Biodiversity Geodatabase Guide

Version 3.0

WP9 Data Management and Synthesis

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1. Introduction

CoCoNet is a European project that will produce guidelines to design, manage and monitor network of MPAs and Ocean Wind Farms. The Project covers a high number of Countries and involves researchers covering a vast array of subjects, developing a timely holistic approach and integrating the Mediterranean and Black Seas scientific communities through intense collective activities and a strong communication line with stakeholders and the public at large. Within this project we aim at providing a common framework for marine data management and final synthesis of the outcomes of different scientific topics from heterogeneous sources. An integrated Geodatabase and a WebGIS system will be the linking tool for all partners, regions and thematic research. It will involve the entire consortium at different levels in topics such as data provision and integration, GIS products, GIS interpretation, data archiving and data exchange. The work is organised around the following main objectives:

- assess the rules for data and metadata sharing between partners reviewing the existing common European protocols and standards (INSPIRE);
- design and implement data repositories (Marine Geodatabase) following the INSPIRE Directive, to store and retrieve the spatial data collected during the lifespan of the project for the Mediterranean and Black Sea areas and for the pilot study areas;
- develop the COCONET WebGIS to integrate the multi scale GIS layers derived from all regions going towards an integrated management of the marine resources;
- develop an analytical and evaluative framework for designing, managing and monitoring regional networks of MPAs, including wind farms, centred on science-based guidelines, criteria, concepts and models.

The CoCoNet project produced the architecture of ten Geodatabases storing data about the major themes starting from the INSPIRE Directive: Protected sites, Habitats and Biotopes, Threats, Geology, Biodiversity, Offshore Wind Farms, Elevation, Maritime Units, Oceanography, Socioeconomics.

The final goal will be to deliver digital maps of networks of marine protected areas and offshore wind farms as final synthesis of the outcome from all scientific topics. The integrated Geodatabase will be a fundament tool to produce the guidelines to design, manage and monitor network of MPAs, and an enriched wind atlas for both the Mediterranean and the Black Seas. The Project will identify groups of putatively interconnected MPAs in the Mediterranean and the Black Seas, shifting from local (single MPA) to regional (Networks of MPAs) and basin (network of networks) scales. The identification of physical and biological connections with clear the processes that govern patterns of biodiversity distribution. This will enhance policies of effective environmental management, also to ascertain if the existing MPAs are sufficient for ecological networking and to suggest how to design further protection schemes based on effective exchanges between protected areas.

2. Geodatabase design

The INSPIRE data model is the conceptual model which the Biodiversity Geodatabase is ispired. The logic model is built in Microsoft Visio 2007 using ESRI classes. The physical model is a ESRI File Geodatabase, with

Feature Classes, Object Classes, Domains, Subtypes, Relationship Classes, Feature Dataset and RasterCatalogs.

Feature Class: a collection of geographic features with the same geometry type (such as point, line, or polygon), the same attributes, and the same spatial reference. Feature classes can be stored in geodatabases, shapefiles, coverages, or other data formats. Feature classes allow homogeneous features to be grouped into a single unit for data storage purposes. For example, highways, primary roads, and secondary roads can be grouped into a line feature class named "roads." In a geodatabase, feature classes can also store annotation and dimensions

Object Class: In a geodatabase, a collection of nonspatial data of the same type or class. While spatial objects (features) are stored in feature classes in a geodatabase, nonspatial objects are stored in object classes.

Relationship Class: An item in the geodatabase that stores information about a relationship. A relationship class is visible as an item in the ArcCatalog tree or contents view.

Domains: The range of valid values for a particular metadata element.

Code Value Domain: A type of attribute domain that defines a set of permissible values for an attribute in a geodatabase. A coded value domain consists of a code and its equivalent value. For example, for a road feature class, the numbers 1, 2, and 3 might correspond to three types of road surface: gravel, asphalt, and concrete. Codes are stored in a geodatabase, and corresponding values appear in an attribute table.

Subtype: In geodatabases, a subset of features in a feature class or objects in a table that share the same attributes. For example, the streets in a streets feature class could be categorized into three subtypes: local streets, collector streets, and arterial streets. Creating subtypes can be more efficient than creating many feature classes or tables in a geodatabase.

Feature Dataset: In ArcGIS, a collection of feature classes stored together that share the same spatial reference; that is, they share a coordinate system, and their features fall within a common geographic area. Feature classes with different geometry types may be stored in a feature dataset.

Raster Catalog: A collection of raster datasets defined in a table of any format, in which the records define the individual raster datasets that are included in the catalog. Raster catalogs can be used to display adjacent or overlapping raster datasets without having to mosaic them together into one large file (http://support.esri.com/en/knowledgebase/GISDictionary/term/object%20class).

The Habitats and Biotopes Geodatabase can store spatial data (vector, grid and raster) and nonspatial data (.dbf).

The Biodiversity Geodatabase is available as .xml file. To use it in ArcGIS, create an empty File Geodatabase and import the .xml file.

3. Geodatabase architecture

The Biodiversity Geodatabase consists of one Feature Dataset, named SamplingFeatures and used to store vector data (Station, Transect, SurveyArea) and 5 Feature Classes (SpeciesOccurence, BirdObservation, CetaceanObservation, NestingSite, SpeciesDistribution). The raster data are collected and described in a

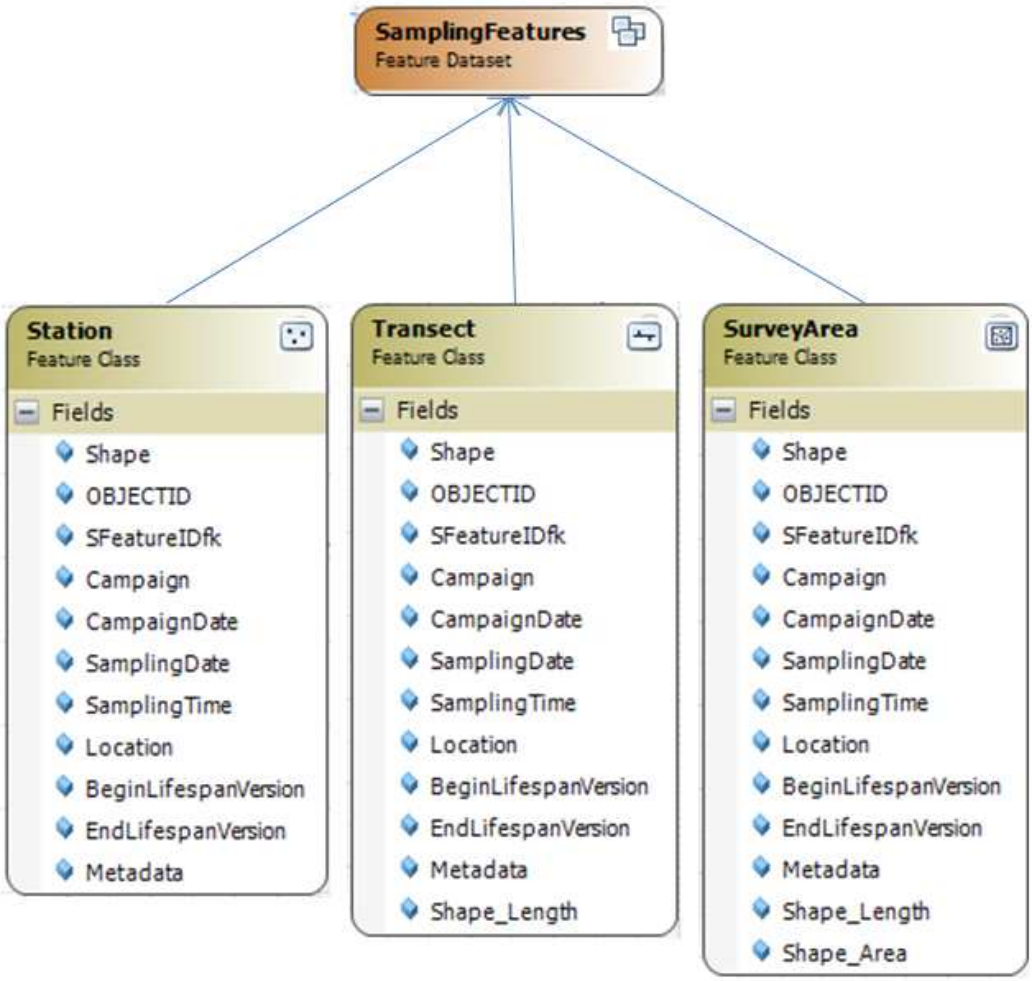
raster catalog , that is BiodiversityCatalog. Lastly, in the Geodatabase there are 7 tables: DistributionInfoType, PopulationSizeType, RangeType, SpeciesInfo, Parameter, RelatedParty and SourceMethodType. The tables are linked to the Feature Classes though Relationship Classes. Domains and Subtypes are present In the Feature Classes and in the Object Classes.

3.1. Feature Dataset: SamplingFeatures

Features used in the sampling, they can be points in case of punctual sampling (Station), polylines in case of linear sampling (Transect) or areas (SurveyArea) when we take into account the area of the entire survey. The Feature Dataset consists of three Feature Classes:

- Station
- Transect
- SurveyArea

GeometryType: none



3.1.1. Feature Class: Station

Station of a punctual sample.

GeometryType: Point

Field	Type	Restriction	Description
SFeatureID	String	None	Identification string of the sampling feature.
Campaign	String	None	Name of the survey for collecting data.
CampaignDate	Integer	None	Year in which the campaign was carried out.
SamplingDate	Date	None	Date in with the sampling was carried out.
SamplingTime	String	hh:mm	Time at which the sampling was carried out.
Location	String	None	Description of the location in which the sampling was carried out.
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (INSPIRE Directive, r4618)..
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (INSPIRE Directive, r4618)..
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.1.2. Feature Class: Transect

A usually straight line along which measurements or observations are made at regular intervals.

