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FiMES

Introduction to the Fisheries Metadata Element Set

Management Summary

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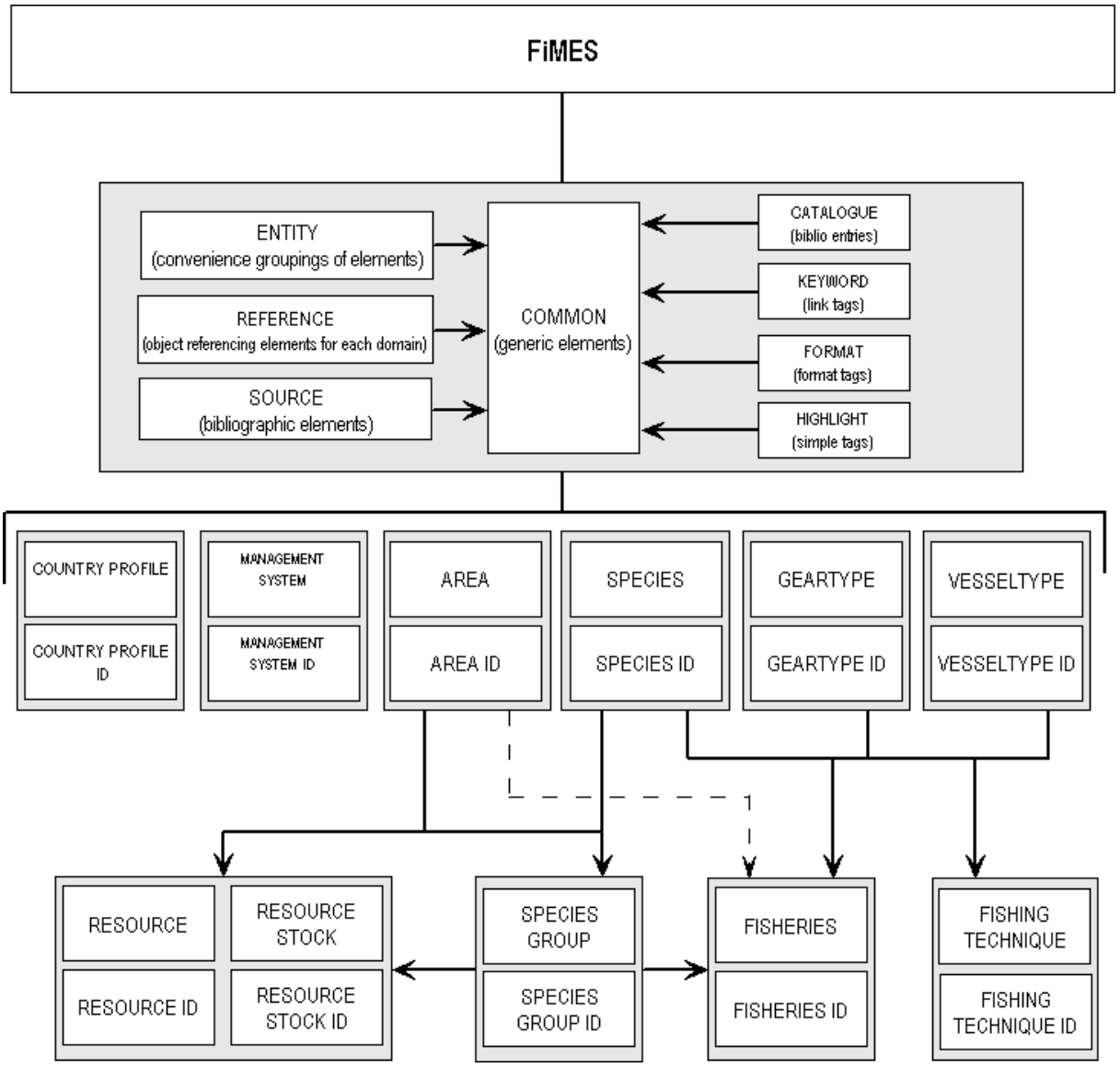
INTRODUCTION

The aim of this document is to give a basic understanding of the structural design and standards behind the Fisheries Metadata Element Set (FiMES); a proposed element set that defines topic trees, branches and leaves for fisheries data.

