Conservation of cetaceans and sea turtles in the Adriatic Sea:

status of species and potential conservation measures

WP 7

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NOTE FROM THE EDITORS

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FIRST SECTION: STATE OF THE ART

Editors: Caterina Fortuna (ISPRA) & Drasko Holcer (BWI)

Chapter 1 – Overview on basic features of the Adriatic Sea

1.1. Oceanographic and meteorological features

This chapter gives a general description of the oceanographic and meteorological features of the Adriatic Sea that are most relevant to the ecology and conservation of cetaceans and sea turtles. It is not an exhaustive review on the existing knowledge in these fields. In future, the identified key features, or newly identified relevant features, will need further consideration.

1.1.1. Physiographic description

The Adriatic Sea – the northernmost arm of the Mediterranean Sea - is landlocked to the north, east and west by the Italian and Balkan peninsulas. It is linked with the Mediterranean through the Otranto Strait (max depth: 780 m; width: about 75 km) to the south (Ionian Sea). This is a rectangular basin (on a NW–SE axis) that extends over about 133,000 km^2 (length: about 800 km; width: max 200 km). It includes over 1,200 islands, islets and reefs and has about 3,000 km of shoreline (8,000 km when including islands). The Adriatic Sea is bordered by Albania, Bosnia-Herzegovina, Croatia, Italy, Montenegro and Slovenia. This is also a drainage basin for river inflow from Kosovo, Macedonia, Switzerland and France. The main freshwater inflow comes from the Po River. The Adriatic Sea has a water volume of about 35,000 km^3; 80% of which is held in the southern portion of the basin.

The Adriatic Sea (Fig. 1.1 & 1.2) can be divided into three sub-basins: i) the northernmost - northern Adriatic - is a shallow basin with the bottom sloping gently to the south and reaching a maximum of about 100m (average depth = 35m); this sub-basin is strongly influenced by the Po river plumes, with low salinity, low water temperature and high productivity; ii) a transition zone - the central or middle Adriatic - influenced by the inflow of Levantine Intermediate Water (LIW) and characterised by three depressions located along the transversal line off the coast of Pescara (Jabuka/Pomo pit), with a maximum depth of about 280m; and iii) the southern sub-basin - southern Adriatic - separated from the central Adriatic by the 170m deep Palagruža sill. This area is characterised by circular-like isobaths (along with steep slopes of up to 30°) with a maximum depth of about 1200m in the centre and relatively high salinity. This sub-basin consists of around 55% of the surface area and about 80% of the total volume of the Adriatic Sea.

The eastern and western shores of the Adriatic Sea show a striking contrast. The north-western

Italian coast is a continuation of the vast Po-Venetian Valley which it is connected to through a coastal area characterised by the alternation of long sandy beaches, important deltaic systems and extended lagoon areas. Sandy beaches are still prevalent in the central-western coast. As a result of geologically recent tectonic deformations the south-western coast shows a little more variation, with the alternation of relatively small sandy and pebble beaches and rocky areas. Here you can find the Tremiti islands. On the other side, the eastern coast is almost all completely rocky (mostly limestone), full of generally oblong islands and islets running parallel to the continental shoreline. This landscape changes along the Albanian coasts, where sandy beaches, river mouths and lagoons predominate intersected by very few short and shallow rocky areas.

Figure 1.1. Adriatic Sea: map of the region with bathymetry and main locations used in this report (source: Drasko Holcer, BWI, NETCET)

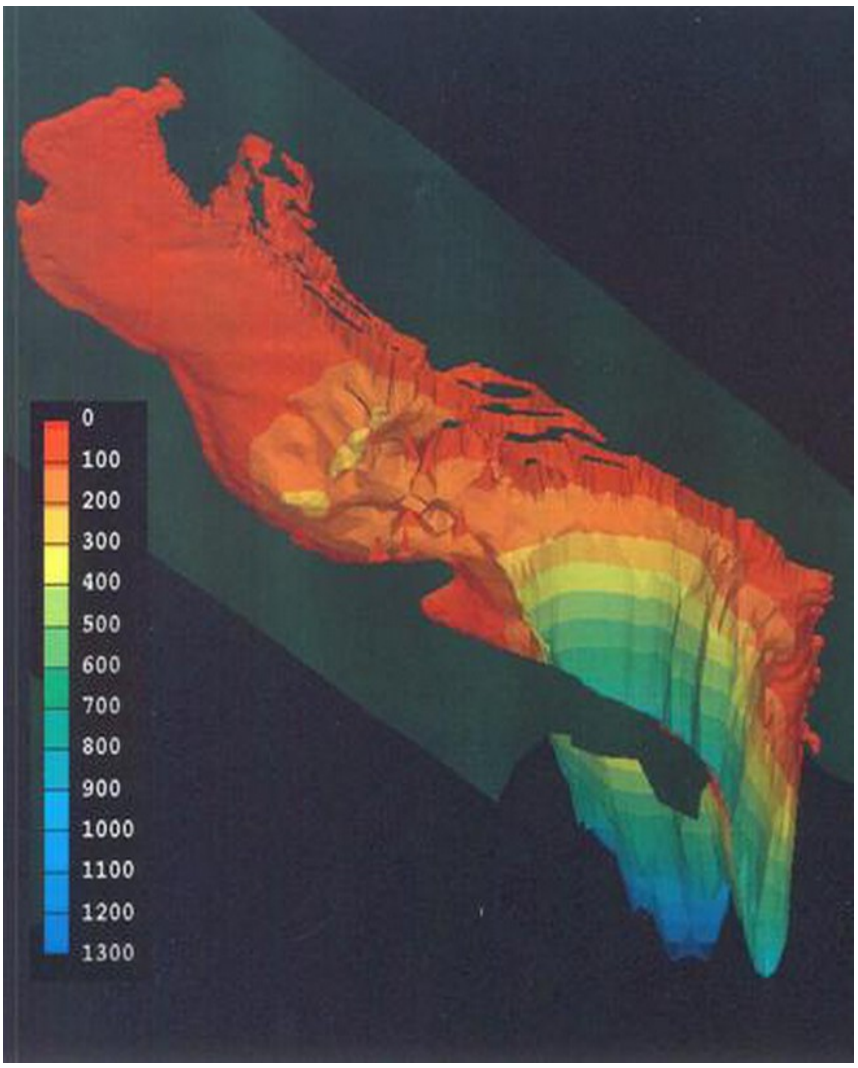

Figure 1.2. Adriatic Sea: 3-D bathymetry (Souce: http://engineering.dartmouth.edu/adriatic/index.html)

1.1.2. Winds and currents

The two main wind systems are the bora (AL: murlani; HR, MN, SLO: bura; IT: bora) and the sirocco (AL: shiroku; HR, MN, SLO: jugo; IT: scirocco). The bora (from the Greek "boreas": north wind) is a north-easterly dry and cold wind (katabatic wind) blowing offshore from the eastern coast. It often reaches speeds of in excess of 100 km/h. The bora produces appreciable buoyancy fluxes through evaporative and heat loss, induces both wind-driven and thermohaline circulation and, most importantly, is responsible for the deep water formation processes. The sirocco blows from the southeast bringing rather humid and relatively warm air into the region.

The Adriatic Sea, together with the Black Sea, is one of the two regions within the Mediterranean Sea where freshwater input exceeds evaporation. This is due mostly to the outflow from the Po River in the north. The Po River, the largest Italian river, drains one of the most industrialized as well as an intensively cultivated area in Europe, and its influence is felt throughout the basin. The Po and the other northern Italian rivers are believed to be the

source of about 20% of the total Mediterranean river runoff. Other rivers may have meaningful local impacts in the coastal areas of the region.

The flow between the Adriatic and the Mediterranean through the Otranto Strait is characteristic of a typical dilution basin where low salinity water is near the surface and high salinity water is at depth. The inflow from the Mediterranean consists of Ionian water at the surface and Modified Levantine Intermediate Water (MLIW) in a depth from 200-300m. This inflow occurs over a wide area along the eastern shore of the Otranto strait. Near–surface outflow from the Adriatic is concentrated in a thin layer along the western coast. This consists of relatively fresh water originating mostly from the northern Adriatic. The remainder of the outflow consists of Adriatic Bottom Water (ABW), a water mass formed in the southern basin that flows over the sill of the Otranto Strait into the Ionian Sea (Fig. 1.3a and 1.3b).