GeometryType: Polyline

Field	Type	Restriction	Description
SFeatureID	String	None	Identification string of the sampling feature.
Campaign	String	None	Name of the survey for collecting data.
CampaignDate	Integer	None	Year in which the campaign was carried out.
SamplingDate	Date	None	Date in with the sampling was carried out.
SamplingTime	String	hh:mm	Time at which the sampling was carried out.
Location	String	None	Description of the location in which the sampling was carried out.
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (INSPIRE Directive, r4618)..
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (INSPIRE Directive, r4618)..
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.1.3. Feature Class: SurveyArea

Area of the entire survey. We can use this information to derive absence data.

GeometryType: Polygon

Field	Type	Restriction	Description
SFeatureID	String	None	Identification string of the sampling feature.
Campaign	String	None	Name of the survey for collecting data.
CampaignDate	Integer	None	Year in which the campaign was carried out.
SamplingDate	Date	None	Date in with the sampling was carried out.
SamplingTime	String	hh:mm	Time at which the sampling was carried out.
Location	String	None	Description of the location in which the sampling was carried out.

BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (INSPIRE Directive, r4618)..
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (INSPIRE Directive, r4618)..
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.2. Feature Class: SpeciesOccurrence

Occurrences of the species. The point indicates the presence of the species (sighting or sampling) in a location.

GeometryType: Point

Field	Type	Restriction	Description
FeatureID	String	None	Identification string of the occurrence.
Taxon	String	None	The maximum known taxonomic description of the concerned species.
Country	String	Domain: CountryCode	Country that has the sovereign of the water where is the occurrence.
Location	String	None	Name of the location where is the occurrence.
SamplingDepth	Double	None	Water depth in the point of the sampling or sighting.
SamplingDate	Date	None	Date of the sampling or sighting.
DeviceType	String	None	Type of device used for sampling.
Device	String	None	Name of the device used for sampling.
MinDepth	Double	None	Minimum depth at which the species was found.
MaxDepth	Double	None	Maximum depth at which the species was found.
SFeatureID	String	None	String that indicates the related sampling feature (station, transect or survey area). The field is used for a relationship.
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (INSPIRE Directive, r4618).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (INSPIRE Directive, r4618).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.3. Feature Class: NestingSite

Sites that sea turtles use to spawn.

GeometryType: Point

Field	Type	Restriction	Description
FeatureID	String	None	Identification string of nesting site.
Taxon	String	None	The maximum known taxonomic description of the concerned species.
Nests	Integer	None	Number of the nests in the site.
Country	String	Domain:	Country that has the sovereign of the concerned coast.

		CountryCode	
Location	String	None	Name of the location where is the nesting site.
Note_	String	None	Note.
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (INSPIRE Directive, r4618).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (INSPIRE Directive, r4618).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.4. Feature Class: SpeciesDistribution

Area of distribution of the concerned species.

GeometryType: Polygon

Field	Type	Restriction	Description
FeatureID	String	None	Identification string of the area.
Taxon	String	None	The maximum known taxonomic description of the concerned species.
Country	String	Domain: CountryCode	Country that has the sovereign of the water where is the concerned species.
Location	String	None	Name of the location where is the concerned species.
SamplingDepth	Double	None	Water depth in the point of the sampling or sighting.
SamplingDate	Date	None	Date of the sampling or sighting.
DeviceType	String	None	Type of device used for sampling.
Device	String	None	Name of the device used forsampling.
MinDepth	Double	None	Minimum depth at which the species was found.
MaxDepth	Double	None	Maximum depth at which the species was found.
SFeatureID	String	None	String that indicates the related sampling feature (station, transect or survey area). The field is used for a relationship.
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (INSPIRE Directive, r4618).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (INSPIRE Directive, r4618).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.5. Feature Class: BirdObservation

Transect along which the birds have been seen.

GeometryType: Polyline

Field	Type	Restriction	Description
FeatureID	String	None	Identification string of the transect.

NumberTaxa	Integer	None	Number of the sighted taxa.
NumberIndividuals	Integer	None	Number of the total sighted individuals.
Country	String	Domain: CountryCode	Country that has the sovereign of the concerned water.
Location	String	None	Name of the location where the transect is carried out.
DeviceType	String	None	Type of device used for sighting.
Device	String	None	Name of the device used for sighting.
SamplingDate	Date	None	Date of the sighting.
StartTime	String	None	Time at which the sighting is started.
EndTime	String		Time at which the sighting is ended.
Note_	String	None	Note.
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (INSPIRE Directive, r4618).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (INSPIRE Directive, r4618).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.6. Feature Class: CetaceanObservation

Point where the cetacean have been seen.

GeometryType: Point

Field	Type	Restriction	Description
FeatureID	String	None	Identification string of point where the cetacean has been sighted.
Taxon	String	None	The maximum known taxonomic description of the concerned species.
NumberIndividuals	Integer	None	Number of the sighted individuals.
Country	String	Domain: CountryCode	Country that has the sovereign of the concerned water.
Location	String	None	Name of the location where the species has been sighted.
DeviceType	String	None	Type of device used for sighting.
Device	String	None	Name of the device used for sighting.
SamplingDate	Date	None	Date of the sighting.
Note_	String	None	Note.
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (INSPIRE Directive, r4618).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (INSPIRE Directive, r4618).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.7. Raster Catalog: BiodiversityCatalog

The raster catalog collects all the raster data. It allows to describe the raster and to link tables thought a dedicated field. The rasters are stored and visualized, in the GDB, as Raster Mosaic, such as BirdsRichness and MammalsRichness.

Field	Type	Restriction	Description
Raster	Raster	None	Attached raster file.
Name	String	None	Name of the attached raster file.
RasterID	String	None	Identification string of the attached raster file.
Variable	String	None	The represented variable (Z variable), e.g. number of individuals, density, temperature.
BeginLifespanVersion	Date	None	Date at which this version of the spatial object was inserted or changed in the spatial data set (INSPIRE Directive, r4618).
EndLifespanVersion	Date	None	Date at which this version of the spatial object was superseded or retired in the spatial data set (INSPIRE Directive, r4618).
Metadata	String	None	Name of the metadata file available in the SeaDataNet repository.

3.8. Object Classes

3.8.1. Object Class: DistributionInfoType

The description of the status of the subject of distribution, including the indication of the abundance by counting, estimation or calculation of the number of occurrences or population size of the particular species (INSPIRE Directive, r4618).

Field	Type	Restriction	Description
ObjectIDfk	String	None	Identification string of the occurrence.
OccurrenceCategory	String	Domain: OccurrenceCategoryValue	The species population density. A soecies abundance in classes (e.g. common, rare) (INSPIRE Directive, r4618).
CollectedForm	Date	None	The date when the collecting of the original species occurrence data started (INSPIRE Directive, r4618).
CollectedTo	Date	None	The date when the collecting of the original species occurrence data stopped (INSPIRE Directive, r4618).
PopulationType	String	Domain: PopulationTypeValue	The permanency of population, particularly with regard to migratory species (INSPIRE Directive, r4618).
ResidencyStatus	String	Domain: ResidencyStatusValue	Information on the status od residency of a species regarding nativeness versus introduction and permanency (INSPIRE Directive, r4618).
SensitiveInfo	Boolean	None	Boolean value that indicates whether the location of a specific species is sensitive (INSPIRE Directive, r4618).
ReproductiveCondiction	String	None	Reproductive condition of individuals of a particular species biodiversity unit

			within the distribution feature (Biodiversity and Conservation Data Model, ESRI).
AgeSexRatio	Integer	None	Age-sex ratio of individuals of a particular species biodiversity unit within the distribution feature (Biodiversity and Conservation Data Model, ESRI).
SuccessionalStage	Integer	None	Successional stage of a particular ecological community biodiversity unit within the distribution feature (Biodiversity and Conservation Data Model, ESRI).

3.8.2. ObjectClass: Parameter

Parameters that describe the population of the occurrence.

Field	Type	Restriction	Description
ObjectIDfk	String	None	Identification string of the occurrence. The field is used as foreign key.
Taxon	String	None	The maximum known taxonomic description of the concerned species.
SamplingDepth	Double	None	Depth of the sample.
Distance	String	None	Distance from the sampling point.
Parameter	String	Code Value Domain: ParameterValue	Parameter taken into account.
Value	Double	None	Value of the parameter.
UnitOfMeasure	String	None	Unit of measure of the parameter.

3.8.3. ObjectClass: PopulationSizeType

A range value indicating the counted, estimated or calculated occurrences or population sizes, which is defined by an upper and a lower limit. A range density (or abundance) value for species occurrence in the individual species distribution units either counted, estimated or calculated based on defined counting units, or using upper and lower bounds (INSPIRE Directive, r4618).

Field	Type	Restriction	Description
ObjectIDfk1	String	None	Identification string of the occurrence. The field is used as foreign key in a relationship with a table.
CountingMethod	String	Code Value Domain: CountingMethodValue	Method of providing a number for the identification of the abundance of a species. To obtain a density or abundance estimate the data set provider can either count, estimate or calculate the population abundance (INSPIRE Directive, r4618).
CountingUnitScheme	Integer	Subtype	Classification scheme used to describe what has been counted, estimated or calculated (INSPIRE Directive, r4618).

CountingUnit	String	Code Value Domain: GeneralCountingUnitValue/ Article17CountingUnitValue	What has been counted, estimated or calculated when compiling information on the abundance of a species (INSPIRE Directive, r4618).
CountingValue	Integer	None	Value of the count, estimate or calculation (INSPIRE Directive, r4618).

3.8.4. ObjectClass: RangeType

Value indicating the upper and lower limits of the counting, estimation or calculation of occurrences (INSPIRE Directive, r4618).

