "mitigation work" have been assigned –

- 1 - Development/proposal of mitigation method/measure
- 2 - Research and evaluation of the DESIGN of mitigation method/measure
- 3 - Implementation of mitigation method/measure
- 4 - Evaluation of the IMPACT of mitigation method/measure

The SC, NC and the TCC may consider reviewing and modifying this list.

- The structure and content of the Species Encounter data described herein is expected to evolve over the longer term as more observer data become available.
- Observer data have not been collected in some of the WCPFC Fisheries, so there won't be information on species encounters available from these fisheries as yet.
- The main WCPFC Databases have yet to be designed, but it is expected that the SPECIES database (described in this document at a basic level) will be one of the main reference tables.
- It may be useful to consider developing “synopses” web pages for the target species and species-of-special-interest on the WCPFC web site, as a separate project.

### **3. Data Model to support the management of the “By-catch” and “By-catch” mitigation databases**

ANNEX A describes the relationships between, and the attributes of, each entity in the proposed database.

The SPECIES table holds basic information, such as scientific and English name, on each species that are encountered in WCPFC Fisheries. [This table will also be one of the key reference tables available to other WCPFC databases systems, once they are developed]. The extent of records in this table will be determined by data collected by observers active in WCPFC Fisheries.

The SPECIES\_ENCOUNTER table contains a qualitative indication of the frequency of encounters of species broken down by gear and WCPFC fishery, determined from available observer data. There may not be any, or there may be one or many entries in this table for each entry in the SPECIES table. The SPECIES\_CATCH\_EST table contains the annual catch estimates (quantitative) of non-target species broken down by gear, WCPFC fishery, vessel nationality and year. There may not be any, or there may be one or many entries in this table for each entry in the SPECIES\_ENCOUNTER table. At this stage, it is expected that there will be very few entries in the SPECIES\_CATCH\_EST table due to the general poor coverage of observer data collection throughout the region, although some countries with adequate coverage may proceed to estimate the catches of non-target (by-catch) species and make them available to the Commission.

The SPECIES\_MITIGATION table holds information on mitigation measures related to a species or species group. For each species listed in the SPECIES table, there may be one or many entries in the

SPECIES\_MITIGATION table, or there may not be any entries in this table for particular species. Each entry in the SPECIES\_MITIGATION table contains a link to a broad mitigation method (stored in the MITIGATION\_METHOD table), an entry distinguishing whether the measure is for all members of the WCPFC, or an individual initiative by a member only, and a link to a WCPFC Decision, where relevant.

The MITIGATION\_METHOD table contains a description of a broad mitigation methodology and any reference, if appropriate. There may be one or many entries in this table for each entry in the SPECIES\_MITIGATION table – conversely, there may be one or many entries in the SPECIES\_MITIGATION table for each entry in the MITIGATION\_METHOD table.

The MITIGATION\_WORK table contains information on discrete work (classified as one the four categories assigned above) related to a mitigation methodology or measure – there may be one or many entries in this table for each entry in the MITIGATION\_METHOD table. The MITIGATION\_WORK table stores (i) the reference to any relevant publication, report, meeting paper or other document that describes the work related to the mitigation measure, (ii) an abstract of the work on the mitigation measure, and (iii) a hyperlink to the document/description of the work related to the mitigation measure (if available). This table caters for linking ongoing work on a particular mitigation measure and, thereby providing a chronological record of progress in developing/reviewing/improving a particular mitigation measure.

The WCPFC\_DECISION\_MIT table contains references and links [on the web site] to WCPFC Decisions on mitigation measures. There may not be any, or there may be one or many WCPFC decisions for each entry in the MITIGATION\_METHOD table.

The SPECIES\_ERA\_ATTR table holds the values for each Ecological Risk Assessment (ERA) attribute for each species encountered in the WCPFC Fisheries. There may not be any, or there may be one or many ERA\_REFERENCES for each entry in the SPECIES\_ERA\_ATTR table.

The SPECIES\_LOCAL table potentially holds the local names of species encountered in the WCPFC Fisheries for each WCPFC member, where relevant and different to the common [English] name stored in the SPECIES Table. There may not be any, or there may be one or many entries in this table for each entry in the SPECIES table.

The SPECIES\_UTILISATION table potentially holds a description of the fate and utilization of species in each of the WCPFC Fisheries. There may not be any, or there may be one or many entries in this table for each entry in the SPECIES table. [There may be consideration to add another level by vessel nationality at a later date.]