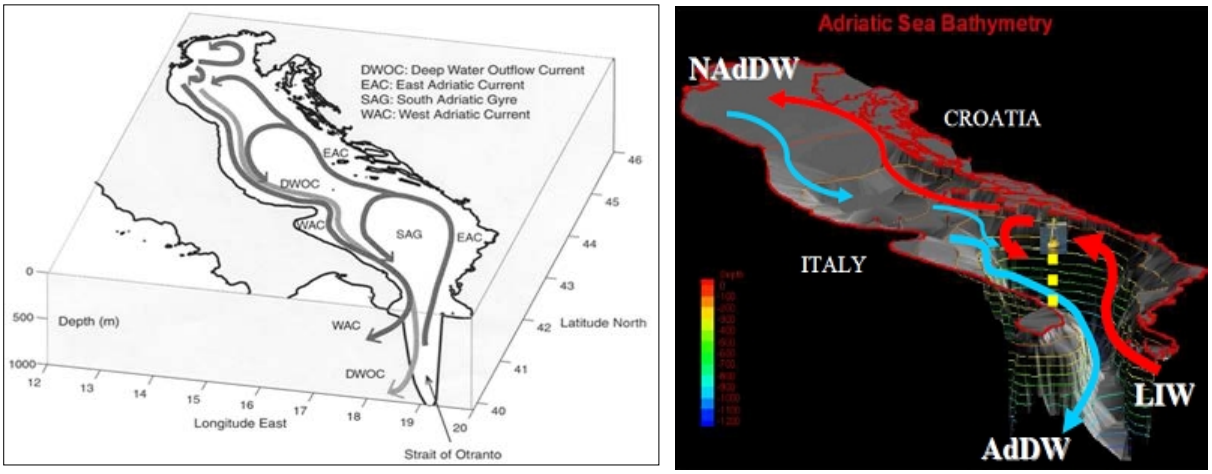

Figure 1.3. Seawater currents in the Adriatic Sea: a) general seawater circulation (DWOC includes NADW+ABW, and EAC, SAG and WAG include MLIW, see text); b) dense water circulation (Sources: http://www.devotes-project.eu/adriatic-sea/; http://nettuno.ogs.trieste.it/e2-m3a/s_themes.html).

The general basin–wide circulation shows a broadly cyclonic pattern with several smaller, more or less permanent embedded gyres (Fig. 1.3). A topographically controlled cyclonic gyre sitting over the South Adriatic Pit partially isolates the northern Adriatic from the Mediterranean influence. This gyre causes a bifurcation of the incoming MLIW, with part of it entering the northern basins over the Palagruža Sill, while the rest is entrained into the South Adriatic cyclonic circulation cell. The circulation regime varies seasonally and inter-annually in response to changes in the heating and wind regimes. Seasonally, the winter circulation is characterized by a prevalence of warmer Mediterranean inflow reinforced by southerly winds. In the summer, there is a stronger outflow of fresher and warmer Adriatic water along the western coast supported by north, north-western winds.

There is also the North Adriatic Deep Water (NADW), a water mass formed in the northern Adriatic Sea during strong bora events, when evaporation can reach 15 mm/day (annual

average total: 1000 mm). This very dense deep water is characterised by temperatures less than 10°C and a relatively low salinity of about 38.3 PSU. After formation, the NADW flows southwards along the isobaths near the bottom of the Italian shelf. The flow partially sinks into the Jabuka Pit, although the major portion moves further southwards to reach the shelf off Bari, where a canyon intersects the shelf and the water deepens.

The Sea Surface Temperature (SST) generally ranges from 12 to 26 C depending on the season. In the Gulf of Trieste and around the Po river delta, given a lower salinity, the water can occasionally freeze. The salinity field, averaged on the water depth, ranges between 31.21 and 39.24 PSU.

1.1.3. An example of how oceanographic and meteorological features can affect the management of cetaceans and sea turtles

Figure 1.4 depicts the results of a model on sediment dispersal in the north-western Adriatic Sea (see http://www.myroms.org/ for full details). In this case, sediment dispersal in the Adriatic Sea was evaluated using coupled three-dimensional circulation and sediment-transport models, representing conditions recorded during 18 months in 2002-2003.

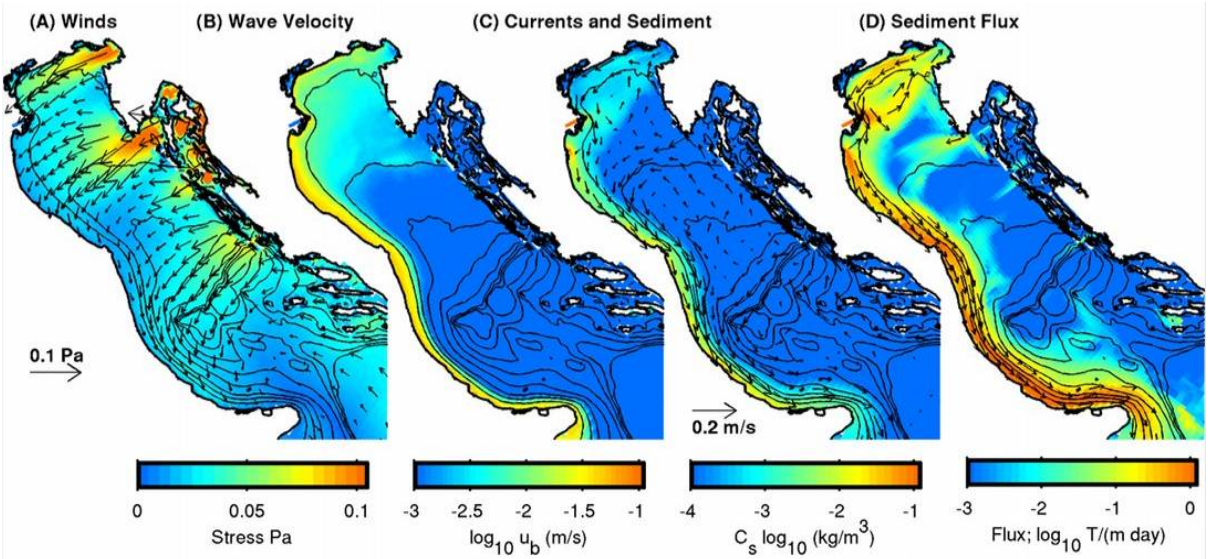

Figure 1.4. Model on sediment dispersal in the Adriatic Sea. Time-averaged: a) wind stress, b) wave orbital velocity, c) depth-averaged suspended-sediment concentration (shading) and current velocity (arrows), d) depth-integrated daily averaged sediment flux (tons/m/day) (Source: http://www.myroms.org/)

This model attempted to realistically portray a winter storm season using coupled models including an atmospheric, wave, hydrodynamic, and sediment model. These models provide an interesting application on how the stranding patterns of sea turtles and cetaceans could be evaluated in the region. This specific model also gives some indication about which coastal areas should naturally provide the highest incidence of strandings, given the wind

and wave patterns. Based on the available information on the known features, models evaluating the incidence of strandings have been developed. Hence, the information collected through stranding networks, such as the NETCET WP4.1, could help to evaluate patterns of strandings within the Adriatic Sea.

1.2. Geopolitical features and legal competence by the bordering countries

1.2.1. Geopolitical features

The Adriatic Sea is bordered by six coastal states in total: Albania, Bosnia and Herzegovina, Croatia, Italy, Montenegro and Slovenia. Each country has a share of the total Adriatic Sea coastline which differs greatly. Table 1.1 summarises some of the relevant characteristic of each country in regard to their Adriatic 'relevance' in terms of coastline extension and number of people living in the bordering administrative areas (e.g. provinces, prefectures, counties or regions). See section 1.3.1 for more details on selected administrative areas.