Field	Type	Restriction	Description
ObjectIDfk2	String	None	Identification string of the occurrence. The field is used as foreign key in a relationship with a table.
LowerBound	Integer	None	The lower limit of the range. If the value of this attribute is null and the UpperBound is populated, this implies that the value is between the UpperBound and zero.
UpperBound	Integer	None	The upper limit of the range. If the value of this attribute is null and LowerBound is populated, this implies that the value is between the lowerBound and infinity.

3.8.5. Object Class: RelatedParty

An organization or a person with a role related to a re source (INSPIRE Directive, r4618).

Field	Type	Restriction	Description
ObjectIDfk	String	None	Identification string of the object. The field is used as foreign key.
IndividualName	String	None	Name of the related party (INSPIRE Directive, r4618).
PositionName	String	None	Position of the party in relation to a resource, such as head of department (INSPIRE Directive, r4618).
Role	String	Code Value Domain: PartyRoleValue	Role(s) of the party in relation to a resource, such as owner (INSPIRE Directive, r4618).
Contact	String	None	Contact information for the related party (INSPIRE Directive, r4618).
OrganizationCode	String	None	Code of the related organization (INSPIRE Directive, r4618).
OrganizationName	String	None	Name of the related organization (INSPIRE Directive, r4618).
Country	String	Code Value Domain: CountryCode	Country of the related organization (INSPIRE Directive, r4618).

3.8.6. Object Class: SourceMethodType

Contains metadata about specific instances of elevation object. Refers to the methods on how observations have been made or recorded (INSPIRE Directive, r4618)..

Field	Type	Restriction	Description
ObjectIDfk	String	None	Identification string of the object. The field is

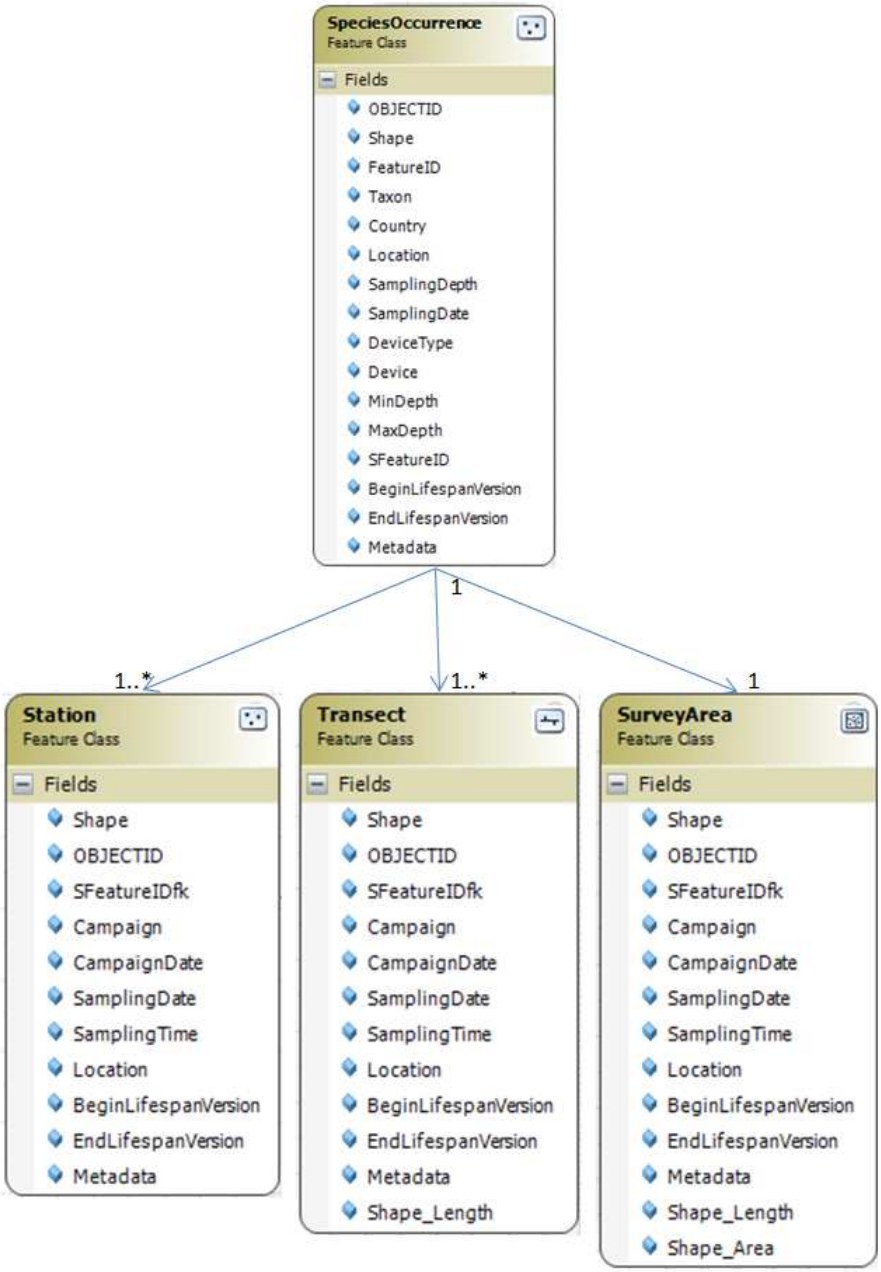
			used as foreign key.
MethodScheme	Integer	Subtype	Classification scheme used to compiling the MethodValue field (Article17SourceMethod or GeneralSourceMethod).
MethodValue	String	Code Value Domain: GeneralSourceMethodValue/ Article17SourceMethodValue	Method by which the data is collected (INSPIRE Directive, r4618).
MethodReference	String	None	A reference to a description of the method by which the data is collected (INSPIRE Directive, r4618).
SourceDatabase	String	None	Name of the database where the data is retrieved from (INSPIRE Directive, r4618).

3.8.7. Object Class: SpeciesInfo

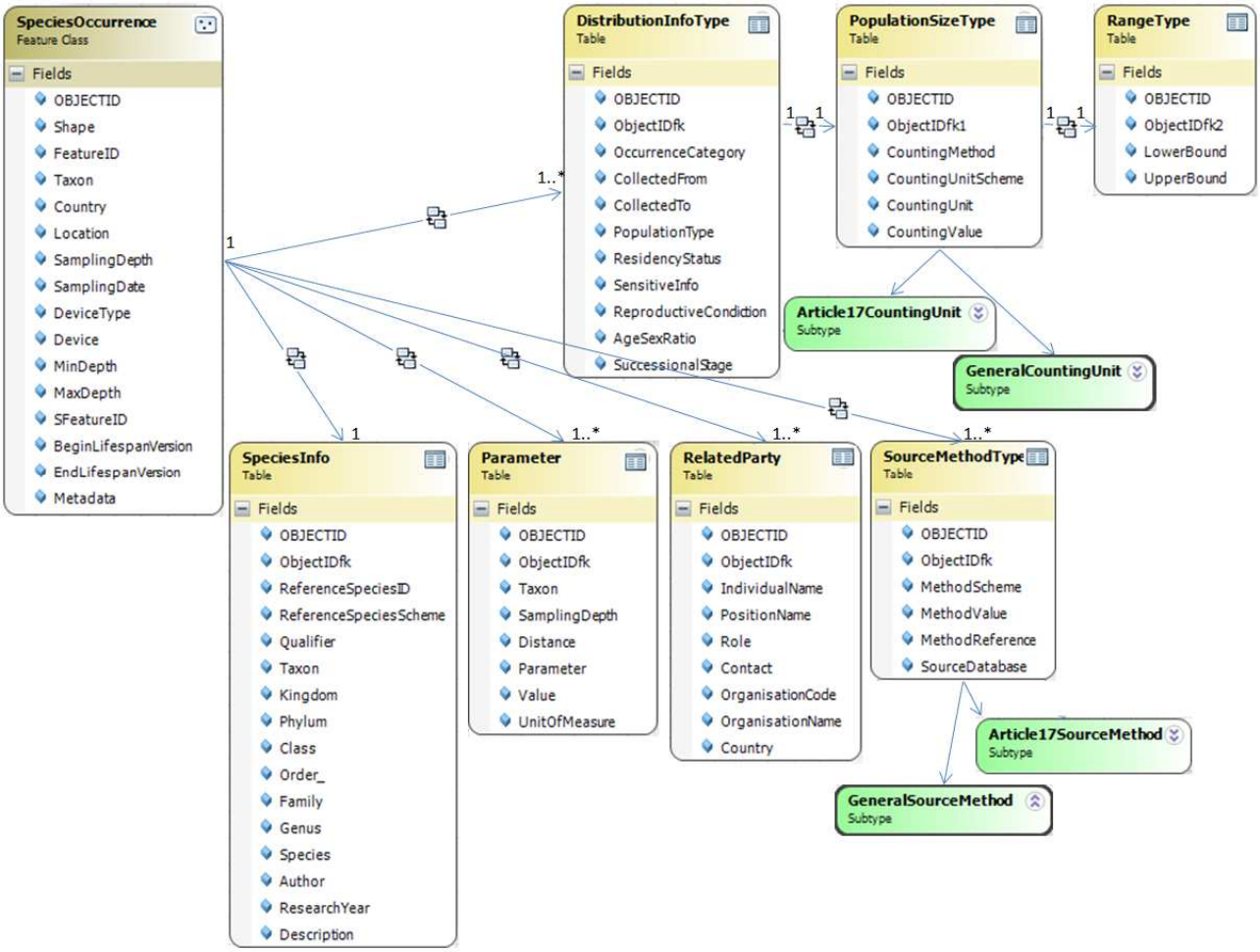
Description of the species.