The element set has been designed in response to FAO Fisheries Web-based data encoding needs. Various fisheries information domains (species, stocks, vessel types, etc.) have been examined and topic trees developed. FiMES has been tested within FAO and by several FIRMS partner programmes.

FiMES is a proposed open-ended standard that easily accommodates and incorporates new fisheries domains. Any domain within FiMES has access to a common pool of elements, and may be designed to include access to the specialised structures of other member domains.

Below is an example of the overall hierarchy and some of the domains found in FiMES:



1. FIMES DESIGN CONCERNS

- FiMES must comply with the Dublin Core Initiative, an international ISO standard for tagging metadata (data describing data.)
- FiMES must meet requirements for implementation by reflecting the needs of database managers, web designers, etc.
- FiMES must meet requirements of those that use it for input, and thus should not be too complicated or cumbersome to use when formatting data and/or documents.
- FiMES must use standardised terminology and structures.
- FiMES must be compliant with existing terminology and standards for the information domains it serves.
- FiMES must be modular and open-ended.
- FiMES must be human-readable.

2. FIMES TYPES

FiMES is organised into common hierarchical categories. The guiding concept is standardisation and ease-of-maintenance. The diagram on the previous page illustrates the structure.

2.1 FiMES

FiMES is the umbrella for all sub elements.
It is an open container that may contain any number of different fisheries domains.
Domains may be nested or in series as data requires.

- This structure allows for the quick creation of structured hybrid documents/data models without changing the existing structure.

2.2 COMMON

- All generic elements that are of use to multiple domains are put in the common module. This applies to both simple and container elements.
- The common module reduces the size of each domain module while helping to encourage the use of standard structure and terminology across domains.
- To simplify maintenance and enhance modularity the common module is further subdivided into entity, keyword, highlight, format, catalogue, reference and source modules.

2.3 ENTITY

- This module contains convenience groups of elements that are used in multiple container elements, e.g. formatting elements, keyword elements, highlighting elements, ISO definitions, etc.
- It is a subset of the common module.

2.4 KEYWORD

- All the simple elements used to tag linking keywords are contained within this module.
- It is a subset of the common module.

2.5 HIGHLIGHT

- All the simple elements used to highlight keywords and phrases are contained within this module.
- It is a subset of the common module.

2.6 FORMAT

- All the simple elements used to format documents, including the IMAGE tag, and low-level SOURCE elements are contained within this module.
- It is a subset of the common module.

2.7 SOURCE

- All the elements that identify the origin, location or ownership of FIGIS data, or data used by FIGIS or others in creating FIGIS objects are contained within this module.
- It is a subset of the common module.

2.8 CATALOGUE

- All the entities that contain repeatedly used bibliographic references are contained within this module.
- It is a subset of the common module.

2.9 REFERENCE

- This module contains the group of reference elements, each of which refers to a specific domain, and contain all the classification codes for that domain. They allow for precise linking to fisheries objects.
- It is a subset of the common module.

2.10 IDENT

- Each domain must have an IDENT module. The IDENT module contains the core set of identifying elements and attributes for that domain.
- It should only be used when the desire is to create a new FIGIS object. When in use for a document, it indicates that a FIGIS object exists or will be created for that document.
- It should be useable by the system to positively identify/locate the object it identifies in all situations.

- Each IDENT domain also includes the SOURCE container for the precise identification of the source materials from which the object was created.
- As some domains are compounds of others, e.g. Stock = Species + Area, the identifying elements in the IDENT may be REF elements (instead of the domain's own classification codes) that precisely define fisheries objects found in *other* domains.
    1) The compound of these foreign domain objects creates the new domain object.
    2) In these cases, the REF elements will be required to appear at least once, and to contain a classification value that links them clearly to their respective fisheries objects
    3) There may be cases in which these classification values are new, other, and/or local only and do not correspond to existing internationally accepted classification systems. As far as possible, international and local standards will be used in conjunction.