#### **4. Requirements for a system to maintain information on By-catch and By-catch Mitigation**

This system will be developed in a suitable RDBMS and will be used to enter data into the By-catch and By-catch mitigation databases. It is expected that the Commission will nominate person(s) to be responsible for managing the By-catch and By-catch mitigation data using the proposed database system. The system will comprise individual forms to enter information into the database -

- Details on each SPECIES encountered in the WCPFC Fisheries
- Details on MITIGATION METHODS, the work related to each method and where WCPFC Decisions have recommended that method (if relevant)
- Details and links to WCPFC\_DECISIONS
- SPECIES Local names
- SPECIES Encounter information
- SPECIES Annual Catch Estimates
- SPECIES ERA Attributes (this may include a facility to import data from existing databases)
- A form to specify what MITIGATION METHODS are to be applied to which SPECIES

Specifically, the following is required from this system :

1. The fields for the descriptions, references and hyperlinks on mitigation methods, mitigation work and WCPFC decisions must be able to support the storage of text in RTF (Rich Text format) and the fields must be able to support the ability to paste text previously copied from an external document or web page.
2. Each form must support the ability for the user to ADD, EDIT and DELETE records, ensuring appropriate referential integrity is enforced.
3. DELETE option will not be available for the SPECIES table at this stage.
4. Deletion of records from the SPECIES\_MITIGATION Table will not result in deletions from the corresponding reference tables.
5. The user will be asked to individually delete each MITIGATION WORK record within a MITIGATION METHOD before the method record can be deleted.
6. The deletion of records from the MITIGATION\_METHOD Table will not result in deletions from the WCPFC Decisions Table.
7. The SPECIES form will include a list of stored data, with the following facilities
  - To sort in alphabetical order for FAO Species code
  - To sort in alphabetical order for Common [English] name
  - To sort in alphabetical order for Scientific name
  - To sort in alphabetical order for Species Group name
  - To filter on a Species Group name entered by the user
8. The MITIGATION\_METHOD form will include a list of stored data, with the following facilities
  - To filter the Mitigation DESCRIPTION field on a keyword entered by the user
  - To filter the REFERENCE field on a keyword entered by the user
  - To filter on Gear entered by the user
9. On the MITIGATION\_METHOD form, on selecting a MITIGATION\_METHOD, there will be a list of MITIGATION WORK, with the following facilities
  - To filter the REFERENCE field on a keyword entered by the user
  - To filter the ABSTRACT field on a keyword entered by the user
  - To filter or sort by MITIGATION WORK Category
10. The WCPFC Decisions on Mitigation form will include a list of stored data, with the following facilities
  - To sort on chronological date the Decision was formally accepted
  - To filter the REFERENCE field on a keyword entered by the user
  - To filter the ABSTRACT field on a keyword entered by the user
11. The SPECIES LOCAL Names form will include a list of stored data, with the following facilities
  - To sort in alphabetical order for FAO Species code
  - To sort in alphabetical order for Common [English] name
  - To sort in alphabetical order for Scientific name
  - To sort in alphabetical order for Species Group name
  - To filter on a Species Group name entered by the user
12. The SPECIES ENCOUNTERS form will include a list of stored data, with the following facilities
  - To sort in alphabetical order for FAO Species code
  - To sort in alphabetical order for Common [English] name
  - To sort in alphabetical order for Scientific name
  - To sort in alphabetical order for Species Group name
  - To filter on a Species Group name entered by the user
  - To filter on WCPFC Fishery name entered by the user
13. The SPECIES\_CATCH\_EST form will include a list of stored data, with the following facilities
  - To sort in alphabetical order for FAO Species code
  - To sort in alphabetical order for Common [English] name
  - To sort in alphabetical order for Scientific name
  - To sort in alphabetical order for Species Group name
  - To filter on a Species Group name entered by the user

- To filter on WCPFC Fishery name entered by the user
  - To filter on Year in addition to any of the filters described above
  - To filter on Vessel Nationality in addition to any of the filters described above
14. The SPECIES\_ERA\_ATTR form will include a list of stored data, with the following facilities
- To sort in alphabetical order for FAO Species code
  - To sort in alphabetical order for Common [English] name
  - To sort in alphabetical order for Scientific name
  - To sort in alphabetical order for Species Group name
  - To filter on a Species Group name entered by the user
  - To filter on a particular ERA Attribute
15. The SPECIES\_MITIGATION form will include a list of stored data, with the following facilities
- To sort in alphabetical order for FAO Species code
  - To sort in alphabetical order for Common [English] name
  - To sort in alphabetical order for Scientific name
  - To sort in alphabetical order for Species Group name
  - To filter on a selected Species
  - To sort by Mitigation Methods
  - To filter on a selected Mitigation Method