Field	Type	Restriction	Description
habitatIDfk	String	None	Identification string of the habitat object. The field is used as foreign key (fk).
ReferenceSpeciesScheme	String	Code Value Domain: ReferenceSpecies-SchemeValue Initial value: worms	Reference list defining a nomenclatural and taxonomical standard to which all local species names and taxonomic concepts shall be mapped to. In the framework of the CoCoNet project we decided to use the WoRMS classification.
ReferenceSpeciesID	String	None	Identifier of one of the reference lists given by the ReferenceSpeciesScheme.
Kingdom	String	None	Taxonomy of the species of one of the reference lists given by the ReferenceSpeciesScheme.
Phylum	String	None	Taxonomy of the species of one of the reference lists given by the ReferenceSpeciesScheme.
Class	String	None	Taxonomy of the species of one of the reference lists given by the ReferenceSpeciesScheme.
Order_	String	None	Taxonomy of the species of one of the reference lists given by the ReferenceSpeciesScheme.
Family	String	None	Taxonomy of the species of one of the reference lists given by the ReferenceSpeciesScheme.
Genus	String	None	Taxonomy of the species of one of the reference lists given by the ReferenceSpeciesScheme.
Species	String	None	Taxonomy of the species of one of the reference lists given by the ReferenceSpeciesScheme.
Author	String	None	Author of the species of one of the reference lists given by the ReferenceSpeciesScheme.
ResearchYear	Integer	None	Year in which the research is carried out.
Description	String	None	Description of the species/community.

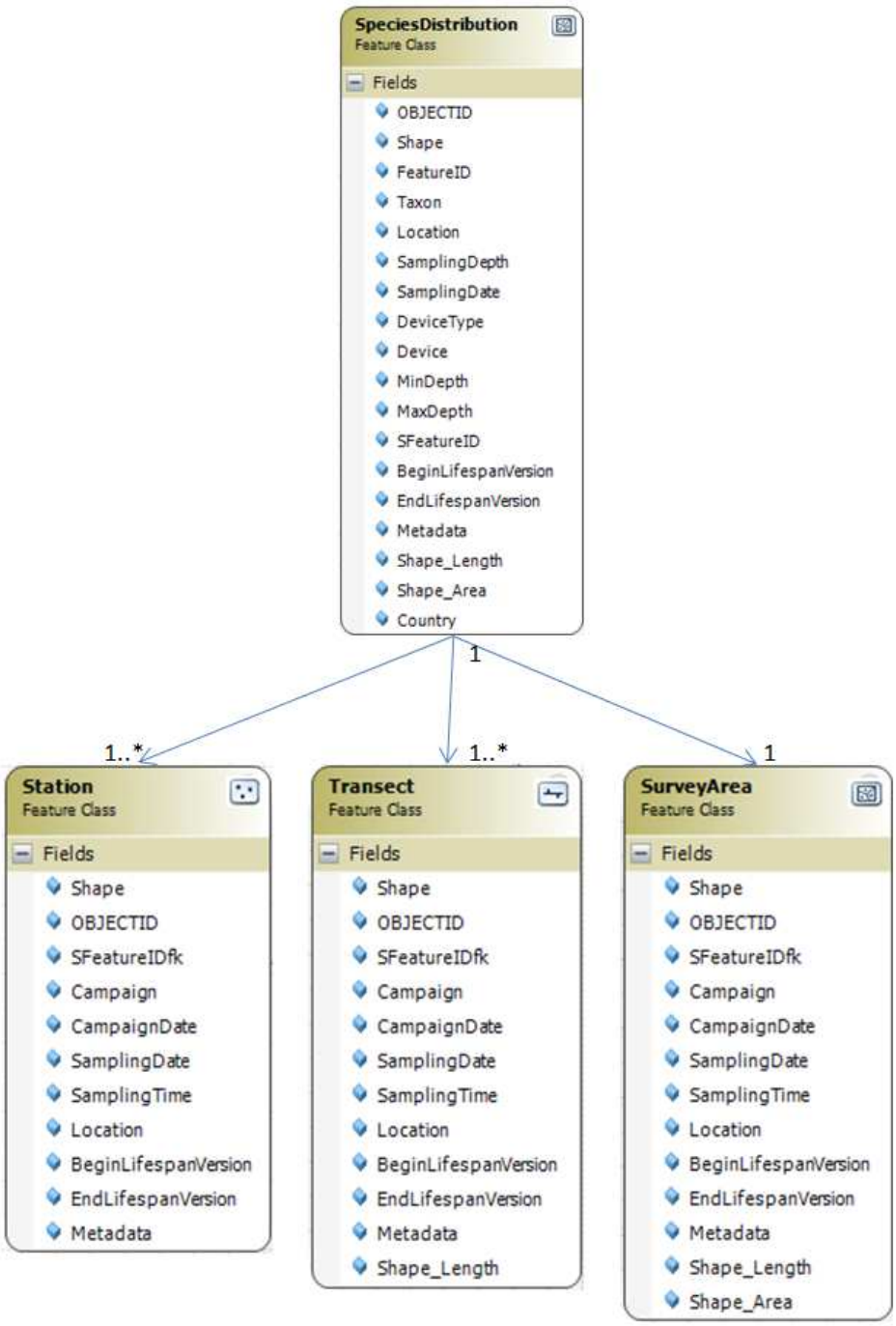
3.9. Relationship Classes



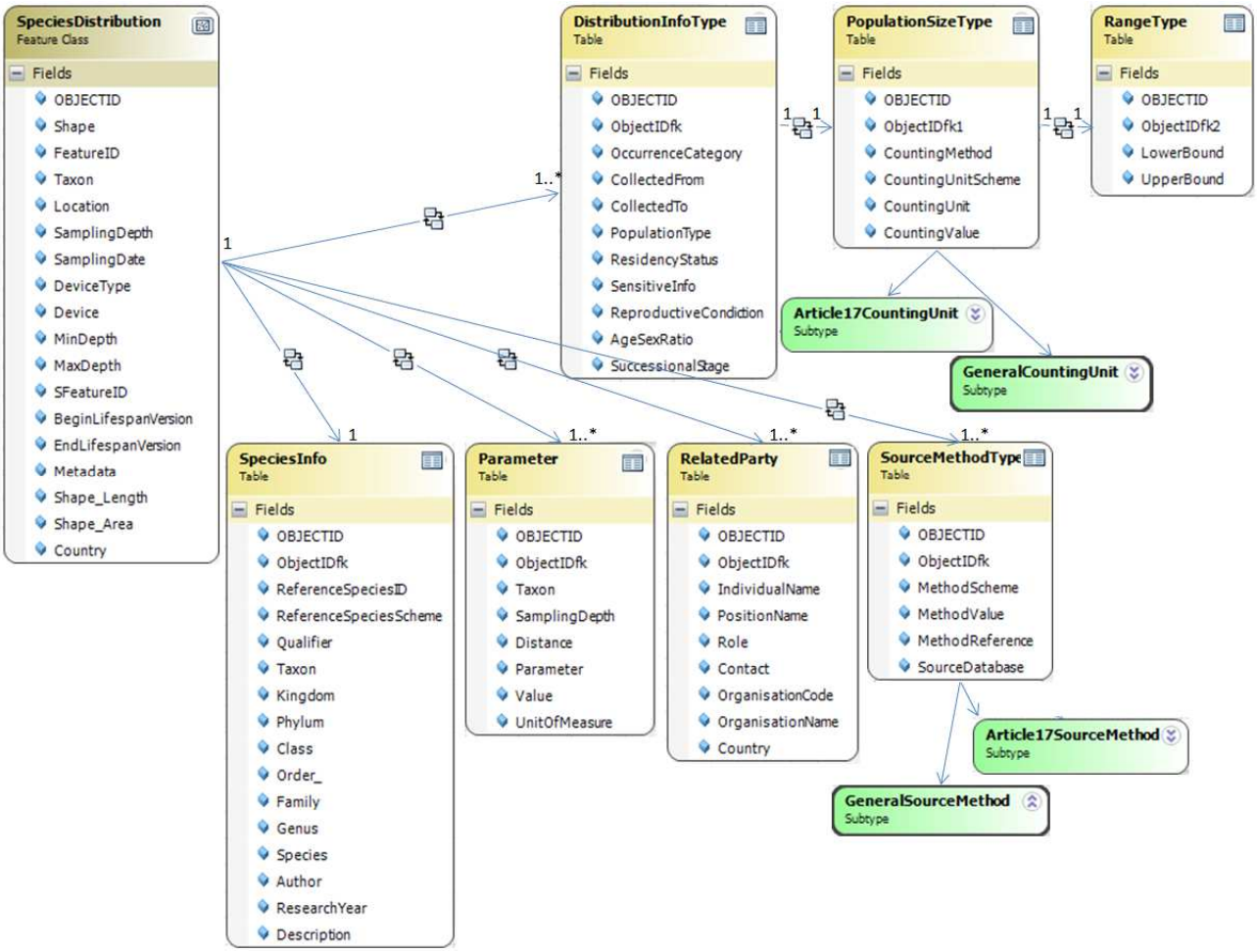
Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
SpeciesOccurrence HasStation	1→1..*	SpeciesOccurrence	Station	SFeatureID	SFeatureIDfk
SpeciesOccurrence HasTransect	1→1..*	SpeciesOccurrence	Transect	SFeatureID	SFeatureIDfk
SpeciesOccurrence HasSurveyArea	1→1	SpeciesOccurrence	SurveyArea	SFeatureID	SFeatureIDfk