2.11 DOMAIN

- There is a different module for every recognisable fisheries domain, developed as need and time permits.
- Each module should meet the needs of a wide variety of uses within that domain.
- Each domain module drives specific behaviour for its immediate content and elements. This is true overall, as content is always taken within the context in which it's found.
- Each domain module has the following basic structure:
    1) IDENT -- A separate linked module, it contains a core set of identifying and system elements that precisely identify a FIGIS object using as many classification systems as possible. If the domain is of version LITE it may contain a REF block instead that links the domain to an existing object.
    2) PROFILE -- A container that appears in all domain module's, these are the key descriptors needed by domain specialists to define an object as distinct to others of the same family. They may be textual and/or visual.
    3) FEATURES -- Elements that are related to an object but not crucial to its description or identification, e.g. status and trends reports, dynamic elements compiled in periodic observations, etc.

3. DOMAIN DESCRIPTIONS

3.1 AQUATIC SPECIES

- Aquatic species are identified as defined by taxonomists.
- The profile section (under the ownership of taxonomists) focuses on species' diagnostic features.
- The features section contains information on species' biology, ecology, and exploitation.

3.2 AQUATIC SPECIES GROUPS

- This domain re-uses the structure of Aquatic Species but at group level (i.e. supra-species.) Groups may be of taxonomic, commercial, statistical, or 'common-sense'. Additional categories may be added as deemed fit.

3.3 AREA

- Area identifies statistical, political, or other geographically based boundaries using standard coding systems such as ISO. Wherever possible area identifiers have a GIS representation that allows data to be viewed as a polygon, line or point-mapping object.
- The Area's profile section serves the purpose of describing the main features of the area. For this purpose, more specific topic containers (e.g. water area profile, or country profile) are created according to the Area type.
- The Area features section gives access to any FIGIS domain whose content is relevant to that area, e.g. aquatic resources by water area, or a fisheries sector country profile for land/political areas.

3.4 STOCKS

Definition: The FAO Glossary for Responsible Fisheries indicates, *inter alia*, that from a pragmatic point of view, a **stock** is "*the part of a fish population which is under consideration from the point of view of actual or potential utilisation*. In more biological terms, it is also "*a group of individuals in a species occupying a well defined spatial range independent of other stocks of the same species. It can be affected by random dispersal movements and directed migrations due to seasonal or reproductive activity. It can be regarded as an entity for management or assessment purposes*. *A **unit stock** comprises all the individuals of fish in an area which are part of the same reproductive process. It is self-contained, with no emigration or immigration of individuals from or to the stock. On practical grounds, however, a fraction of the unit stock may be considered as a "stock" (or as **a management unit**) for management purposes as long as the results of the assessments and management remain close enough to what they would be on the unit stock."*

A stock is defined by a wide range of characteristics selected for their relevance to the fisheries that exploit the stock. A stock may consist of widely separated species such as fish, shrimp and clams, and may also be multi-species. It may be highly migratory, straddling or shared as well as global, ocean-wide, regional, national and local -- all attributes that carry diverse management implications. Stocks are units generally defined by scientists for assessment purposes, and their indicators tend to describe their size, potential, health status and trends.

- Hence, Stocks are identified in FIGIS as the compulsory combination of an AQUATIC SPECIES (or SPECIES GROUP) and a WATER AREA geographical location. This water area may be described at any scale using standard statistical areas, areas of competence (e.g. EEZs) or environmental geo-classification systems such as Large Marine Ecosystems.
- The Stocks profile section describes the water area main environmental characteristics, the stock's biological and ecological features, and if necessary it's structure.
- The Stocks features section presents a stock's dynamic aspects such as exploitation, assessment, management, and status and trends.
-

3.5 AQUATIC RESOURCES

Definition: The term "**resources**" is also often used when referring to vaguely defined "stocks." The FAO Glossary for Responsible Fisheries indicates that **aquatic resources** are the "*biotic element of the aquatic ecosystem, including genetic resources, organisms or parts thereof, populations, etc. with actual or potential use or value (sensu lato) for humanity. Fishery resources are therefore those aquatic resources of value to fisheries.*" Just like a stock, a fishery resource is delimited in space and its geographical demarcation often has a political or juridical connotation, e.g. Moroccan resources, EEZ or high seas resources. Potential or actual catch is a typical resources indicator reflecting the notions of **use** or **value** attached to the resource's concept. It could be local, national (e.g. the shrimp resource of Ghana), regional (e.g. Atlantic tuna) or global (e.g. cephalopod resources of the world.)