## 5. Requirements for a web-based query system to extract By-catch and By-catch mitigation information

A query facility will be developed using the web pages on the Commission web site system to access the By-catch and By-catch mitigation information stored and managed in the RDBMS specified above. **ANNEX B** provides examples of what the web-based query system might look like in appearance. The web-based query system will comprise the following forms/facilities used to extract information from the By-catch and By-catch mitigation databases –

- List the references for a selected Mitigation Measure
- List Mitigation Measures by a selected species groups or species
- List Species groups and/or species that are covered by a selected Mitigation Measure
- List Mitigation Measures covered by [a selected] WCPFC Decisions
- List Mitigation Measures covered by a selected Gear type
- List Mitigation Measures undertaken by a selected Entity
- List Entities involved in applying a selected Mitigation Measure
- List Species Groups and/or species covered by [a selected] WCPFC Decisions
- List Species, Encounter rate, annual catch estimates (and notes on the quality of estimates) for a selected WCPFC Fishery
- List WCPFC Fisheries, Species, Encounter rate, annual catch estimates (and notes on the quality of estimates) for a selected Species Group
- List Species (ERA attributes and references on the source of information for each attribute related to that species) for a selected WCPFC Fishery
- List Species local names, for a selected species group or species
- List values for all species for a selected ERA Attribute

Specifically, the following is required from this system :

1. The fields for the descriptions, references and hyperlinks on mitigation methods, mitigation work and WCPFC decisions presented on the web pages will retain the format stored in the database. The user must be able to extract these data (for example, via COPY/PASTE), retaining the RTF-type format. The information extracted should be presented in tabular form.
2. Pull-down or Combo-box type lists should be used for -
  - Species Groups

- Species
  - Gear
  - WCPFC Fisheries
  - Entities (e.g. CCMs)
  - Category of Mitigation Measure
3. Where used, the selection of a “Species Groups” entry will be used to filter the “Species” list.
  4. Where used, the selection of a Mitigation Method will filter the information presented in the following tables
    - SPECIES\_MITIGATION
    - MITIGATION\_METHOD
    - MITIGATION\_WORK
    - WCPFC\_DECISIONS
  5. Where used, the selection of a WCPFC Fishery will be used to filter the SPECIES\_ENCOUNTER information presented.
  6. Where used, the selection of a WCPFC Fishery, Gear and/or Vessel Nationality will be used to filter the SPECIES\_CATCH\_EST information presented.
  7. Where used, the selection of Species or “Species Group” will be used to filter the SPECIES\_ERA\_ATTR information presented.
  8. There should be facilities to -
    - Export the extracted data to an MS WORD document
    - Export the extracted data to an MS EXCEL file
    - Print the extracted data

## References

- BAILEY, K.N., WILLIAMS P.G. & ITANO DG (1996). By-catch and discards in the Western Pacific tuna fisheries: A review of SPC Data Holdings and Literature. Oceanic Fisheries Programme (OFP). **OFP Technical Report 34**. Secretariat of the Pacific Community (SPC), Noumea, New Caledonia.