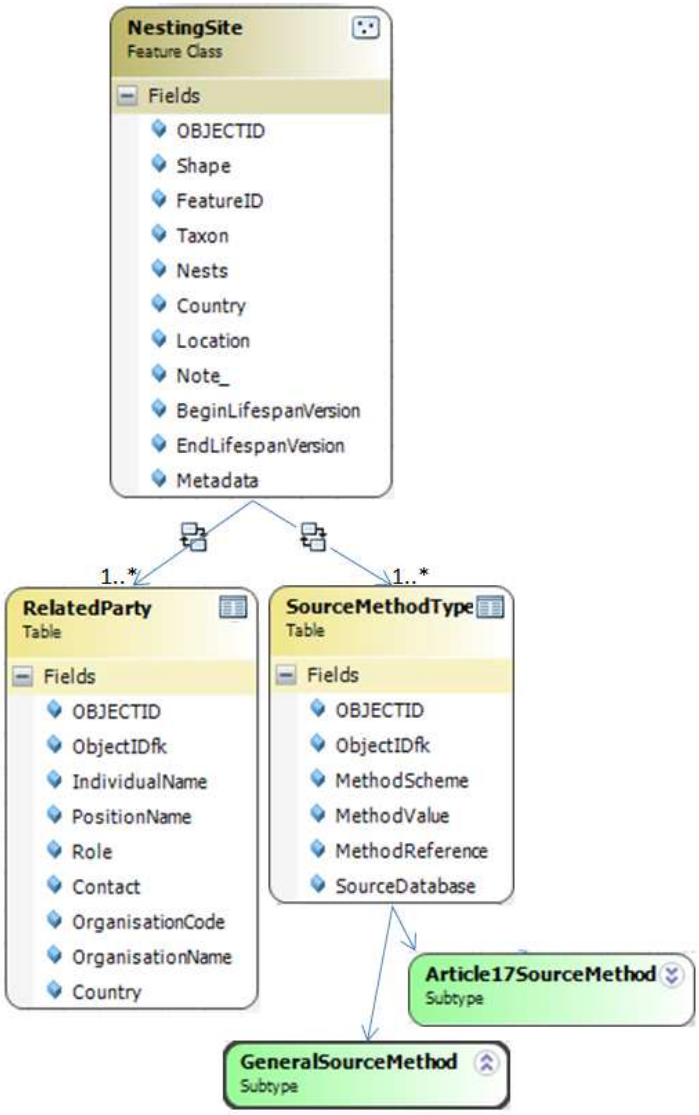
Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
SpeciesOccurrence HasSpeciesInfo	1→1	SpeciesOccurrence	SpeciesInfo	FeatureID	ObjectIDfk
SpeciesOccurrence HasParameter	1→1..*	SpeciesOccurrence	Parameter	FeatureID	ObjectIDfk
SpeciesOccurrence HasSourceMethdoType	1→1..*	SpeciesOccurrence	SourceMethod Type	FeatureID	ObjectIDfk
SpeciesOccurrence HasRelatedParty	1→1..*	SpeciesOccurrence	RelatedParty	FeatureID	ObjectIDfk
SpeciesOccurrence HasDistributionInfoType	1→1..*	SpeciesOccurrence	DistributionInfo Type	FeatureID	ObjectIDfk
DistributionInfoTypeHas PopulationSizeType	1→1	DistributionInfoTyp e	PopulationSize Type	ObjectIDfk	ObjectIDfk1
PopulationSizeType HasRangeType	1→1	opulationSizeType	RangeType	ObjectIDfk1	ObjectIDfk2



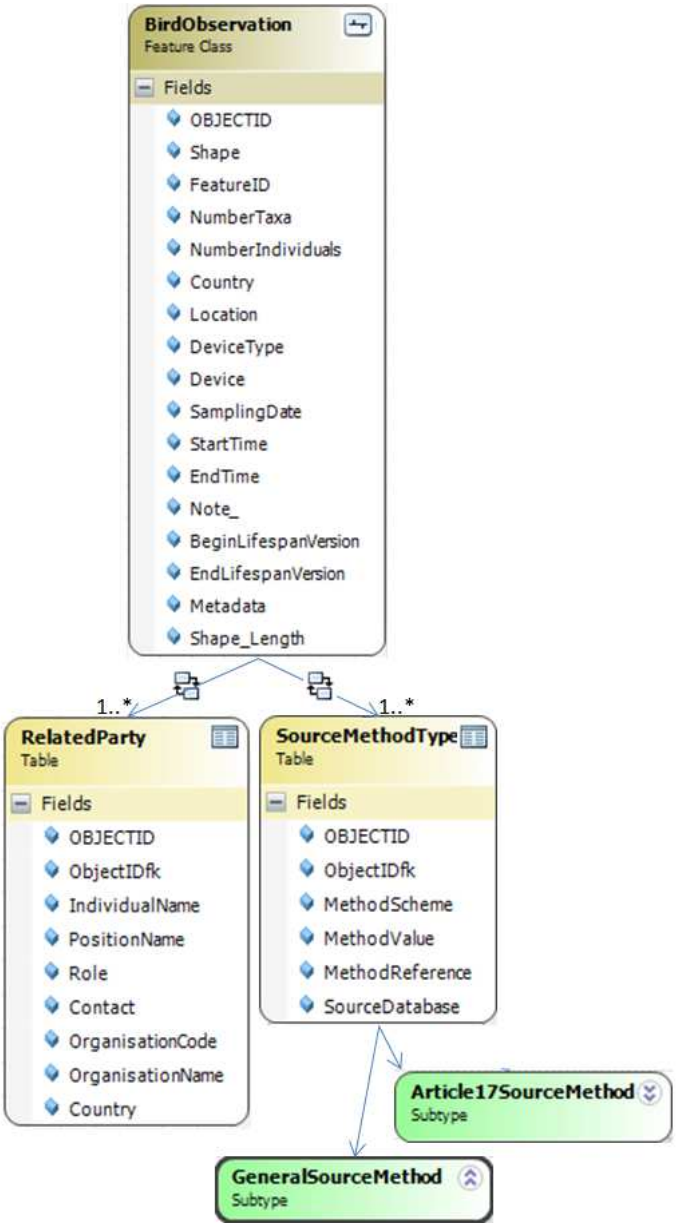
Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
SpeciesDistribution HasStation	1→1..*	SpeciesDistribution	Station	SFeatureID	SFeatureIDfk
SpeciesDistribution HasTransect	1→1..*	SpeciesDistribution	Transect	SFeatureID	SFeatureIDfk
SpeciesDistribution HasSurveyArea	1→1	SpeciesDistribution	SurveyArea	SFeatureID	SFeatureIDfk



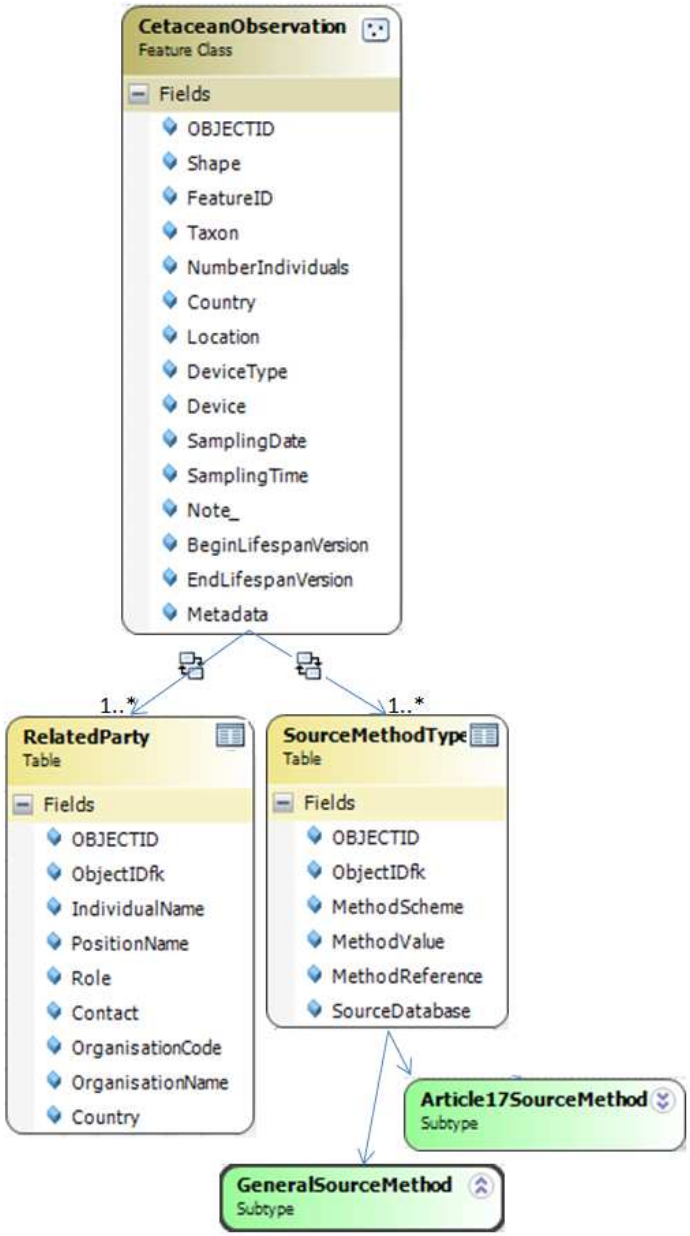
Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
SpeciesDistribution HasSpeciesInfo	1→1	SpeciesDistribution	SpeciesInfo	FeatureID	ObjectIDfk
SpeciesDistribution HasParameter	1→1..*	SpeciesDistribution	Parameter	FeatureID	ObjectIDfk
SpeciesDistribution HasSourceMethdoType	1→1..*	SpeciesDistribution	SourceMethod Type	FeatureID	ObjectIDfk
SpeciesDistribution HasRelatedParty	1→1..*	SpeciesDistribution	RelatedParty	FeatureID	ObjectIDfk
SpeciesDistribution HasDistributionInfoType	1→1..*	SpeciesDistribution	DistributionInfo Type	FeatureID	ObjectIDfk
SpeciesDistribution HasPopulationSizeType	1→1	DistributionInfoType	PopulationSize Type	ObjectIDfk	ObjectIDfk1
SpeciesDistribution HasRangeType	1→1	opulationSizeType	RangeType	ObjectIDfk1	ObjectIDfk2