Table 1.1 - Some number on the Adriatic region – relevance of countries

	Albania	**Bosnia and Herzegovina[1]**	**Croatia**	**Italy**	**Montenegro**	**Slovenia**
Adriatic continental coastline, km	273 (6.9%)	23 (0.6%)	1,880 (47.4 %)	1,447 (36.5%)	294 (7.4%)	47 (1.2%)
Adriatic continental & insular coastline, km	292 (3.5%)	23 (0.3%)	6,278 (74.7 %)	1,468 (17.5%)	294 (3.5%)	47 (0.6%)
Number of Adriatic sea islands, islets and reefs	3	0	1185	5	5	1
Adriatic population (n of people)	1,989,439* (14.5%)	236,278 (1.7%)	1,411,935 (10.3%)	9,692,855 (70.7%)	148,683 (1.1%)	230,906 (1.7%)

Key: *including the urban population of Tirana (about 420,000 people). Source of demographic statistics: Croatian Bureau of Statistics, http://www.dzs.hr/Hrv_Eng/ljetopis/2013/sljh2013.pdf (2013 data); Statistical Office of the Republic of Slovenia (2011 data); http://www.geohive.com/cntry/bosherz.aspx (2013 preliminary data); Statistical Office of Montenegro – Census 2011; Italian National Institute of Statistics, www3.istat.it (census 2011).

The numbers in Table 1.1 should be considered with caution and only as proxies, since some of these administrative divisions maybe have highly populated territories far from the coast (this is the case of many of the Italian provinces). Concerning the Italian islands, Table 1.1 includes only Tremiti islands. Islands and islets of the Venice and Grado lagoons and of the Po delta (a total of 156 islands) are not included.

The total Adriatic coastline amounts to almost 8,500 km, including the insular coastline. Of the six Adriatic countries Croatia has the longest total coastline, amounting to over 6,000 km (74% of the total); whereas it's continental coastline amounts to 46%. The Italian coastline is mostly continental (36% of the Adriatic continental coastline), accounting for only 16% of the total continental and insular Adriatic coastline. When considering continental and insular coastline, Albania and Montenegro are below 5%, whereas Slovenia and Bosnia-Herzegovina are

[1]Bosnia and Herzegovina comprises three entities: Federation of Bosnia and Herzegovina, Republic of Srpska and Brčko District. The Federation of Bosnia and Herzegovina consists of ten federal units (cantons). The Herzegovina-Neretva canton extends to the coast (with 12.2 km^2 of sea surface).

below 1%.

Besides large differences in terms of coastline length, the Adriatic countries show considerable differences in terms of the share in coastal and maritime activities too. Table 1.1 shows their population size in the Adriatic area only as a proxy of potential man-made pressure. Italy has by far the highest potential for impact. See more in the next paragraph on differences in terms of share, in regards to rights and duties toward the conservation and management of the coastal and marine environment, and later (e.g. sections 1.2.2, 1.3.1, 1.3.4, 1.3.5) statistics on at sea activities, such as fishery, tourism and maritime traffic.

1.2.2. Maritime jurisdictional boundaries

The general maritime jurisdictional situation in the Adriatic Sea is rather complex. Figure 1.5 shows the maritime jurisdictions within the Adriatic Sea, some of which are still not ratified by the relevant parties. These boundaries are based on the generally applied principles of the UNCLOS.

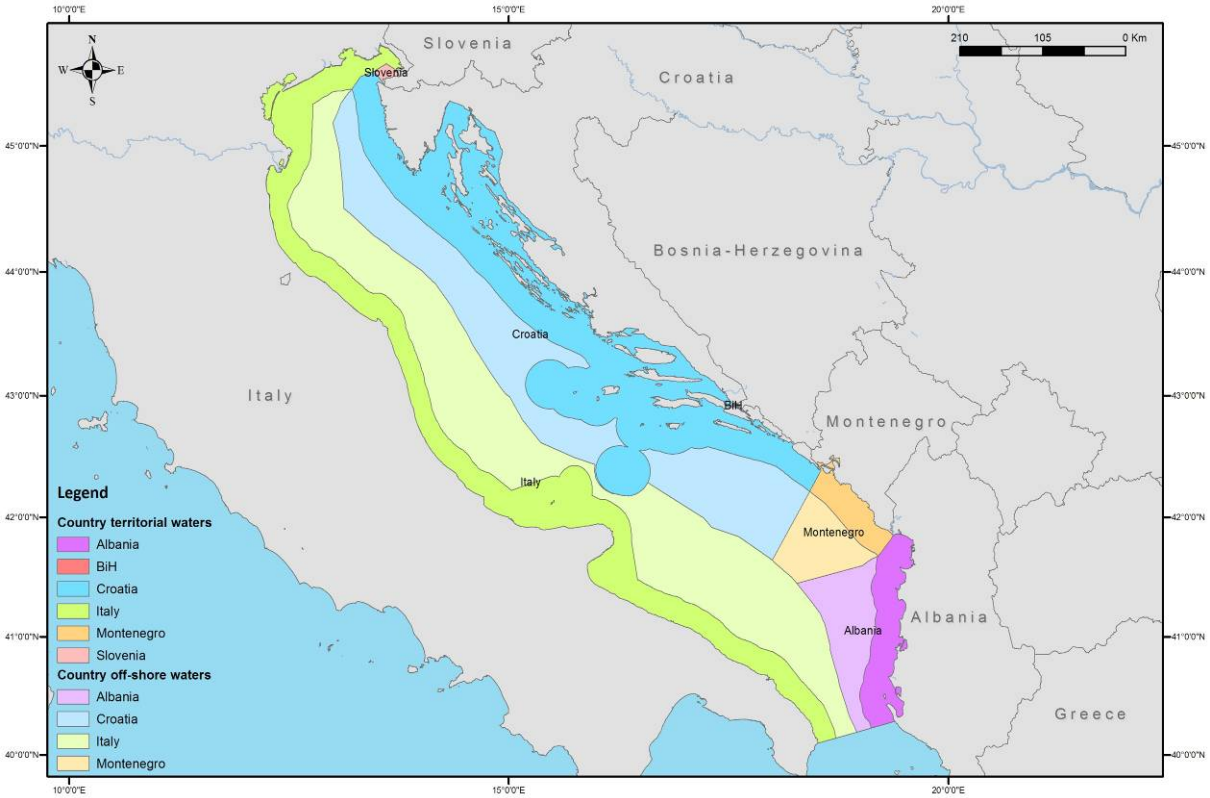

Figure 1.5. Maritime jurisdiction within the Adriatic Sea (source: Drasko Holcer, BWI, NETCET)

Albania, Croatia, Italy and Montenegro have established their territorial seas up to 12nm from their established baselines. Slovenia has in principle also established their territorial sea. This is agreed with Italy according to the rule of equidistance between facing states. However, there is an ongoing international arbitration between Slovenia and Croatia over the disputed

area of the bay of Piran and the adjacent sea, so there are still no official boundaries.

The maritime border between Croatia and Bosnia-Herzegovina has been established through a treaty in 1999, but not yet ratified.

Concerning Economic Exclusive Zones, and variations therein, the states emerging from the break-up of the Socialist Federal Republic of Yugoslavia inherited the international agreements signed with Italy, in accordance with the principles of the General Succession of Bilateral Agreements. Within the frame of the 1968 Agreement Italy and Croatia signed:

- the Technical Agreement in 2005 adopting the use of WGS 84 allowing an accurate determination of the delimitation lines of the Italian and Croatian continental shelves which were reviewed;
- the Technical Agreements in 2009 & 2012 guaranteeing the exploitation of the Annamaria Gas Field in the Adriatic Sea which lies on both sides of the delimitation line between the continental shelves of the two states.

Albania and Italy also signed (1995) an agreement on the delimitation of the continental shelf following the criterion of equidistance from their respective baselines (Italian Law 147/1995, entered into force since February 26 1999). Among other technical details, this agreement also sets out that there are defined criteria (proportionality and compensation) for the exploitation of deposits that may exist straddling the boundary lines; and that the contracting parties shall take all possible measures to ensure that the explorations and the exploitations of natural resources do not affect the ecological balance of the sea or unjustifiably interfere with other legitimate uses.