ANNEX A - BY-CATCH and BY-CATCH MITIGATION DATABASE STRUCTURE

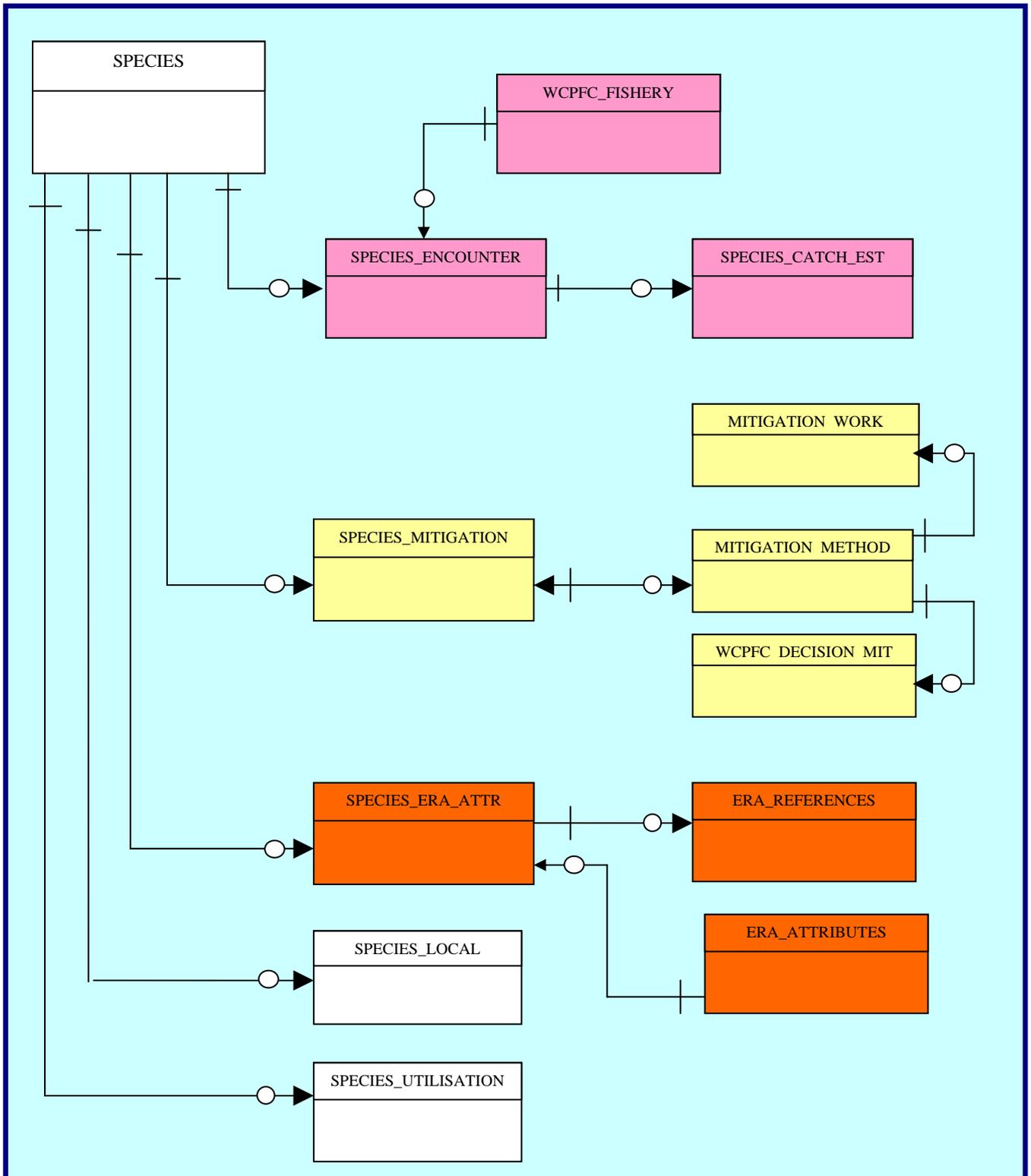


Figure 1. Diagram showing the proposed entities and relationships used to support the WCPFC By-catch and by-catch mitigation databases

## Database Table : SPECIES

The SPECIES table contains basic information on each species encountered in fisheries under the jurisdiction of the WCPFC. The WCPFC SPECIES Table is one of several 'global' reference databases that will be accessed by other databases systems maintained by the WCPFC. It is expected that the structure of this table proposed here will be similar to that eventually defined by the commission.

Considerations :

- The FAO three-letter species codes will be used
- The species, or species group, included in this database will be restricted to those that are target, By-catch or interact with fishing gears under the jurisdiction of the WCPFC.
- Species groups (e.g. at the GENUS or FAMILY level) will be included at the same level as species in this table. There is no intention to have a sophisticated structure in this database to handle hierarchy, i.e. PHYLUM-ORDER-FAMILY-GENUS-SPECIES (this simple structure proposed is in line with the FAO Species database).

Field Name	Data Type	Description
SP_ID	Text[3]	FAO Species Code (uniquely identifying the species or species group)
SP_SCI_NAME	Text[50]	Scientific Name
SP_NAME	Text[50]	Common, English name, as per FAO Species list
SP_GROUP_ID	Text[3]	Species GROUP used for convenience  TUN - Tuna species BIL - Billfish species TTX - Marine Turtles BRD - Sea birds SHK - Sharks and Rays OTH - Other species
SP_CAT_ID	Text[3]	Category level of this record  SPS - Species level GEN - Genus level FAM - Family level

### Database Table : SPECIES\_MITIGATION

The SPECIES\_MITIGATION table contains information on the mitigation measures that are directed to the management of a species encountered in the WCPFC Fisheries. The mitigation method could be directed to the management of a species as a result of a Commission decision, or may be an initiative at National level, or for another reason. There is provision to include mitigation measures used outside the jurisdiction of the WCPFC that are relevant to species of interest to the WCPFC.