- Aquatic Resources are identified in FiMES along the same patterns as Stocks.
- The main structural difference between Resources and Stocks is the absence in the Resources Feature section of the Assessment topic, which is strictly reserved to Stocks as defined and assessed by scientists.

3.6 GEARTYPES

- Gear types are categories of devices used in capturing aquatic species. Any new Gear type is identified by reference to standard international types.
- The Gear type profile section describes a gear type's main physical characteristics.
- The Gear type features section deals with any other related information affecting gear types, from specific devices used in reducing undesired impacts to fisheries management regulations.

3.7 VESSELTYPES

- Vessel types are categories of floating vehicles (or platforms) used to carry GEARTYPES and capture fish. Any new Vessel type is by reference to standard international types.
- The Vessel type profile section describes a vessel type's main physical characteristics.
- The Vessel type features section deals with any other vessel type related information, such as statistics, applicable regulations and socio-economic aspects.

3.8 FISHING TECHNIQUES

- Definition: a fishing technique describes the set of equipment used for the capture of a target species together with any associated fishing practices.

- Fishing techniques are identified in FIGIS as the compulsory combination of a target SPECIES (or SPECIES GROUP) and the GEARTYPE + VESSELTYPE pair used to catch it.
- The profile section focuses on the target species' behaviour and habitat and highlights how the Gear type and platform characteristics are designed and associated to catch it, possibly adding focus on on-board handling mode.
- The features section describes the Fishing technique's associated practices and strategies, including socio-economic matters, fishing operations, and possible impacts of the technique.

3.9 FISHERY

Definition: The FAO Glossary states "***a fishery*** *is an activity leading to harvesting of fish (sensu lato) from the wild using some fishing technology (****capture fishery****) as well as activities producing fish through* ***aquaculture****.*" Capture fisheries are generally identified by the target species, the area of operation and the gear used (e.g. Atlantic Northern Blue fin long line fishery.) They may also be identified by vessel nationality, exploitation form, and occasionally by fishing season. A given resource or stock may be exploited by many fisheries (e.g. a long line and a purse seine fishery may both exploit Yellow fin tuna), and a single fishery may exploit many stocks at the same time (e.g. multi-species trawl fisheries.)

- In FIGIS, it is proposed to define and characterise a fishery along three primary dimensions (or keys) resulting in a flexible nested structure of fisheries types according to various scales and aggregation levels. As an example, the western central-Pacific Japanese purse-seiner tuna fishery is identified in the following manner:
  1) The target SPECIES, or target GROUP OF SPECIES, e.g. tuna.
  2) The WATER AREA geographical location of the fisheries (e.g. the western central-Pacific) associated with a unique geographical identifier. However, because the geographical demarcation of the fishery's area may change over time (as demonstrated by tuna fisheries), the association between the fisheries geographical identifier and the standard geographical GIS objects (latitude and longitude, squares, statistical areas, EEZs, shelf/oceanic areas, or some intersection of these objects) should be flexible over time. GIS will be used systematically to index geo-references against all pertinent geographical typologies.
  3) The exploitation unit[1] (e.g. Japanese purse-seiner) may refer to any of the fisheries exploitation patterns: the GEARTYPE (e.g. trawl), the VESSELTYPE (e.g. trawler), the FISHING TECHNIQUE (e.g. drum seining), or the on-board HANDLING MODE (freezer-trawler), and/or any of the other aforementioned qualifiers, such as the FORM OF EXPLOITATION (e.g. subsistence, artisanal, industrial, commercial, recreational) or the VESSEL FLAG. The exploitation unit will allow effective linkage with the management units described in the Management System Profiles. The flag may be used to identify which countries participate in a fishery and aid in assessing new policies and management.

- The Fisheries profile section describes the essential aspects of the elements used in defining the Fishery.

- The Fisheries features section contains dynamic aspects of a fishery such as exploitation, management and related performance, and post-harvest topics.