Following these agreements on the continental shelf delimitations, Croatia, Italy and Slovenia approved specific legislation for the establishment of special zones, implying a potential for extending their national jurisdiction beyond territorial waters. This legislation concerns:

- the Ecological and Fishery Protection Zone (EFPZ), established by Croatia in 2003 in order to mitigate the negative impacts on marine resources. However, the EFPZ only applies to non-EU Member States (OG 157/2003, 77/2004, 138/2006, 31/2008), as Fishery is exclusive competence of the EU and such management measures need to be carefully negotiated in Brussels with all EU MS;
- the Ecological Protection Zone and Continental Shelf established by Slovenia in 2005; however, its delimitations with neighbours are still to be agreed (RZECEP, 001-22-104/05);
- a framework Italian law passed in 2006 (law 61/2006) that allows the establishment of an Ecological Protection Zone around the whole country, provided that boundaries are agreed with neighbouring countries for each of its portion. So far, the only agreed portion of this EPZ is that in the Ligurian and Tyrrhenian seas successfully negotiated

with France.

Albania and Montenegro still have not established any special zones. Therefore a big portion of the southern Adriatic remains currently unclaimed. Although Montenegro did not declare an EEZ, such a possibility is stipulated by their Maritime Law allowing the Parliament to declare it. Based on such stipulations Montenegro started with offshore licensing for hydrocarbons prospecting and possible extraction, effectively extending their jurisdiction to that part of the Adriatic. Albania also extended its offshore hydrocarbons prospecting activities to its possible EEZ area although it did not formally extend its jurisdiction to currently the unclaimed offshore waters of the Adriatic sea.

The Adriatic Sea is roughly composed of 54% of territorial waters (12nmi), 41% of which is under EU jurisdiction. When adding the potential EPZ and EFPZ, the waters under the jurisdiction of the European MSs amounts to 87% of the total area (46% IT, 41% HR). Eight percent in the southern Adriatic is still officially unclaimed, therefore, not entirely managed. In addition it is important to note that the EPZ and EFPZ designations control or manage only some marine uses.

Table 1.2 summarises some rough estimates of the extension of territorial waters, "continental shelf" waters and potential/existing EPZ and EFPZ.

Table 1.2 - Summary of national jurisdictions on Adriatic waters (areas in km²)

	Albania	Bosnia-Herzegovina	Croatia	Italy	Montenegro	Slovenia
Territorial waters within 12nmi (54% of the total Adriatic Sea)	5,000 (4%)	0 [17] (0%)	32,000 (24%)	23,000 (17%)	2,000 (1%)	0 *[185-376]* (0.2-0.5%)
Continental shelf boundary (including EPZs or EFPZs)	Unclaimed (6,000 [4%])	0	55,000 (41%)	61,000 (46%)	Unclaimed (5,000 [4%])	0

Note: Areas are rounded to the nearest thousand km². Calculations were made on GIS: these are not officially approved numbers. In the case of Slovenian territorial waters, given the ongoing arbitration, numbers are only given as proxies.

Besides the boundaries issue, the management of specific activities at the Adriatic level would require regional agreements among all relevant stakeholders. For example, for effective management of the fishing activities in the Adriatic this would imply an agreement at least between the EU, GFCM, national Authorities (both EU and non-EU countries) and RAC MED.

1.2.4. Existing and proposed spatial management measures relevant to cetaceans and sea turtles conservation

Within the Adriatic region, there are a high number of examples of marine spatial management measures/conservation mechanisms (Fig. 1.6). These have different objectives and thus different management measures, which can have beneficial impacts on cetaceans

and sea turtles conservation. Particularly we should consider the following:

- EU Natura 2000 sites established under the Habitats Directive & Birds Directive (SCIs: Sites of Community Importance , SACs: Special Areas of Conservation & SPAs: Special Protection Areas; http://natura2000.eea.europa.eu/#/);
- Marine Protected Areas, National and Regional Marine Parks, etc designated according to national legislation;
- Fishery 'no take' zones & Biological Protection Areas (BPAs or ZTBs in Italian; see also Fig. 1.8);
- Gas & oil restricted areas (no-exploitation: part of "Zone A"; buffer zones: no fishing, navigation or mooring; see also Fig. 1.7);
- Proposed Specially Protected Areas of Mediterranean Importance (SPAMIs);
- Proposed Ecologically or Biologically Significant Areas (EBSAs).

According to this list and looking at Figure 1.6, there are a few hundred established marine sites that have regulated or restricted areas of different kinds, most of which have a limited extension at sea. These areas have different spatial management objectives and some have real management measures in place. One MPA and nine Coastal Protected Areas (CPAs; these are mainly river mouths and lagoons, including adjacent shallow marine waters) in Albania, 327 sites in Croatia (310 Natura 2000 marine sites; seven MPAs all overlapping with the Natura 2000 sites and 17 gas platforms), 142 sites in Italy (four MPAs also listed as SCIs; five SACs; 114 oil & gas platforms; nine BPAs, five of which also listed as SCIs; 23 SCIs, including Regional Parks of the Po delta, Monte San Bartolo, the State Natural Reserve Le Cesine), and eight in Slovenia (five SACs, including the Landscape Park Strunjan and three SPAs). Montenegro does not have any marine protected areas or coastal protected areas extending at sea, except for a part of the Bay of Kotor that is protected under the UNESCO World Heritage convention.

Details of the objectives and management measures for these protected and/or managed areas are summarised in Tables 1.4 and 1.5.