**Note that Mitigation methods can, indirectly, apply to all by-catch species, but this Table should only contain links of the main species relevant to that mitigation measure.**

There may be one or many different mitigation measures directed to the management of a species encountered in the WCPFC Fisheries.

Considerations :

- There may be more than one instance (record) of a species/mitigation method combination when, for example, a country has a different application of a mitigation method than the WCPFC. The NOTES field would clarify these instances in each case.

Field Name	Data Type	Description
SP_ID	Text[3]	FAO Species Code [Link to SPECIES Table]
SP_MIT_ID	Number[7]	Unique, internal identifier for this table.
MIT_METH_ID	Number[7]	Link to the description of a "Mitigation Method" relevant to this species
MIT_Entity	TEXT[50]	The entity that this mitigation measure/development is related to.  Essentially, this will be the "WCPFC" which covers the members of the Commission, or may be a particular CCM, if they have established a National Plan of Action (NPOA) for a species of special interest, for example. This could also include other RMFOs, NGOs. For example, an NGO project may be directed towards a species that the Commission is yet to consider.  [This field could be a link to an ENTITY Database, if established].
NOTES	Memo	Comments/Notes relevant to this particular Species Mitigation Method.

### Database Table : MITIGATION\_METHOD

The MITIGATION\_METHOD table contains a description and reference (if available) to a broad mitigation methodology or measure.

Field Name	Data Type	Description
MIT_METH_ID	Number[7]	Unique MITIGATION_METHOD identifier. Relevant to a particular mitigation measure.
MIT_METH_DESC	MEMO	Brief description of the broad Mitigation Methodology..
MIT_GR_ID	Text[1]	Fishing Gear that this Mitigation method is related to. (May be pertinent to "all" gears ?)
MIT_METH_REF	MEMO	Reference to the relevant Publication, Report, Meeting Paper, etc. describing broad Mitigation methodology
MIT_METH_LINK	TEXT[50]	Hyperlink to relevant description of broad Mitigation methodology, if available

**Database Table : MITIGATION\_WORK**

The MITIGATION\_WORK table contains references to specific work done to develop, implement, evaluate, review and improve mitigation measures.

Considerations :

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Field Name	Data Type	Description
MIT_WORK_ID	Number[7]	Unique MITIGATION WORK identifier. Relevant to a particular piece of work on mitigation measure.
MIT_METH_ID	NUMBER[7]	A link to the broad Mitigation methodology (in MITIGATION_METHOD).
MIT_WORK_DATE	DATE	A reference date for this work to put it in perspective with other "work" undertaken with respect to this MITIGATION_METHOD.
MIT_WORK_CAT_ID	NUMBER[2]	To facilitate the organization and dissemination of work on Mitigation Measures, the following categories of "mitigation work" have been assigned -  1 - Development/proposal of mitigation method/measure 2 - Evaluation of the DESIGN of mitigation method/measure 3 - Implementation of mitigation method/measure 4 - Evaluation of the IMPACT of mitigation method/measure  This field stores the category relevant to this particular "Mitigation Work"
MIT_MEAS_REF	MEMO	Reference to the relevant Publication, Report, Meeting Paper, etc. describing the discrete mitigation work
MIT_MEAS_ABS	MEMO	Abstract of the work on Mitigation.
MIT_MEAS_LINK	TEXT[50]	Hyperlink to the discrete work on Mitigation measure, if available

**Database Table : WCPFC\_DECISION\_MIT**

The WCPFC\_DECISION table contains references to the decisions made by the commission in respect of mitigation measures for CCMs.

Considerations :

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Field Name	Data Type	Description
WCPFC_DEC_ID	Number[7]	Unique identifier for each WCPFC Decision made in respect of mitigation measures.
MIT_METH_ID	Number[7]	Link to the relevant MITIGATION METHOD identifier.
WCPFC_DEC_REF	MEMO	Reference to the WCPFC Decision.
DEC_DATE	DATE	Date that the WCPFC Decision relating to a mitigation measure was made
WCPFC_DEC_ABS	MEMO	Abstract of WCPFC Decision
WCPFC_DEC_LINK	TEXT[50]	Hyperlink to relevant Decision text on the commission web site

**Database Table : SPECIES\_LOCAL**

The SPECIES\_LOCAL table contains the common names of species in languages other than English. The local names of species in each country of Commission Members may be stored in this database table for reference.