3.10 MANAGEMENT SYSTEM and FISHERY MANAGEMENT UNIT

Definition: Decision-makers manage fisheries by identifying management units. According to the FAO Glossary for Responsible Fishing, *"a* ***Fishery Management Unit (FMU)*** *is a fishery or a portion of a fishery identified in a Fishery Management Plan (FMP) relevant to the FMP's management objectives*." Therefore the makeup,

[1] The term "fishing unit" may be preferred

the attributes and the focus of an FMU reflect it's sector's strategies and objectives. FMU's may be organised around fisheries biological, geographic, economic, technical, social or ecological dimensions. They are the focus for the application of the selected management methods and measures. Particular properties of the stocks and/or the fisheries may be incorporated in the definition of management units.

A management system is a set of rules formally compiled in :

- A **legal framework** (e.g. a law, set of decrees, management plan, 5 years development plan) and its related legal instruments,
  established within the mandate of
- A **Management Authority** (e.g. a regional body, a state, or provincial government)
  and specifying management objectives, strategies or methods for at least
- One **Fishery Management Unit**. More detailed management rules applying to some of the identified fishery management units may be found in other [sub] management systems.

A management system is a specific type of institution, as can be seen from the Institutions' definition.

3.11 INSTITUTIONS

Definition: According to the FAO Glossary, an Institution is "*a set of rules, processes and organisations used by a set of individuals to organise specific repetitive activities that produce outcomes affecting those individuals and others."*

- FIGIS Institutions objects are formal organisations (e.g. FAO) and/or their sub-divisions, departments, dependent bodies or institutionalised programmes, all with a legal status.
- The Institution's profile section describes its mandate, structure, membership and establishing legal texts.
- The features section deals with the Institution's life, e.g. meetings, projects, publications, or job opportunities.

3.12 COLLECTIONS

Definition: A Collection is a collection of information managed in a homogeneous way. It is a domain used for managing ownership and user access, and giving information of quality assurance type (data types, scope and coverage, processing methods, etc.)

3.13 COUNTRY PROFILES

Definition: A Country Profile contains high-level information about a country's fisheries sector.

4. ELEMENT TYPES

4.1 Container Element

(An element whose primary quality is structural, it contains other elements and/or attributes.)

- Domain Element = A root-level container element that holds all elements and attributes that fall within a single domain. It may also contain elements borrowed from other domains or the common module as needed to define the domain.
- REF Element = usually found contained within the IDENT element of a compound domain, it is used when positive linking to a FIGIS object is desired. It contains all the elements and attributes that are capable singly and/or together of positively identifying an object. Several REF elements may together form the IDENT structure that creates a new object, e.g. STOCKS_IDENT = SPECIES_REF plus AREA_REF. Use of REF also allows for the positive indexing of a container element or paragraph, while avoiding the creation of a new FIGIS object.
- IDENT Element = a root level container element found in its own module that contains all the existing identifying elements for a FIGIS object. Use of IDENT results in the creation of a FIGIS object, unless that object already exists, in which case the two are automatically flagged for further examination.
- Contextual Element = a topic container element whose meaning may change depending on where it's placed.

4.2 Simple Element

(Contained within a container and primarily content-based.)

- Text = (*domain*Text) a simple element whose content is descriptive text. It contains keyword and highlighting elements adapted to the domain it describes, and is most often used outside of its domain, e.g. "GearTypeText" is used within Fishing Techniques to generally describe the gear type found within a fishing technique.
- Format = (e.g. Latin, Bold) a simple formatting element that exists only to tag other element or attribute contents for use by publishing, browser or search software; e.g. in order to tag a word as a hypertext link or indicate that it should appear in italics. Usually declared within a parameter entity. Its use is discouraged.
- Keyword = (L_*element*) a tagging element used to mark text as a keyword, for use by the search engine. It is a lightweight linking and indexing element used when positive referencing (the linking of text to a known data object) is neither desired nor required.
    1) Keyword tagging elements are grouped by domain within parameter entities called 'domaincommelem' so that calling the entity from an element gives the user access to all keyword tags for that domain.
    2) Any element may potentially contain an entity or entities allowing it to use keyword tagging as needed for indexing or keyword linking to other possible data objects.
    3) The linking behaviour of a tagged keyword may change depending on the container in which it is found.
- Highlight = (H_*element*) a simple element containing a word or phrase important to the container in which it is found but not a potential link. Also used to capture indicators related information, e.g. indicator name, value, unit, date, source, etc.
    1) Highlight tagging elements are grouped by domain within parameter entities called 'domaincommelem' so that calling the entity from an element gives the user access to all highlight tags for that domain.
    2) Any element may potentially contain an entity or entities allowing it to use highlight tagging as needed to isolate and/or highlight important sections of text.