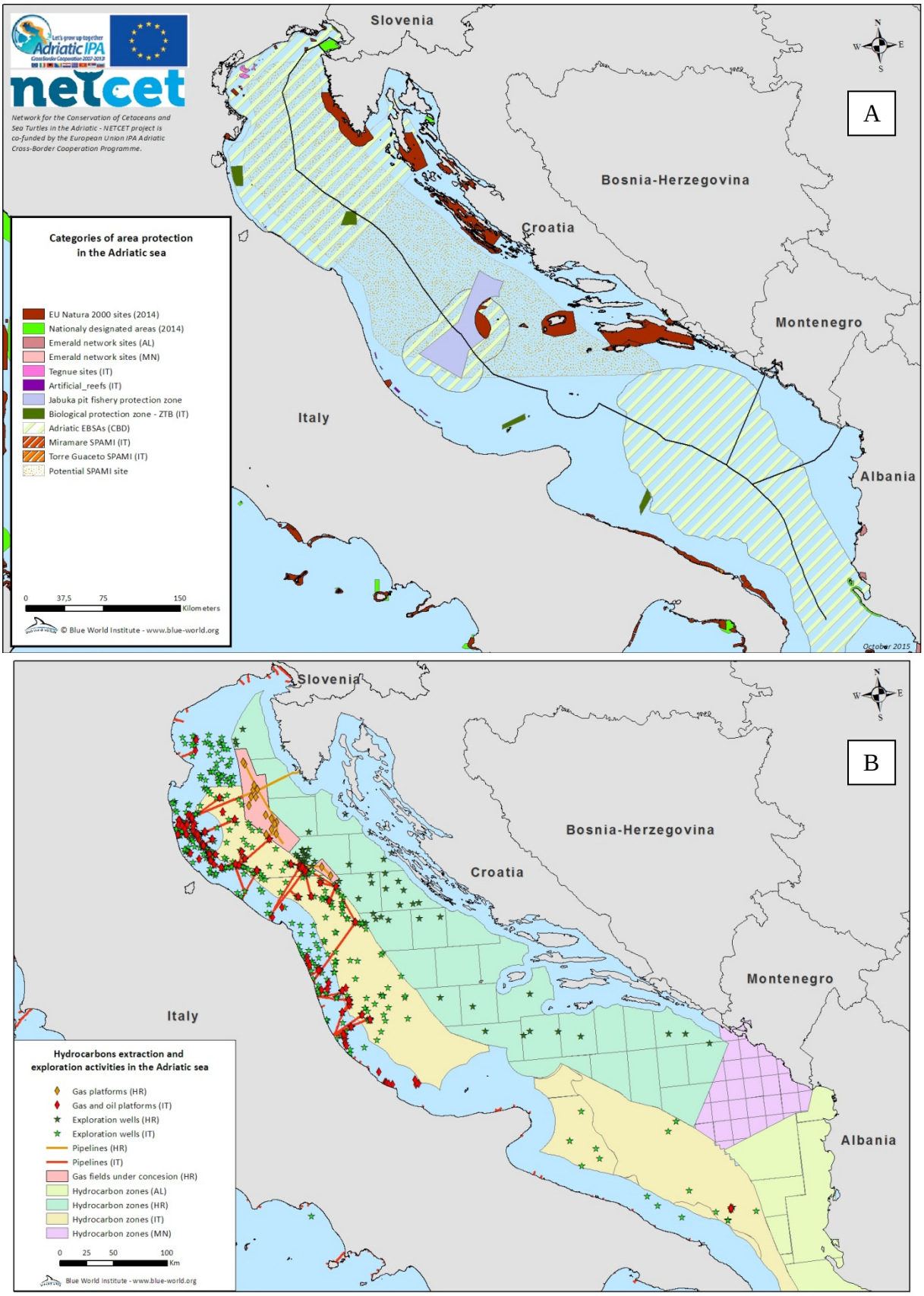

Figure 1.6. Different types of spatial restrictions within the Adriatic: A) Nationally Designated Areas such as Marine Protected Areas (MPA), National Parks, Nature Parks and Marine Reserves; Biological Protection Areas (BPAs; IT: ZTB), Natura 2000 sites (Sites of Community Importance (SCIs); B) existing gas and oil platforms and pipelines (source: Drasko Holcer, BWI, NETCET)

1.2.3.1. Natura 2000 network

Under the Habitats Directive (HD), there are three steps for the selection of Special Areas of Conservation (SACs) for the Natura 2000 network. These are: 1) identification of "Sites of Community Importance" (SCI) and proposal to the EU Commission (CION) based on a comprehensive scientific assessment of the habitat types and species present (selection criteria are specified by the HD); 2) adoption by the Commission, in agreement with the Member States (MS) of final lists of SCIs (through scientific seminars convened by the CION for each bio-geographical region in order to analyse the MS proposals); 3) designation by the MS all their respective SACs on the basis of the officially adopted list of SCIs, **within six years from its approval**. In this process, priority should be given to those sites that are most threatened and/or that are of most importance in conservation terms. Member States must take immediate management or restoration measures to ensure the favourable conservation status of their sites. Only, designated SACs require full management plans. Nevertheless, within designated Natura 2000 sites (SCIs and SPAs) MSs **must take appropriate conservation measures** to maintain and restore to a favourable conservation status habitats and species for which the site has been designated. In addition they must avoid damaging activities that could significantly disturb the species or deteriorate the habitats of community importance. Under the Birds Directive there is a similar process to arrive at the designation of a Special Protection Area (SPA).

Within the Adriatic Sea there are ten designated SACs and some hundred SCIs, the majority of which were identified by Croatia. It is relevant to note that the Natura 2000 network could potentially also contribute to the conservation measures for dolphin and sea turtles through the SPAs that have been identified for bird conservation (four SPAs in Slovenia, six and two pSPAs identified respectively by Croatia and Italy) in situations where such areas overlap with crucial habitat for these species (Fig. 1.6). However, only 21 Natura 2000 sites, designated by Croatia and Italy actually list cetaceans and sea turtles as species of present within the site boundaries (Tab. 1.3).

There appear to be substantial differences in the way both countries have identified the Natura 2000 for these two species. As far as HD species are concerned Croatia has not identified any SCIs hosting Caretta. According to information reported in the Natura 2000 Standard Data forms (SDF), three of the six Croatian sites are identified only on the basis of bottlenose dolphin presence while the remaining three are also identified based on the presence of other HD habitats (i.e. marine caves, reefs, sandbanks, Posidonia meadows). The Croatian sites have a declared marine surface area ranging from 75-100% of the overall SCI coverage amounting to a marine coverage ranging between 500-1000km^2 (with the exception of one site which is 165km^2). The bottlenose dolphin population estimated to be present in each site is ranked as hosting anywhere between 15-2% of the overall population

present within national waters and auxiliary information indicates that each site represents one of six most important feeding and reproductive grounds present within the country. Each of these sites has been selected on the basis of its purely marine nature (as opposed to a terrestrial site extending at sea) and on the basis of its coverage of marine surfaces hosting important bottlenose dolphin habitat.

Table 1.3. Species listed in designated Natura 2000 sites of the Adriatic Sea

Species	Listed species
Tursiops truncates (Annex II species)	- Six HR SCIs (listed as target species) in : Archipelago of Western Istria"; "National park Kornati"; "Archipelago of J. Molat-Dugi-Kornat-Murter-Pašman-Ugljan-Rivanj-Sestrunj-Molat"; "Archipelago of the island of Vis"; "Lastovo and Mljet Channel" and "Cres - Lošinj Archipelago. - Four IT SACs: "Laguna di Marano e Grado"; "Foce dell'Isonzo - Isola della Cona"; "Valle Cavanata e Banco Mula di Muggia"; "Carso Triestino e Goriziano". - Five IT SCIs: "Tegnue di Chioggia"; "Tegnùe di Porto Falconera"; "Trezze San Pietro e Bardelli"; "Area marina di Miramare"; "Torre del Cerrano".
Caretta caretta (Annex II species)	- Five IT SACs: "Laguna di Marano e Grado"; "Foce dell'Isonzo - Isola della Cona"; "Valle Cavanata e Banco Mula di Muggia"; "Cavana di Monfalcone"; "Carso Triestino e Goriziano". - Ten IT SCIs: "Tegnue di Chioggia"; "Tegnùe di Porto Falconera"; "Trezze San Pietro e Bardelli"; "Area marina di Miramare"; "Vene di Bellocchio, Sacca di Bellocchio, Foce del Fiume Reno, Pineta di Bellocchio"; "Sacca di Goro, Po di Goro, Valle Dindona, Foce del Po di Volano"; "Torre del Cerrano"; "Litorale Brindisino"; "Torre Guaceto e Macchia S. Giovanni"; "Torre Veneri"
Grampus griseus	- Two IT SACs: "Laguna di Marano e Grado"; "Valle Cavanata e Banco Mula di Muggia".
Stenella coreuleoalba	- Four IT SACs: "Laguna di Marano e Grado"; "Foce dell'Isonzo - Isola della Cona"; "Valle Cavanata e Banco Mula di Muggia"; "Carso Triestino e Goriziano". - Two IT SCIs: "Area marina di Miramare"; "Torre del Cerrano".
Delphinus delphis	- Two IT SACs: "Foce dell'Isonzo - Isola della Cona"; "Carso Triestino e Goriziano". - Two IT SCIs: "Area marina di Miramare"; "Torre del Cerrano".
Balaenoptera physalus	- One IT SCI: "Torre del Cerrano".
Physeter macrocephalus	- One IT SAC: "Carso Triestino e Goriziano".
Chelonia mydas	- One IT SAC: "Foce dell'Isonzo - Isola della Cona". - Three IT SCIs: "Tegnue di Chioggia"; "Tegnùe di Porto Falconera"; "Torre del Cerrano".

On the other hand, the information reported in the nine Italian SDFs indicate that the sites have been established on the basis of the presence of *Tursiops* but also of various other HD marine, anadromous habitats (i.e. reefs, sandbanks, coastal lagoons) and species such Caretta but also various other marine and coastal bird species. The marine extension of these sites is always less than 75km^2 and the bottlenose dolphin population size estimated within the site is either considered insignificant with respect to the population size at a national level or in a few exceptions within the 0-2% range.

The Italian Natura 2000 sites established for Caretta are 15, nine of which are also sites established for *Tursiops*. The marine surface area of these sites is small; most of them are less than 10km^2 in surface area (46%) or less than 30km^2 (39%). The estimated population size present with each site is declared as being mostly insignificant with respect to the size of the population in national waters.