Considerations :

- Request each country to provide common names for each species (provide species list with scientific name)

Field Name	Data Type	Description
SP_ID	Text[3]	FAO Species Code [Link to SPECIES Table]
LANG	Text[50]	Language / Nationality
SP_LOCAL	Text[50]	Common name in that Language

**Database Table : SPECIES\_ENCOUNTER**

The SPECIES\_ENCOUNTER table contains a qualitative estimate of the encounter frequency for each species broken down by fishery.

Field Name	Data Type	Description						
SP_ENC_ID	NUMBER[7]	Unique identifier for each Species Encounter record. [Internal use only]						
SP_ID	Text[3]	FAO Species Codes						
GR_ID	MEMO	Gear identification (L-Longline; P-Pole-and-line; S-Purse seine)						
FISHERY_ID	NUMBER[5]	<p>Link to Fisheries defined for the WCPFC Conventional Area.</p> <p><u>LONGLINE</u></p> <p>North Pacific ALABCORE Fishery                      North Pacific SWORDFISH Fishery                      Tropical/Subtropical BIGEYE/YELLOWFIN [Offshore - Shallow]                      Tropical/Subtropical BIGEYE/YELLOWFIN [Offshore - Deep]                      Tropical/Subtropical BIGEYE/YELLOWFIN [Distant-water]                      South Pacific ALABCORE Fishery [Offshore]                      South Pacific ALABCORE Fishery [Distant-water]                      South Pacific SWORDFISH Fishery</p> <p><u>PURSE SEINE</u></p> <p>Tropical Unassociated-set                      Tropical Associated-set</p> <p><u>POLE-AND-LINE</u></p> <p>Tropical distant-water fishery                      Tropical offshore fishery</p> <p><u>TROLL</u></p> <p>North Pacific ALABCORE Fishery                      South Pacific SWORDFISH Fishery</p>						
ENC_RATE	TEXT[1]	[Qualitative] indication of the encounter frequency of this species within each fishery, based on available observer data. (categories taken from "Bailey et al., 1996")						
		<table border="1"> <thead> <tr> <th><u>LONGLINE</u></th> <th></th> </tr> </thead> <tbody> <tr> <td>T</td> <td>Usually a target or secondary target species for this fishery.</td> </tr> <tr> <td>A</td> <td>Usually abundant, at least 1 per set on average</td> </tr> </tbody> </table>	<u>LONGLINE</u>		T	Usually a target or secondary target species for this fishery.	A	Usually abundant, at least 1 per set on average
		<u>LONGLINE</u>						
T	Usually a target or secondary target species for this fishery.							
A	Usually abundant, at least 1 per set on average							

		C	Commonly taken, usually it would be expected that at least 1 of this species would be taken every 10 sets
		S	Seldom caught; taken on a few occasions but not considered common or rare in the catch; typically it would be expected that at least 1 of this species would be encountered every few months, 1 every 100 sets, or may only be taken at certain times of the year for that area (i.e. seasonal encounters in this fishery).
		R	Rarely taken; there may be only one taken per year, or for some species, one recorded occurrence only
		<u>PURSE SEINE</u>	
		T	Target species for this fishery.
		A	Abundant, common in large numbers, usually > 100 per set on average
		C	Common in moderate numbers, usually 1-100 per set on average.
		S	Seldom caught, taken on a few occasions but not considered common or rare in the catch; typically it would be expected that at least 1 of this species would be encountered every month, 1 every 100 sets, or may only be taken at certain times of the year for that area (i.e. seasonal encounters in this fishery).
		R	Rarely taken, around 1 every 1,000 sets, or one recorded occurrence only.
QUAL_NOTES	MEMO		Quality of the estimate of encounter rate listed in ENC_RATE. This field may store the coverage of observer activities over time, or some other description to put the value of ENC_RATE into perspective.  <u>This might be better handled by having a general observer data coverage field associated with WCPFC_FISHERY.</u>
ENC_REF	MEMO		List of references (with hyperlinks, if available) to specific analyses that have been undertaken that provide a more precise indication of the catch level of this species in this fishery.

### Database Table : SPECIES\_CATCH\_EST

The SPECIES\_CATCH\_EST table contains the annual catch estimates (metric tonnes and/or number of individuals) of non-target species broken down by Gear, WCPFC fishery, Vessel Nationality (if available) and Year.