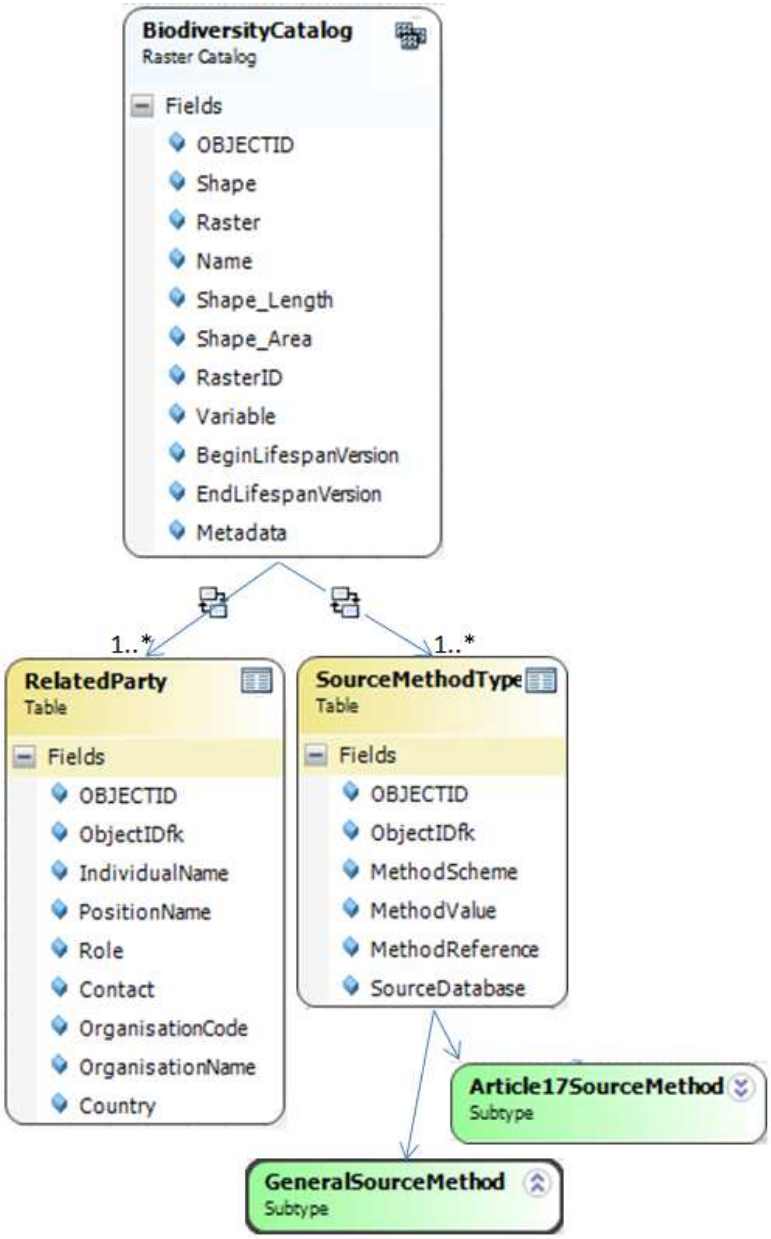
Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
NestingSiteHas SourceMethdoType	1→1..*	NestingSite	SourceMethodType	FeatureID	ObjectIDfk
NestingSiteHas RelatedParty	1→1..*	NestingSite	RelatedParty	FeatureID	ObjectIDfk



Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
BirdObservationHas SourceMethdoType	1→1..*	BirdObservation	SourceMethodType	FeatureID	ObjectIDfk
BirdObservationHas RelatedParty	1→1..*	BirdObservation	RelatedParty	FeatureID	ObjectIDfk



Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
CetaceanObservation HasSourceMethdoType	1→1..*	CetaceanObservation	SourceMethod Type	FeatureID	ObjectIDfk
CetaceanObservation HasRelatedParty	1→1..*	CetaceanObservation	RelatedParty	FeatureID	ObjectIDfk



Name	Multiplicity	Origin class	Destination class	Primary key	Foreign key
BiodiversityCatalog HasSourceMethdoType	1→1..*	BiodiversityCatalog	SourceMethod Type	RasterID	ObjectIDfk
BiodiversityCatalog HasRelatedParty	1→1..*	BiodiversityCatalog	RelatedParty	RasterID	ObjectIDfk

4. Metadata

In the framework of the CoCoNet project, metadata are produced by Mikado software. Each Feature Class and raster layer has a CDI (Common Data Index) accessible though the SeaDataNet portal (http://seadatanet.maris2.nl/v_cdi_v3/search.asp). The CDIs are also available on the webpage http://coconetgis.ismar.cnr.it/ as .xml files, grouped by Geodatabase. Lastly, the metadata file is linked to the feature or to the raster file though a field in the attribute table.

ANNEX 1

Acronyms

CDI – Common Data Index

FC – Feature Class

FD – Feature Dataset

OC - Object Class

fk – foreign key

References

Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

D2.8.III.19 Data Specification on Species Distribution – Technical Guidelines (D2.8.III.19_v3.0)

http://inspire.ec.europa.eu/data-model/approved/r4618/html/

http://coconetgis.ismar.cnr.it/

http://seadatanet.maris2.nl/v_cdi_v3/search.asp

WoRMS Editorial Board (2015). World Register of Marine Species. Available from http://www.marinespecies.org at VLIZ. Accessed 2015-05-26

ANNEX 2 – Domains

Article17CountingUnitValue_v3

Type: Code Value Domain

Description: The unit used in reporting for Article 17 Report. Expresses counted or estimated number for the abundance (e.g. occurrences or the population size) (INSPIRE Directive, r4618).

Value	Code	Definition
Adults	adults	
Colonies	colonies	
Individuals	individuals	
Localities	localities	
Males	males	
Pairs	pairs	
Breeding females	breedingFemales	
Calling males	callingMales	
Flowering stems	floweringStems	
Inhabited logs	inhabitedLogs	
Inhabited stones or boulders	inhabitedStonesOrBoulders	
Inhabited trees	inhabitedTrees	
Shoots	shoots	
Tufts	tufts	
Length	length	
Area	area	

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR
State: approved
Used in: PopulationSizeType (OC)
Extensibility: none
Note 1: The values of the list are found here:
http://bd.eionet.europa.eu/activities/Natura_2000/Folder_Reference_Portal/Population_units.pdf

Article17SourceMethodValue_v3

Type: Code Value Domain

Description: The methods that have been used in the sources for compiling the information about the occurrences of the habitats within an aggregation unit for article 17 purposes. Describes how the information about the occurrences of the habitats within a a unit has been compiled (INSPIRE Directive, r4618-ir)

Value	Code	Definition
Absent data	absentData	Absent data (INSPIRE Directive, r4618-ir)
Complete survey	completeSurvey	Complete survey (INSPIRE Directive, r4618-ir)
Estimate expert	estimateExpert	Estimate based in expert opinion with no or minimal sampling (INSPIRE Directive, r4618-ir)
Estimate partial	estimatePartial	Estimate based on partial data with some extrapolation and/or modeling (INSPIRE Directive, r4618-ir)

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR
State: approved
Used in: SourceMethodType (OC)

Extensibility: none
Note 1: The values of the list are found here:
http://circa.europa.eu/Public/irc/env/monnat/library?l=/habitats_reporting/reporting_2007-2012/reporting_guidelines/reporting-formats_1/_EN_1.0_&a=d (D2.8.II.1_v3.0)

CountingMethodValue_v3

Type: Code Value Domain
Description: Method for producing numbers indicating the abundance of a species (INSPIRE Directive, r4618).

Value	Code	Definition
Calculated	calculated	
Counted	counted	
Estimated	estimated	

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR
State: approved
Used in: PopulationSizeType (OC)
Extensibility: none
Note 1: none

CountryCode_v3

Type: Code Value Domain
Description: Country code as defined in the Interinstitutional style guide published by the Publications Office of the European Union (INSPIRE Directive, r4618-ir)

Value	Code
Albania	AL
Algeria	DZ
Bosnia and Herzegovina	BA
Bulgaria	BG
Cyprus	CY
Croatia	HR
Egypt	EG
France	FR
Gaza Trip	PS
Georgia	GE
Gibraltar	GI
Greece	EL
Israel	IL
Italy	IT
Lebanon	LB
Libya	LY
Malta	MT
Monaco	MC
Morocco	MA
Montenegro	ME
Romania	RO
Russia	RU
Slovenia	SI

Spain	ES
Syria	SY
Tunisia	TN
Turkey	TR
Ukraine	UA
United Kingdom	UK

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR
State: approved
Used in: SpeciesOccurrence (FC), SpecisDistribution (FC), BirdObservation (FC), CetaceanObservation (FC), NestingSite (FC), RelatedParty (OC).
Extensibility: none
Note 1: none

GeneralCountingUnitValue_v3

Type: Code Value Domain

Description: The unit used to express a counted or estimated number indicating the abundance (e.g. occurrences or the population size) (INSPIRE Directive, r4618).