The nature of the existing Adriatic Natura 2000 sites hosting bottlenose dolphins and loggerhead turtles is very diverse and reflects a substantially different establishment approach. The Croatian sites are exclusively marine, they have a geographic distribution and

surface area extension which leads to a substantial coverage of bottlenose dolphin habitat and population with respect to knowledge of the species' presence in national waters. Italian sites on the other hand are much smaller and contain several HD marine features and often times non-marine ones (such as in the case of terrestrial sites extending seaward or transitional waters of coastal lagoons and river deltas). In the cases of exclusively marine sites these overlap with existing spatial protection measures such as MPAs (MPA Miramare and Torre del Cerrano) or fishery restricted zones (i.e. Tegnue). Such differences have substantial implications in terms of the ensuing conservation measures that the existing network can provide with respect to these two species. Sites covering extensive areas of the species' distribution lay the groundwork for protection of species' critical areas through a univocal management measure (i.e. the site management plan), while sites extending over smaller marine surfaces and apparently designed to contain more than one HD marine feature will have a lower chance to provide sufficient management of the species' critical areas at a basin level (unless many more small marine sites are established on the basis of a species' specific ecological design).

1.2.3.2. Croatian marine protected areas

Past designation, pre independence, of protected areas in Croatia was generally *ad hoc* invariably based on aesthetics and/or political criteria. Although a significant area of the Croatian land territory was placed under protection, less than 1% of the territorial waters was protected.

In Croatia there are four categories of protected areas whose surface extend into the sea (even if sometimes by very little): National Parks, Nature Parks, Special Marine Reserves and Protected Landscapes.

For instance, the bays of Limski and Malostonski were designated as Special Nature Reserves for the protection of the mariculture of molluscs. The main restriction was on recreational use within the area. Also, the islands and adjacent marine area of Brijuni, Kornati and Mljet were all declared National Parks. Once again their rationale was based mainly on aesthetics and the potential for developing tourism.

Since Croatian independence nature protection has still mainly focussed on the terrestrial environment, although there have been two major recent additions (CEC 2004). These are the Lastovo archipelago Park of Nature (143.18 km^2 of sea surface) and the Cres-Lošinj Special Marine Reserve (460.59 km^2 of sea surface), both of which were designated based on scientific criteria. After initial preventive protection, Lastovo archipelago Nature Park was permanently protected in 2006. While the Cres-Lošinj SMR was under preventive protection for a period of three years, between 2006 and 2009. At the time, these two areas accounted for over 60% of the area protected for marine biodiversity in Croatia, and increased the overall protected area within the territorial waters to nearly 2%. Unfortunately in 2009 the preventive

protected status of Cres-Lošinj Special Marine Reserve lapsed and was removed from the protected area register, although it is now a Natura 2000 site and will become an SAC by 2020.

In total, currently, there are 22 protected areas (including eleven Significant Landscapes) with a marine component within Croatian internal waters in total their size at sea is: 616,28 km² (about 2%) (SINP data base, 2015). See Table 1.4 for more details. Internal waters and territorial waters are legally identified by different areas. All Croatian MPAs in Croatia lies within the internal waters.

1.2.3.3. Italian marine protected areas

Within the Italian legislation there are different types of protected areas which are relevant to the marine environment based on the ecosystem and geomorphological protection objectives contained in their designation nature: National Parks (sites of national or international relevance), Regional Parks (regional relevance). There are also Natural Reserves (either regional or National), sites relevant for biodiversity including for genetic resources. In addition, there are Marine Protected Areas (an *ad hoc* status established by the Law 394/91). Italian MPAs are multipurpose protected areas. Within an MPA activities are usually regulated according to up to 4 zones: i) zone A, integral reserve; ii) zone B, general reserve; iii) zone C, protection reserve; iv) zone D, area of economic and social development. Table 1.4 also list Adriatic MPAs summarising their objectives and management measures.

Article 19.3 Law 394/91 lays down some general prohibitions that apply to all MPAs. These are: the collection of flora & fauna (including fishing and hunting); collection or damage to archaeological sites and geological formations; any alteration of the geophysical environment and biochemical characteristics of the water, including the introduction of any pollutants, waste dumps (solid & liquid), aquaculture, illegal sewers; introduction of weapons, explosive, toxic & polluting substances or any other killing tool; any type of advertisement; navigation on engine. The latter is actually no longer applied, except that in some Zone A categories; this prohibition is often disregarded and substituted with boat speed regulations. There are three Adriatic MPAs designated under this law: Miramare, Torre Cerrano and Torre Guaceto. Their total area is 38.13 km².

Table 1.4 - Spatial management measures relevant to cetaceans and sea turtles for habitats & species protection in the Adriatic Sea: Marine National & Regional Parks, Marine Regional Parks, Marine Protected Areas

Name/Relevant countries	*Management measures*	*Legal reference*
Karaburun & Sazan Island National Park (Albania)	The park covers a marine area stretching 1.9 km along the coastlines of Karaburun Peninsula and Sazan Island near the Bay of Vlora. The marine park is 16 kilometres long with a width varying from 3 to 4.5km and covering a total of 124km² of sea surface. Karaburun Peninsula itself is a Managed Nature Reserve while Sazan Island is a military zone.	Council of Minister, Decision nr. 289 of the 28.04.2010.
Mljet National Park (Croatia)	Established in 1960 it extends into the sea for 24.39 km². The main natural values related to the sea are two salt water lakes that are important geological and oceanographic phenomena. This National Park is also listed as Natura 2000 SCI (HR5000037) and SPA (HR1000037).	Act on the Proclamation of National Park of the Western Part of the Island of Mljet (OG 49/60, 13/97)

Table 1.4 (*continued*) - Spatial management measures relevant to cetaceans and sea turtles for habitats & species protection in the Adriatic Sea: Marine National & Regional Parks, Marine Regional Parks, Marine Protected Areas