Field Name	Data Type	Description
SP_CATEST_ID	NUMBER[7]	Unique identifier for each Species Catch Estimate record. [Internal use only]
SP_ENC_ID	NUMBER[7]	Link to the SPECIES ENCOUNTER INFORMATION (which contains the Species, Gear type and WCPFC Fishery)
FLAG_ID	TEXT[2]	Vessel Nationality (where relevant, or can be blank which refers to annual catch estimates determined for the entire Fishery - all flags - as referred to in the linked SPECIES ENCOUNTER information]
YY	NUMBER[4]	Year that the annual catch estimate refers to.
CATCH_MT	NUMBER[7]	Catch estimate (metric tonnes), where relevant, refer to Catch_units
CATCH_NO	NUMBER[10]	Catch estimate (numbers of individuals) , where relevant, refer to Catch_units
CATCH_UNITS	TEXT[1]	C - Catch in metric tonnes only provided N - Catch in numbers only provided B - Catch in both MT and numbers provided
CATEST_REF	MEMO	List of reference(s) (with hyperlinks, if available) to work involved in determining the annual catch estimates for this species taken in the WCPFC Fishery by the Gear/Vessel nationality. [This could be handled by a link to a CATCH_EST_REF tables ...]

**Database Table : SPECIES\_ERA\_ATTR**

The SPECIES\_ERA\_ATTR table contains the ERA attributes for species encountered in WCPFC fisheries.

Field Name	Data Type	Description
SP_ERA_ID	NUMBER[7]	Unique identifier for each Species ERA attribute record. [Internal use only]
SP_ID	TEXT[3]	FAO Species code (link to SPECIES database)
ERA_ATTR	NUMBER[4]	Link to the ERA_ATTRIBUTE Table, which contains a description of each ERA Attribute
ERA_ATT_VALUE	TEXT[15]	The value of the ERA Attribute. The value can be a number or text, but is stored in a Text field.
ERA_ATTR_REF_ID	NUMBER[7]	Link to the ERA_REFERENCE table whci indicates the Reference to the source of information of this species ERA Attribute Value.

**Database Table : ERA\_REFERENCE**

The ERA\_REFERENCE table contains the References to the source of each Species/ERA attribute value found in the SPECIES\_ERA\_ATTR table.

Field Name	Data Type	Description
SP_ERA_ID	NUMBER[7]	Link to the SPECIES_ERA_ATTR database table
ERA_ATTR_REF_ID	NUMBER[7]	Unique identifier for each Reference to the source of a species ERA attribute value. [Internal use only]
SP_ID	TEXT[3]	FAO Species code (link to SPECIES database)
ERA_REF	MEMO	A reference, hyperlink and/or description of the source of one or many ERA attribute values.

**Database Table : SPECIES\_UTILISATION**

The SPECIES\_UTILISATION table contains information on the utilization of species caught in WCPFC fisheries.

Considerations :

- An additional level for Vessel nationality could be added to this table at a later date.
- Also consider adding specific fields for "Retained", "Discarded"
- Target vs By-catch ?

Field Name	Data Type	Description
SP_ID	Text[3]	FAO Species Code [Link to SPECIES Table]
GR_ID	MEMO	Gear identification (L-Longline; P-Pole-and-line; S-Purse seine)
FISHERY_ID	NUMBER[5]	<p>Link to Fisheries defined for the WCPFC Conventional Area.</p> <p><b><u>LONGLINE</u></b></p> <p>North Pacific ALABCORE Fishery            North Pacific SWORDFISH Fishery            Tropical/Subtropical BIGEYE/YELLOWFIN [Offshore - Shallow]            Tropical/Subtropical BIGEYE/YELLOWFIN [Offshore - Deep]            Tropical/Subtropical BIGEYE/YELLOWFIN [Distant-water]            South Pacific ALABCORE Fishery [Offshore]            South Pacific ALABCORE Fishery [Distant-water]            South Pacific SWORDFISH Fishery</p> <p><b><u>PURSE SEINE</u></b></p> <p>Tropical Unassociated-set            Tropical Associated-set</p> <p><b><u>POLE-AND-LINE</u></b></p> <p>Tropical distant-water fishery            Tropical offshore fishery</p> <p><b><u>TROLL</u></b></p> <p>North Pacific ALABCORE Fishery            South Pacific SWORDFISH Fishery</p>
SP_UTIL	MEMO	Details on the utilization of this species in this fishery. The details could include commercial versus local consumption. How the species is processed, etc. Markets, etc.