4.3 Attribute

(Contained by an element and content-based.)

- CodeSystem = defines the classification system used by the element to which it is attached. This is used in conjunction with attribute “Code” to identify a FIGIS object.
- Code = a standard value for the element that contains it. Always linked to a CodeSystem that defines the system in which the code is found.
- Style = an attribute that can be used to supply simple formatting information about the contents of an element such as paragraph level, bulleted list, hidden text, etc.
- FID = a FIGIS unique identifier for FIGIS objects.
- Fishery Key = used to identify which REF elements in an exploitation unit should be considered keys that define the unit as a unique object.

5. NAMING CONVENTIONS

This document describes the various groups of naming conventions used in creating names for the FiMES elements.

5.1 NAMESPACE

All elements begin with a **namespace** that limits the scope of their meaning to that defined at the location indicated by their namespace resource indicator.

- Example: **fi:**
- A namespace declaration in XML defines the name of the namespace and where its element set can be found:
  xmlns:fi="http://www.fao.org/fi/figis/xml/"

FIGIS uses the following namespaces:

- **fi**
  The FIGIS namespace, it defines a set of elements and structures used to contain fisheries data and metadata.
- **ags**
  The FAO/WAICENT agricultural standards namespace, it defines a set of elements and structures used to contain metadata for agricultural data.
- **dc**
  The Dublin Core group namespace, it defines a set of simple elements and structures used to contain metadata for any kind of resource.
- **fint**
  The FIGIS internal namespace, it defines a set of elements and structures used to contain data internal to the function of the FIGIS database and servers.

5.2 THEMATIC DOMAIN

Elements are organised by thematic domain.

- *Example:* AqSpecies

FIGIS uses the following domain names:

i. **AqResStock**
   Aquatic resources and stocks
ii. **AqRes**
   Aquatic resources
iii. **Area**
   Geo-political information
iv. **AqSpecies**
   Aquatic species taxonomy and biology
v. **AqSpeciesGroup**
   Aquatic species groups
vi. **Collection**
   Metadata about data collections and datasets
vii. **Country**
   Country-level fishing sector profiles
viii. **Fisheries**
   Fisheries data
ix. **FishTechnique**
   Fishing techniques

x. **Geartype**
Fishing gear types
xi. **Institution**
Fisheries institutions
xii. **Programme**
Fisheries programmes
xiii. **Project**
Fisheries projects
xiv. **LegalFramework**
Fisheries legal frameworks, instruments, regulations, policies, etc.
xv. **ManageSystem**
Fisheries management systems
xvi. **Topic**
Fisheries topics
xvii. **VesselRecord**
Data for individual vessels, including HSVAR
xviii. **Vesseltype**
Fishing vessel types.

5.3 CAPITALISATION

All elements begin with an upper-case letter followed by one or more lower case letters.

Example: **Assessment**

5.4 CONCATENATION

All elements formed out of more than one word are concatenated, with the first letter of each word in upper case.

Example: **AqSpeciesGroup**

5.5 SUFFIXES

Many elements contain special suffixes that share a common meaning and structure. They are preceded by an underscore.

i. **_Link**
Indicates a container holding linking elements that singly or in combination link to another resource object. There is one per domain.
ii. **_Entry**
Indicates the element is part of a list or a group. All **Entry** elements have a parent element formed from the same name but not containing the word **Entry**.
iii. **_Ident**
There is one **Ident** container per domain. It contains all the possible identifying elements for an object. These elements are the object keys. Each instance of an **Ident** container creates an object in the FIGIS database.
iv. **_Ref**
There is one **Ref** container per domain. It refers to the identifying elements found in the Ident container. It is used for positive linking to FIGIS objects but does **not** create an object in the FIGIS database.

v. **_Profile**
There is one **Profile** container per domain. It contains the elements used by domain specialists to declare one object as distinct and unique from another.