Name/Relevant countries	*Management measures*	*Legal reference*
Kornati National Park (Croatia)	Established in 1980 it extends into the sea for 165.63 km^2. The main natural values are geomorphological and oceanographic features in the sea, and preserved marine biodiversity. This National Park is also Natura 2000 SCI (HR4000001) and SPA (HR1000035).	Act on Kornati National Park (OG 31/80, 14/88, 13/97)
Karaburun & Sazan Island National Park (Albania)	The park covers a marine area stretching 1.9 km along the coastlines of Karaburun Peninsula and Sazan Island near the Bay of Vlora. The marine park is 16 kilometres long with a width varying from 3 to 4.5km and covering a total of 124km^2 of sea surface. Karaburun Peninsula itself is a Managed Nature Reserve while Sazan Island is a military zone.	Council of Minister, Decision nr. 289 of the 28.04.2010.
Mljet National Park (Croatia)	Established in 1960 it extends into the sea for 24.39 km^2. The main natural values related to the sea are two salt water lakes that are important geological and oceanographic phenomena. This National Park is also listed as Natura 2000 SCI (HR5000037) and SPA (HR1000037).	Act on the Proclamation of National Park of the Western Part of the Island of Mljet (OG 49/60, 13/97)
Kornati National Park (Croatia)	Established in 1980 it extends into the sea for 165.63 km^2. The main natural values are geomorphological and oceanographic features in the sea, and preserved marine biodiversity. This National Park is also Natura 2000 SCI (HR4000001) and SPA (HR1000035).	Act on Kornati National Park (OG 31/80, 14/88, 13/97)
Brijuni National Park (Croatia)	Established in 1983 it extends into the sea for 26.45 km^2. It was declared as protected because of geomorphology, hydrology, climate and overall landscape features with the existing flora. The seabed of Brijuni is an important fish spawning ground. This National Park is also listed as Natura 2000 SCIs (HR2000604, HR5000032) and SPA (HR1000032).	Act on the Proclamation of Brijuni National Park (OG 46/83, 57/89, 5/90, 45/99)
Telašćica Nature Park (Coratia)	Established in 1988 it extends into the sea for 44.67 km^2. The main natural values related to the sea are the geomorphological features (cliffs, salt lake "Mir", Telašćica Bay) and diverse seabed biocenosis. Its management plan was adopted in 2012. This Nature Park is also listed as Natura 2000 SCI (HR400002) and SPA (HR100035).	Act on the Proclamation of Telašćica Park of Nature (OG 14/88)
Lastovo archipelago Nature Park (Croatia)	Established in 2006 it extends into the sea for 143.18 km^2. The main natural values related to the sea are numerous endangered marine species and habitats. Its management plan was approved in 2013. This Nature Park is also listed as Natura 2000 SCI (HR5000038) and SPA (HR1000038).	Act on the Proclamation Lastovo archipelago Park of Nature (OG 111/06)
Prvić and Grgur Channel Special Reserve (Croatia)	Established in 1972 it extends into the sea for 38,38 km2. It was declared as protected due to high cliffs on the northeast and the south-western side of the island Prvić and because a colony of Griffon Vulture (Gyps fulvus). This Special Reserve is also listed as Natura 2000 SCI (HR3000021, HR3000022) and SPA (HR1000033).	Decision SO Krk No. 02-1596 / 1-1971
Neretva Delta (south-eastern part) Special Reserve (Croatia)	Established in 1974 it extends into the sea for 4,57 km2. It was declared as protected due to the spawning ground for numerous fish species. Delta of Neretva river is also significant for migration, nesting and wintering of waterbirds. This Special Reserve is also listed as Natura 2000 SCI (HR5000031) and SPA (HR1000031).	Decision SO Metković No. 785/1-1974
Limski Bay Special Marine Reserve (Croatia)	Established in 1979 it extends into the sea for 4.2 km2. It was declared as protected because of the specific geological features of high bioproduction (plankton, shellfish, fish). This Special Marine Reserve is also listed as Natura 2000 SCI (HR3000001) and SPA (HR1000032).	Act on the Proclamation of Limski zaljev Special Marine Reserve (OG 63/1979)
Malostonski Bay Special Marine Reserve (Croatia)	Established in 1983 it extends into the sea for 57.16 km2. It was declared as protected due to the special geological features and natural flow of nutrients from the land (hence the sea is of high bioproduction). This Special Marine Reserve is also listed as Natura 2000 SCI (HR4000015).	Act on the Proclamation of Malostonski Bay Special Marine Reserve (OG 4/1983);
Datule Barbariga Special Reserve (Croatia)	Established in 1994 it extends into the sea for 4,17 km2. It was declared as protected due to dinosaur bones in seabed. This Special Reserve is also listed as Natura 2000 SCI (HR5000032) and SPA (HR1000031).	Decision declaring, Assembly, 03/10./1994 (SNIZ No.1/ 96)
Pantan Special reserve (Croatia)	Established in 2000 it extends into the sea for 0,10 km2. This spring of watercourse was declared as protected due to its habitats for brackish fish species. It is also significant for migration and wintering of waterbirds. This Special Reserve is also listed as Natura 2000 SCI (HR3000430).	Decision declaring the site Pantan special reserve (OG of the County of Split-Dalmatia No.10/2000)
Limski Bay Significant landscape (Croatia)	Established in 1964 it extends into the sea for 4,96 km2. It was declared as protected due to geological features (flooded canyon). This Significant landscape is also listed as Natura 2000 SCI (HR3000001) and SPA (HR1000032).	Decision on the protection and registration in Register (No. 20/1-1964)
Zavratnica Significant landscape (Croatia)	Established in 1964 it extends into the sea for 0,08 km2. It was declared as protected due to geological features (flooded valley). This Significant landscape is also listed as Natura 2000 SCI (HR3000034).	Decision on the protection and registration in Register (No. 160/3-1964)
Sit-Žut archipelago Significant landscape (Croatia)	Established in 1967 it extends into the sea for 80,71 km2. It was declared as protected due to landscape features. This Significant landscape is also listed as Natura 2000 SCI (HR3000419).	Decision declaring the Kornati archipelago reserve of natural landscape (The Executive Board of the Parliament, No. 3178/2-238-1967)
Stiniva Cove Significant landscape (Croatia)	Established in 1967 it extends into the sea for 0,0005 km2. It was declared as protected due to geological features. This Significant landscape is also listed as Natura 2000 SCI (HR3000097) and SPA (HR1000039).	Decision SO Vis No. 01-407/4-67
River Krka (lower flow) Significant landscape (Croatia)	Established in 1968 it extends into the sea for 4,24 km2. It was declared as protected due to landscape features. This Significant landscape is also listed as Natura 2000 SCI (HR3000171).	Decision declaring watercourse and coastal zone of the river Krka a natural reserve (OG of the municipality of Drniš, Knin and Šibenik No. 12/1968)
Labin, Rabac and Prklog Cove Significant landscape (Croatia)	Established in 1972 it extends into the sea for 3,02 km2. It was declared as protected due to geological and landscape features. This Significant landscape is also listed as Natura 2000 SCI (HR3000463).	Decision SO Labin br. S-142/1-72

Table 1.4 (*continued*) - Spatial management measures relevant to cetaceans and sea turtles for habitats & species protection in the Adriatic Sea: Marine National & Regional Parks, Marine Regional Parks, Marine Protected Areas

Name/Relevant countries	*Management measures*	*Legal reference*
Donji Kamenjak and Medulin archipelago Significant landscape (Croatia)	Established in 1973 it extends into the sea for 0,15 km2. It was declared as protected due to landscape features. This Significant landscape is also listed as Natura 2000 SCI (HR5000032) and SPA (HR1000032).	Decision declaring (OG No 5/96, 7/02)
Kanal – Luka Significant landscape (Croatia)	Established in 1974 it extends into the sea for 4,24 km2. It was declared as protected due to landscape features. This Significant landscape is also listed as Natura 2000 SCI (HR3000171).	Decision declaring the area Kanal-Luka Reserve of natural landscapes (OG of the municipality Drniš, Knin and Šibenik No. 8 of 1974)
Blaca Valley Significant landscape (Croatia)	Established in 1986 it extends into the sea for 0,08 km2. It was declared as protected due to landscape features. This Significant landscape is also listed as Natura 2000 SCI (HR3000127).	Decision declaring Blaca Vallley a protected area (OG of the municipality Brač No.4 / 1986)
Zrce Significant landscape (Croatia)	Established in 1988 it extends into the sea for 1,55 km2. It was declared as protected due to landscape feature. This Significant landscape is part of Natura 2000 SCI (HR3000039).	Decision SO Pag No. 2161-40/88-01-3
Rijeka Dubrovacka Significant landscape (Croatia)	Established in 1964 it extends into the sea for 1,27 km2. It was declared as protected due to landscape feature. One very small part of this Significant landscape is part of Natura 2000 SCI (HR2001010).	Decision on the protection and registration in Register (No. 164/2-1964)
MPA Miramare (Italy)	Activities are regulated differently according to 2 zones (A, integral reserve; B, general reserve). Commercial fishery and the general prohibitions (as at art. 19.3, Law 394/91) apply to both zones. Navigation, anchoring, bathing, scuba diving, leisure fishing (from shore only) are prohibited or regulated according to different zones. This MPA is also listed as Natura 2000 SCI (IT3340007).	Ministerial Decree 12/11/1986
MPA Torre del Cerrano (Italy)	Activities are regulated differently according to 3 zones (B, general reserve; C, protection reserve; D, area of economic and social development). Zone A (Integral reserve) does not exist for this AMP. Besides the general prohibitions (as at art. 19.3, Law 394/91) in all zones the following activities are forbidden: fires, jet-sking, water ski & other aquatic sports, commercial fisheries (trawls, purse-seines, hydraulic dredges), spearfishing, active fish restocking, aquaculture, input of alien species. The following activities are prohibited or regulated according to different zones: scuba diving, navigation, mooring, anchoring, artisanal fisheries, leisure fishing, research, pescaturismo, maritime state concessions. This MPA is also listed as Natura 2000 SCI (IT7120215).	Inter-Ministerial Decree of 21th October 2009 (G.U.R.I 80 of 7/4/2010).
MPA di Torre Guaceto (Italy)	Activities are regulated differently according to 4 zones (A, integral reserve; B, general reserve; C, protection reserve; D, area of economic and social development). Besides the general prohibitions (as at art. 19.3, Law 394/91) in all zones the following activities are forbidden: commercial fisheries (trawls, purse-seines), active fish restocking, aquaculture, spearfishing, anchoring, night scuba diving tours, jet-sking, water ski & other aquatic sports. The following activities are prohibited or regulated according to different zones: scuba diving, navigation, mooring, anchoring, artisanal fisheries, leisure fishing, research, pescaturismo, sailing schools. This MPA is also listed as Natura 2000 SCI (IT9140005).	Inter-Ministerial Decree of 4th December 1991.
MPA Isole Tremiti (Italy)	Activities are regulated differently according to 3 zones (A, integral reserve; B, general reserve; C, protection reserve). Besides the general prohibitions (as at art. 19.3, Law 394/91) in all zones the following activities are forbidden: jet-sking, water ski & other aquatic sports, commercial fisheries (trawls, purse-seines, hydraulic dredges), spearfishing, active fish restocking, aquaculture, input of alien species. The following activities are prohibited or regulated according to different zones: scuba diving, navigation, mooring, anchoring, artisanal fisheries, leisure fishing, research, pescaturismo. This MPA is also listed as Natura 2000 SCI (IT9110011).	Decree of the President of the Republic of 5th June 1995
Landscape Park & Nature Reserve Strunjan (Slovenia)	Strunjan Landscape Park was established on 2nd of February 1990 with a view to the protection of natural values and biodiversity and landscape diversity. In 2004 the Regulation on the Regional Park Strunjan was adopted.	Institutions Act (Official Gazette of RS, Nos. 12/91).