ANNEX B

Example of the proposed design of the web-based query interface for By-catch encounters

**Western and Central Pacific Fisheries Commission**

**BY-CATCH  
in WCPFC Fisheries**

Select Species Group	<input type="text" value="Marine Turtles"/>
Select Species	<input type="text" value="GREEN TURTLE"/>
Select Species (Scientific)	<input type="text" value="Chelonia Mydas"/>
Select Gear	<input type="text" value="LONGLINE"/>
Select Fishery	<input type="text" value="Tropical/Subtropical BIGEYE/YELLOWFIN [Offshore - Shallow]"/>

**QUALITY OF ENCOUNTER ESTIMATE**

Coverage of observer data in this fishery is currently poor [< 1%]

**ENCOUNTER CATEGORY "S"**

Seldom caught; taken on a few occasions but not considered common or rare in the catch; typically it would be expected that at least 1 of this species would be encountered every few months, 1 every 100 sets, or may only be taken at certain times of the year for that area (i.e. seasonal encounters in this fishery)

Example of the proposed design of the web-based query interface for By-catch Mitigation information

**Western and Central Pacific Fisheries Commission**

## BY-CATCH MITIGATION

### List of references (work) for a selected MITIGATION MEASURE

Select Mitigation Method Deep-set LONGLINE set Technique ▾

Show brief description of Mitigation Method

Show Categories of Mitigation work

Show references

Category	Reference	Hyperlink
1	Beverly, S. (2001) A new technique for reducing bycatch and improving catch rates of Bigeye tuna. SPC." [with an abstract and hyperlink to document on the web, if available, etc.]	<a href="#">Beverly (2001)</a>
1	WWF (2002) Report on the WWF Prizes - A new technique for reducing bycatch and improving catch rates of Bigeye tuna. WWF."	<a href="#">WWF (2002)</a>
2	Beverly, S. (2003a) Trip report on Princess 106 to test the Deep-set longlining technique. SPC."	<a href="#">Beverly (2003a)</a>
4	Beverly, S. (2003b) A review analysing the success of the Deep-set longlining technique on reducing bycatch. SPC."	<a href="#">Beverly (2003b)</a>
3	NFRMA. (2004) New Nauru Licensing conditions - enforcement of the Deep-set longlining technique."	<a href="#">NFMRA (2004)</a>
2	Beverly, S. and B. Molony (2005) Improving the deep-set longlining technique. SPC."	<a href="#">Beverly and Molony (2005)</a>
3	WCPFC. (2006) WCPFC Commission Decisions. Section 4. Commission Decisions related to Bycatch Mitigation. Fourth Regular Meeting of the WCPFC. Pitcairn. 2-4 April 2006. pp 123-127"	<a href="#">WCPFC (2006)</a>

## ANNEX C

### Proposed schedule of work

Task	Estimated time (man-weeks)	Priority	Responsible
1. Decision on RDBMS and finalization of database structures	< 1	HIGH	
2. Create database system to store and maintain data	3-4	HIGH	
3. Populate SPECIES table based on current regional OBSERVER database.	< 1	HIGH	
4. Populate SPECIES_MITIGATION, MITIGATION_METHOD and MITIGATION_REVIEW tables with information from past SC and SCTB meetings	2-3	HIGH	
5. Populate SPECIES_ENCOUNTER table with information from current regional OBSERVER database.	2-3	HIGH	
6. Design and develop the web pages for handling " <u>By-catch Encounters and By-catch Mitigation</u> " queries by accessing relevant databases	3-4	HIGH	
7. Populate the SPECIES_UTILISATION table with information from various sources.	??	LOW	Specific project ?
8. Populate SPECIES_LOCAL table with local names of fish from CCMs	??	LOW	Specific project ?
9. Populate SPECIES_MITIGATION, MITIGATION_METHOD and MITIGATION_REVIEW with information relevant to the WCPFC, but obtained from other RFMOs, NGOs, etc.	ONGOING	LOW	Specific project ?
10. Design and develop the web pages for handling " <u>Non-target Species annual catch estimates and ERA Attributes</u> ".	??	??	
11. Populate SPECIES_ERA_ATTR tables	ONGOING	??	Alistair Hobday, David Kirby
12. Populate SPECIES_CATCH_EST table	ONGOING	??	CCMs to provide annual catch estimates ?