vi. **_Feature**
There is one **Feature** container per domain. It contains elements related to the domain but not essential to its identification or distinction.

vii. **_Overview**
There is one **Overview** container per domain. It is typically used by a foreign domain when making a brief overview of another domain object.

viii. **_Struct** (structure)
Found in some domains, it is used to hold nested child domains of the main domain and is found in the **Profile** container.

ix. **_Parent**
This container holds one or more **Ref** elements that positively link to a parent object or objects. Used for building object structures or to identify a new object by hierarchy. Unlike **Struct** it is not a container for groups of other objects, but instead just identifies the relationships to other objects.

x. **_Child**
This container holds one or more **Ref** elements that positively link to a child object or objects. Used for building object structures or to identify a new object by hierarchy. Unlike **Struct** it is not a container for groups of other objects, but instead just identifies the relationships to other objects.

xi. **_Text**
There is one **Text** container per domain. This is a container that holds low-level and formatting elements and is used to hold general text for a domain. Its primary function is that of reducing the clutter of elements at various levels, thus enabling the user to see only the higher-level elements.

5.6 PREFIXES

Many elements contain special prefixes that share a common meaning and structure. They are followed by an underscore.

i. **Overall_**
There is one **Overall** container for most domains. It contains elements used to describe the domain in general terms across multiple domain objects. It often contains a number of **Overview** elements in which information for a specific object within the domain is contained.

ii. **H_**
These elements contain only text and formatting elements and are used to highlight passages within a container.

iii. **L_**
These are lightweight linking elements containing a keyword or key phrase that the author believes may be linkable to a fisheries object.

5.7 COMMON TERMS

There are a number of commonly used terms that share similar meanings although their structure may vary from one domain to another. Therefore, although they are technically prefixes or suffixes they do not contain an underscore.

i. **Method**
A practical technique for achieving an objective (usually managerial.)

ii. **Objective**
A desired end result (usually managerial.)
iii. **Strategy**
Unlike Method, **Strategy** indicates more of a broadly defined theoretical direction for achieving an objective, e.g. Strategies use Methods to achieve Objectives.
iv. **StatusTrend**
The current state of an object and/or its general trend.
v. **Assess**
Statements about the current condition of an object based on analysed data.
vi. **Indic**
The data analysed when making an assessment.
vii. **Exploit**
Generally linked to an element that discusses the manner or the quantity, currently or historically in which a species is captured.
viii. **Segment**
A discrete portion of a larger unity, e.g. a segment of a fishing fleet.
ix. **Sector**
A discrete portion of a larger unity, e.g. the marine sector of the fishing industry.
x. **SubSector**
A discrete portion of a larger sector, e.g. the coastal sub sector of the marine sector.
xi. **Data**
Indicates that the element contains a raw data value. Almost always has an attached attribute value of **Unit**.

5.8 COMMON ELEMENT ATTRIBUTES

There are a number of commonly used attributes and/or attribute suffixes/prefixes that are without structure and share similar meanings.

i. **Class**
Indicates a group or class membership for the element.
ii. **Type**
Indicates a group or class membership for the element.
iii. **Category**
Indicates a group or class membership for the element.
iv. **CodeSystem**
Indicates the title of the system to which a code value is attached.
v. **Code**
Contains the code value linked to the CodeSystem.
vi. **Format**
Indicates whether the element should be output in a list (Bullet), as normal text flow (Normal) or not at all (Hidden).
vii. **Unit**
Indicates the unit of measure for the value found in the element or in the Value attribute.
viii. **Other**
Used to insert a non-standard attribute value.
ix. **Scale**
Indicates the scale of the Unit attribute.
x. **Status**
Indicates whether the data has been validated.
xi. **Date**
A date linked to the data found in the element.
xii. **Value**
Contains a raw data value.

xiii. Alias

Holds an arbitrary primary ID value used when linking other elements to the element identified by the Alias. This attribute is found only in Ident, Ref and Source elements. Its purpose is that of providing a shorthand way for other elements to call the identifying information found in these kinds of elements.

xiv. GetAlias

Holds an ID value defined in the Alias attribute of another element, thus linking the two elements.