Value	Code	Definition
Colonies	colonies	
Individuals	individuals	
Juvenile	juvenile	
Larvae	larvae	
Pairs	pairs	
Shoal	shoal	
Shoots	shoots	
Tufts	tufts	

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR
State: approved
Used in: PopulationSizeType (OC)
Extensibility: yes
Note 1: none

GeneralSourceMethodValue_v3

Type: Code Value Domain

Description: What are the methods that have been used in the sources for compiling the information about the elevation objects

Value	Code	Definition
Collection examination	collectionExamination	Data collected from examinations of collections (INSPIRE Directive, r4618-ir)
Grid mapping	gridMapping	Data observations collected by systematic surveys in grid cells (INSPIRE Directive, r4618-ir)
Line sampling	lineSampling	Data collected by systematic surveys along linear transects (INSPIRE Directive, r4618-ir)
Literature examination	literatureExamination	Data collected from literature examinations like printed maps, tables (INSPIRE Directive, r4618-ir)
Prediction	predictionModeling	Data from prediction modeling

modeling		
Random observation	ramdomObservation	Data collected by randomly distributed (INSPIRE Directive, r4618-ir)collection/observation sites randomly outside a systematic survey (INSPIRE Directive, r4618-ir)
Remote sensing observation	remoteSensingObservation	Data collected by the Remote Sensing Observation method
Statistical sampling	statisticalSampling	Data collected on locations selected by statistical sampling methods (INSPIRE Directive, r4618-ir)

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR
State: approved
Used in: SourceMethodType (OC)
Extensibility: yes
Note 1: none

OccurrenceCategoryValue_v3

Type: Code Value Domain

Description: A species population density in classes (common, rare, very rare or present) (INSPIRE Directive, r4618).

Value	Code	Definition
Absent	absent	
Common	common	
Present	present	
Rare	rare	
Very rare	veryRare	

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR
State: approved
Used in: DistributionInfoType (OC)
Extensibility: yes
Note 1: none

ParameterValue_v3

Type: Code Value Domain

Description: type of parameter

Value	Code	Definition
Abundance	abundance	
Biomass	biomass	
Dry biomass	dryBiomass	
Horizontal projected cover	horizontalProjectedCover	
Kg per dredge	kgPerDredge	
Kg per hour of dredging	kgPerHourOfDredging	
Number of individuals	numberOf individuals	
Sample biomass	sampleBiomass	
Sample number of individuals	sampleNumberOfIndividuals	
Sample number of species	sampleNumberOfSpecies	

Visual cover	visualCover	
Wet biomass	wetBiomass	

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR
State: approved
Used in: Parameter (OC)
Extensibility: yes
Note 1: none

PartyRoleValue_v3

Type: Code Value Domain

Description: Roles of parties related to or responsible for a resource (INSPIRE Directive, r4618-ir)

Value	Code	Definition
Author	author	Author of the data (INSPIRE Directive, r4618-ir)
Custodian	custodian	Guardian or keeper responsible for maintaining data (INSPIRE Directive, r4618-ir)
Distributor	distributor	Person or organisation who distributes the data (INSPIRE Directive, r4618-ir)
Originator	originator	Responsible party who created the dataset or metadata (INSPIRE Directive, r4618-ir)
Owner	owner	Person who owns the data (INSPIRE Directive, r4618-ir)
Point of contact	pointOfContact	Responsible party who can be contacted for acquiring knowledge about or acquisition of the data (INSPIRE Directive, r4618-ir)
Principal investigator	principalInvestigator	Key person responsible for gathering information and conducting research (INSPIRE Directive, r4618-ir)
Processor	processor	Responsible party who has processed the data in a manner in which data has been modified (INSPIRE Directive, r4618-ir)
Publisher	publisher	Responsible party who published the data (INSPIRE Directive, r4618-ir)
Resource provider	resourceProvider	Party that supplies the data (INSPIRE Directive, r4618-ir)
User	user	Person who uses the data (INSPIRE Directive, r4618-ir)

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR
State: approved
Used in: RelatedParty (OC)
Extensibility: yes
Note 1: none

PopulationTypeValue_v3

Type: Code Value Domain

Description: The permanency of populations, particularly with regard to migratory species (INSPIRE Directive, r4618).

Value	Code	Definition
Concentration	concentration	
Permanent	permanent	
Reproducing	reproducing	

Wintering	wintering	

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR
State: approved
Used in: DistributionInfoType (OC)
Extensibility: none
Note 1: These values are used for Natura2000 (revised SDF).

ReferenceSpeciesSchemeValue_v3

Type: Code Value Domain

Description: Reference lists defining a nomenclatural and taxonomical standard to which local names and taxonomic concepts can be mapped. The authorized ReferenceSpeciesScheme provides reference species list which defines the ReferenceSpeciesName with its scientific name plus author and ReferenceSpeciesId (INSPIRE Directive, r4618-ir)

Value	Code	Definition
EuNomen	eunomen	Names and taxonomic concepts as defined by the Pan European Species Inventory, published by eunomen.eu/portal (INSPIRE Directive, r4618-ir)
EUNIS	eunis	Names and taxonomic concepts as defined by the EUNIS Species list (INSPIRE Directive, r4618-ir)
Nature Directives	natureDirectives	Names and taxonomic concepts as defined by the nature directives species list (INSPIRE Directive, r4618-ir)
WoRMS	worms	Names and taxonomic concepts as defined by the World Register of Marine Species (WoRMS Editorial Board (2015)

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR
State: approved
Used in: SpeciesInfo (OC)
Extensibility: none
Note 1: In the framework of the CoCoNet project we decided that the WoRMS register has the priority. It is always updated and it includes only the marine species.

ResidencyStatusValue_v3

Type: Code Value Domain

Description: Category of the residency of the occurrences or estimated population (INSPIRE Directive, r4618).

Value	Code	Definition
Cultivated	cultivated	
Extinct	extinct	
Introduced established	introducedEstablished	
Introduced impermanent	introducedImpermanent	
Native	native	
Naturally impermanent	naturallyImpermanent	
Probably extinct	probablyExtinct	
Reintroduced or transloted	reintroducedOrTransloted	

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR

State: approved
Used in: DistributionInfoType (OC)
Extensibility: yes
Note 1: These values are used for Natura2000 (revised SDF).

SpeciesGroupValue_v3

Type: Code Value Domain

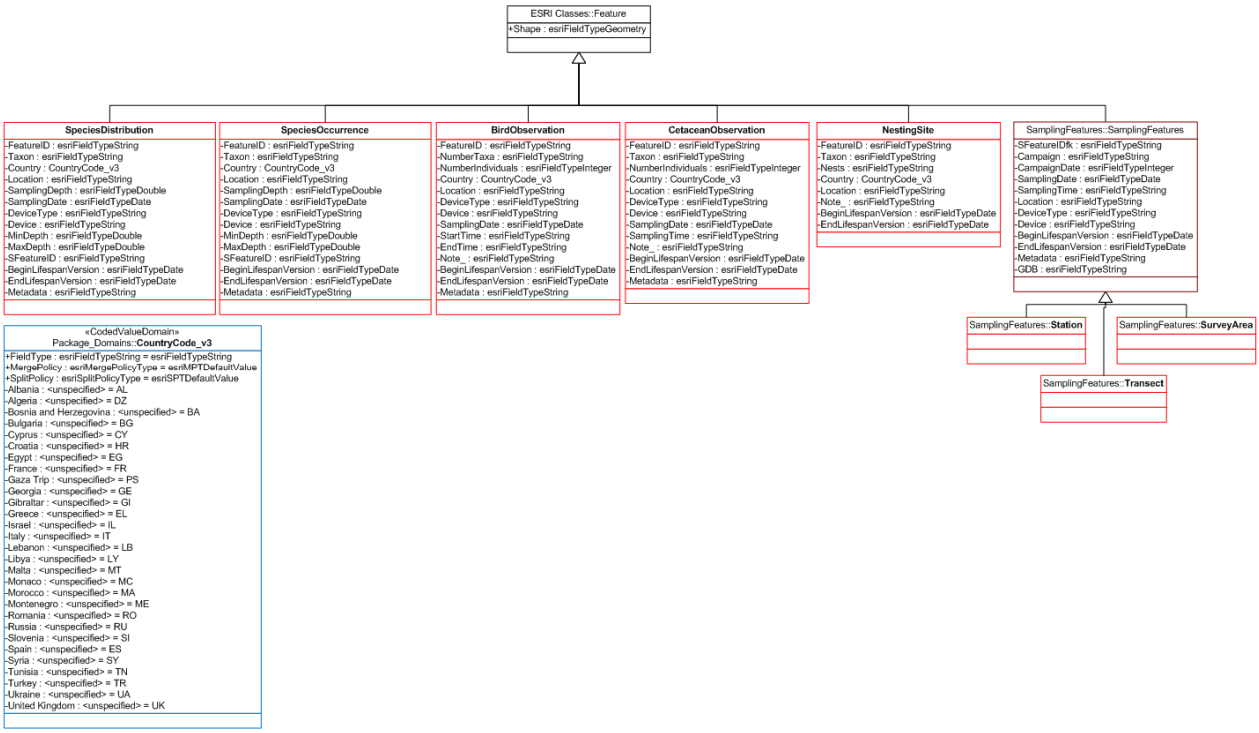
Description:

Value	Code	Definition
Pre-reproductive	PreReproductive	
Reproductive	Reproductive	
Post-reproductive	PostReproductive	

Created: 25/08/2015
Modified: none
Author: CNR-ISMAR
State: approved
Used in: DistributionInfoType (OC)
Extensibility: none
Note 1:

Annex 3 –UML diagram

Feature classes

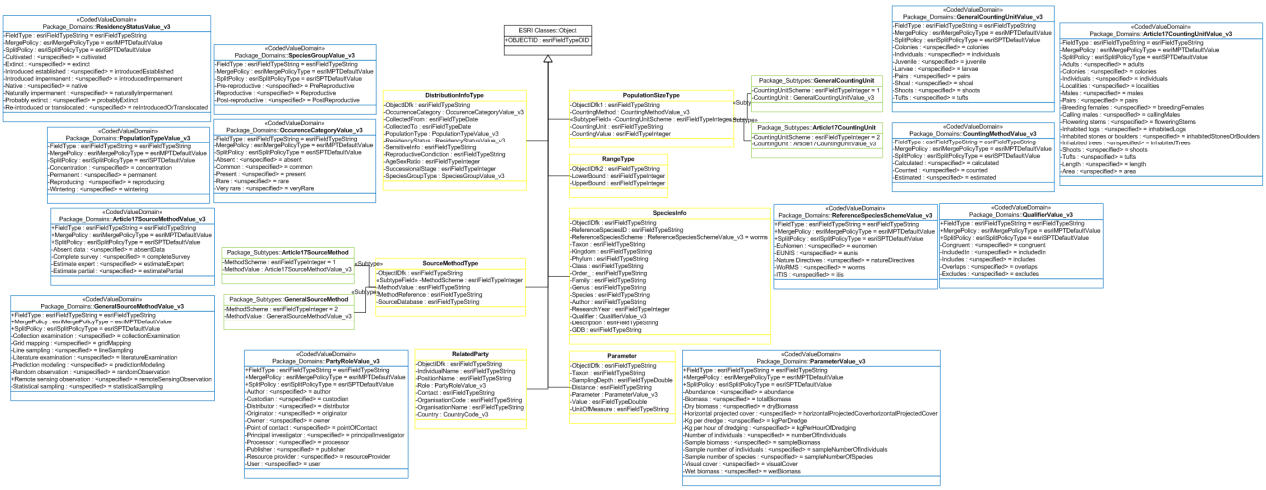


Feature Class (abstract): brown

Feature Class: red

Domain: blue

Object classes

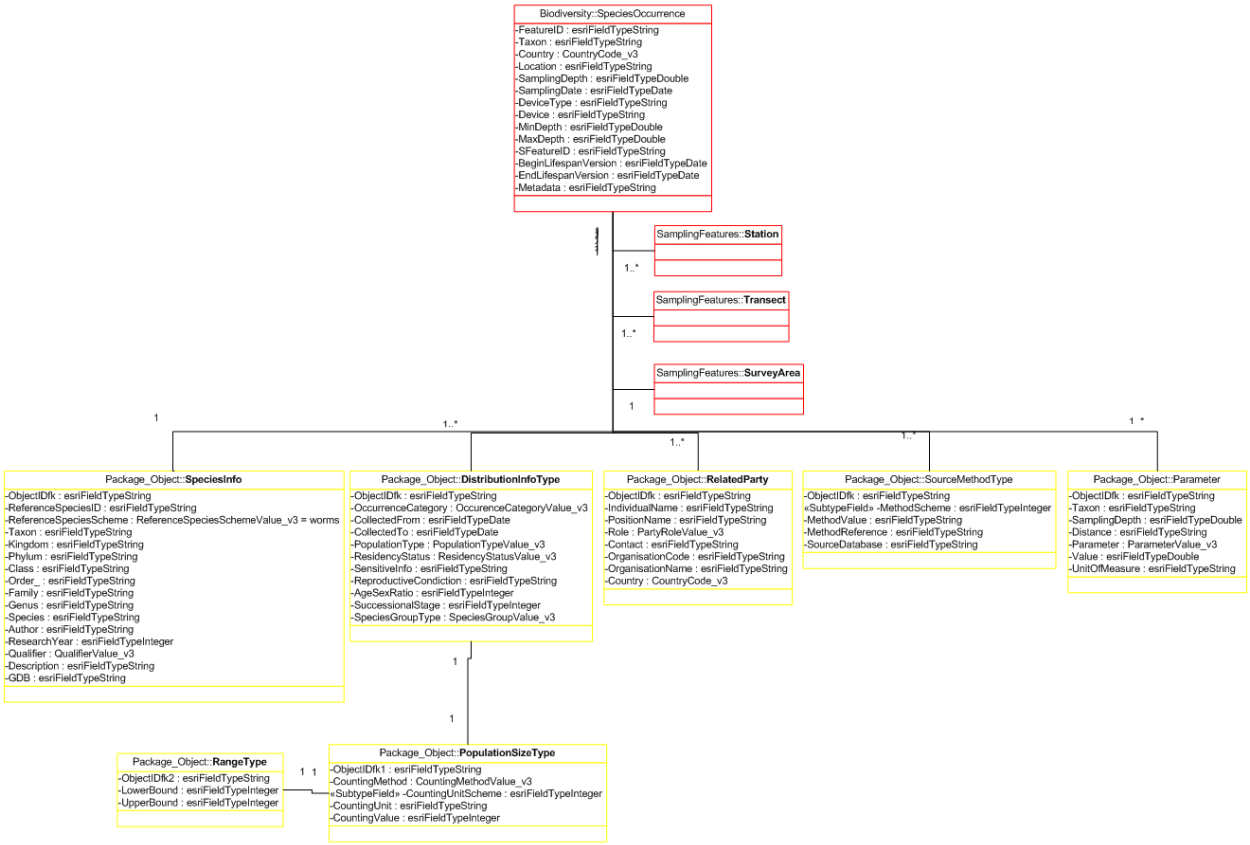


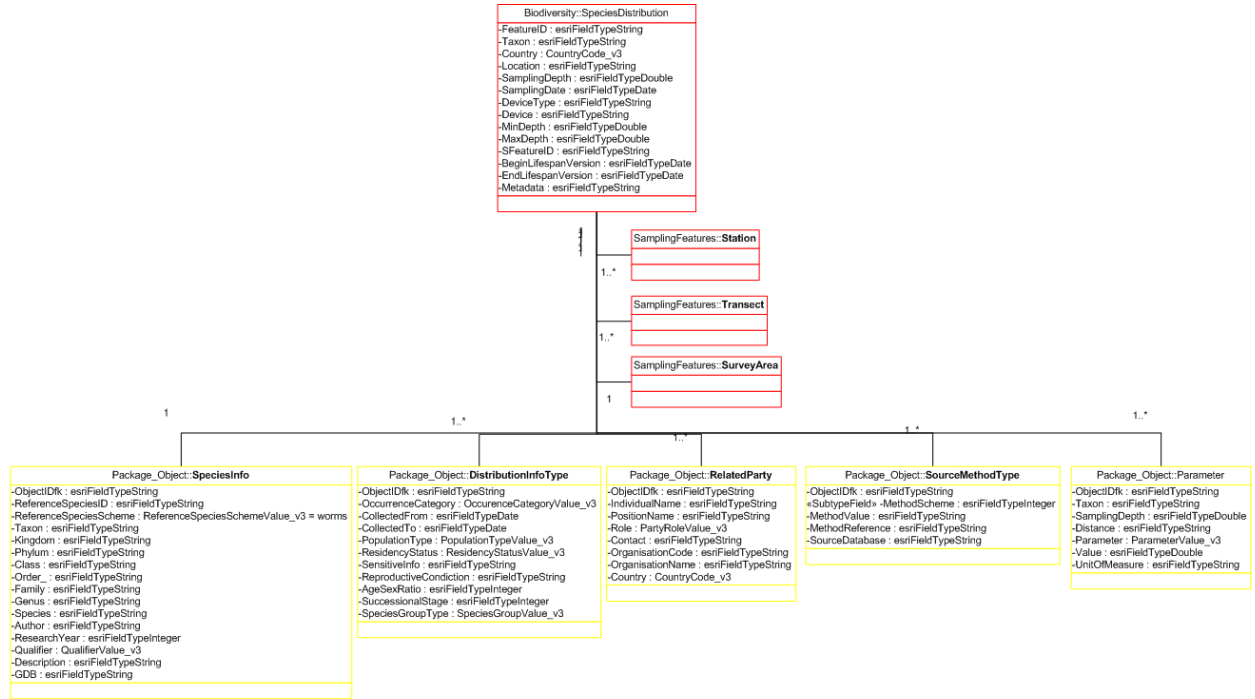
Object Class: yellow

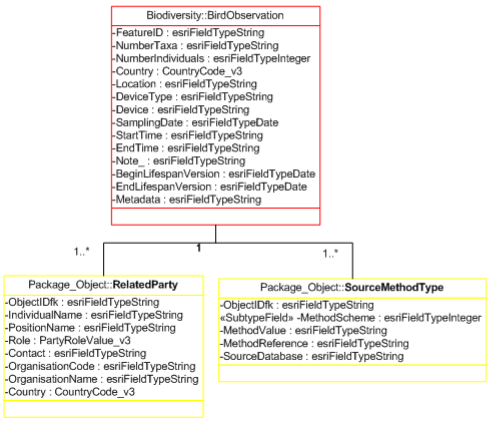
Subtype: green

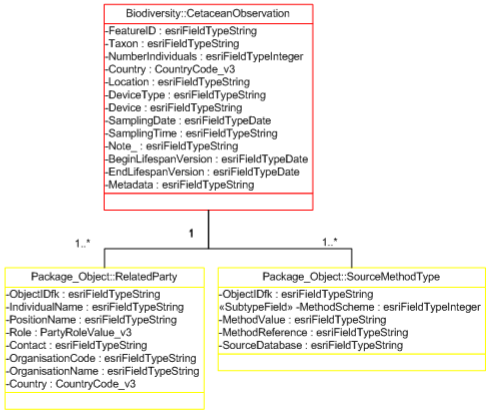
Domain: blue

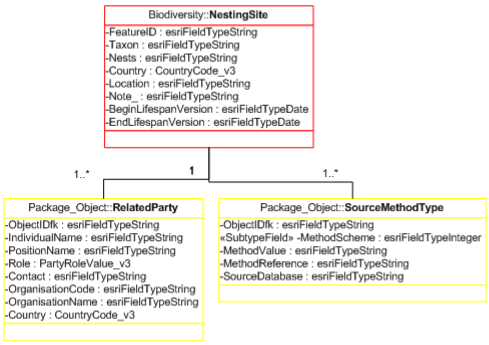
Relationship classes











Feature Class: red

Object Class: yellow

Annex 4 – Layer visualization