1.2.3.4. Fishery-regulated areas

The Italian law allows the implementation of conservation measures specifically oriented to the protection of biological resources by establishing Biological resource Protection Areas (BPAs; *Zone di Tutela Biologica*). In general BPAs prohibit both professional and leisure fishery (including spearfishing) all year round unless otherwise specified. BPAs do not require any form of active management. BPAs are formally established by the Italian central government (Ministry of agriculture, food and forestry), but more recently the role of the Italian regional governments has become stronger as far as their implementation measures are concerned. The current Italian BPAs in the Adriatic are listed in Table 1.5 and are also shown in Fig. 1.6.

Table 1.5 - Spatial fishery management measures relevant to cetaceans and sea turtles in place in the Adriatic Sea: Biological Protection Areas, Fishery Protection Zones and other spatial closures under EU regulations

Name/Relevant countries	*Management measures*	*Legal reference*
BPA of Miramare (Italy)	Set-nets and purse-seines are allowed. Traps allowed only for cuttlefish and shrimps. Leisure fisheries are allowed with max 5 hooks per fishermen. All trawling activities are prohibited (including dredges). This BPA is also an MPA and it is listed as Natura 2000 SCI (IT3340007).	Ministerial Decree of 22/01/2009 (*Zone di tutela biologica: nuove determinazioni*), Ministry of Agruculture.
BPA of Porto Falconera Tegnùe (taly)	All fishing activities are strictly prohibited. This BPA is also listed as Natura 2000 SCI (IT3250048).	As above.
BPA of Tegnùe di Chioggia (Italy)	Set-nets and leisure fishing (max 5 hooks per fishermen) are allowed, but only in the four channels between the four rocky reefs. All trawling activities are prohibited (including dredges). This BPA is also listed as Natura 2000 SCI (IT3250047).	As above.
BPA off Ravenna (Italy)	Set-nets, long-lines and traps are allowed. Leisure fisheries are allowed with max 5 hooks per fishermen. Cooperative fishing boats are allowed to fish. All trawling activities are prohibited (including dredges).	As above.
BPA of Barbare (taly)	Set-nets, traps and surface long-lines are allowed. Leisure fisheries are allowed with max 5 hooks per fishermen. All trawling activities are prohibited (including dredges).	As above.
BPA Paguro (Italy)	Relict of a gas platform (1963) collapsed in 1965 after an explosion. It constitutes now an artificial reef of over a muddy bottom. The protected area is under the jurisdiction of Emilia Romagna and extends for 0.66 km^2. See Fig. 1.8. Within this protected area, any fishing activity is prohibited. This BPA is also listed as Natura 2000 SCI (IT4070026).	Ministerial Decree 21/7/1995 ("Istituzione della zona di tutela biologica nell'ambito del compartimento marittimo di Ravenna") Natura 2000 site IT4070026
BPA of Jabuka (Croatian continental shelf waters, but relevant to Italian fishing boats)	Both professional and recreational fishery activities are prohibited.	Ministerial Decree of 16/06/1998 (*Modalità di attuazione delle interruzioni tecniche della pesca per le navi abilitate allo strascico e/o volante relativamente all'anno 1998*), Ministry of Agruculture.
BPA off Puglia (Italy)	Set-nets, long-lines and traps are allowed between Jan 1st and Jun 30st. Leisure fisheries are allowed with max 5 hooks per fishermen. All trawling activities are prohibited.	Ministerial Decree of 22/01/2009 (*Zone di tutela biologica: nuove determinazioni*), Ministry of Agruculture.
BPA of Tremiti islands (Italy)	Set-nets, long-lines and traps are allowed. Bottom and pair pelagic/mid-water trawlers are allowed between Nov 1st and March 31st. Leisure fisheries are allowed with max 5 hooks per fishermen. This BPA is also an MPA and it is listed as Natura 2000 SCI (IT9110011).	As above.
EU Minimum distances and depths for the use of fishing gears (Croatia, Italy, Slovenia)	Towed dredges and trawl nets are prohibited at depths >1,000m. Towed gears are prohibited <3nmi of the coast or < the 50m isobath where that depth is reached at a shorter distance from the coast. Trawl nets are prohibited <1.5nmi of the coast. Boat dredges and of hydraulic dredges are prohibited within 0.3nmi of the coast. Purse seines are prohibited within 300m of the coast or within the 50m isobath where that depth is reached at a shorter distance from the coast.	Regulation (EC) No 1967/2006
Ecological and Fishery Protection Zone (EFPZ), Croatia	Established by Croatia in 2003 in order to mitigate the negative impacts on marine resources, the EFPZ only applies to non-EU Member States.	Decision of the Croatian Parliament to extend the jurisdiction of the Republic of Croatia in the Adriatic Sea (OG 157/2003, 77/2004, 138/2006, 31/2008)

The Italian BPA of the Pomo/Jabuka pit extends over 2200 km^2 . It was established by the Italian Ministry of agriculture, food and forestry in 1998, forbidding any fishing activity by Italian vessels in this area. It lies entirely in international waters, outside both Italian and Croatian territorial waters, its eastern boundary being the line of the Croatian territorial waters. Within this area fishing by Italian vessels is prohibited. The Jabuka pit is recognised as one of the more important habitats in the Adriatic Sea for a number of fish species. This is an area with high density of hake (*M. merluccius*) and shrimp (*N. norvegicus*), species with a high commercial value. The Pomo Pit is also believed to be the main nursery area in the northern and central Adriatic for many demersal species, particularly for hake. Since 2006 the Pomo/Jabuka pit lies within the Croatian EFPZ, a factor which increases its protectionregime with respect to non-EU fishing boats.

Fisheries policy and management are the exclusive competence of the EU in the sphere of international relations. The EU is authorised to obtain international commitments with third

countries or international fisheries organisations on behalf of EU Member States. The European Commission negotiates fishing agreements with third countries on behalf of the EU. Therefore the increased size of EU waters within the Adriatic Sea should lead to better management of the marine environment at regional level.

1.2.3.5. Restricted areas related to oil and gas exploitation

Currently there are 114 Italian platforms (Fig. 1.6), three of which are temporary floating structures. Ten out of the 104 active platforms are for oil extraction and another eight are platforms supporting gas and oil production. Concerning restricted areas related to oil and gas exploration and exploitation, the Italian Law 9/1991 ("*Norme per l'attuazione del nuovo Piano energetico nazionale*") established that, within the Zone A, the following areas are closed entirely to oil and gas exploration and exploitation: Gulf of Venice – in the belt of the sea extending from a parallel line drawn across the mouth of Tagliamento River, and the parallel line drawn across the mouth of the Po River, Goro channel. In addition, in a 500m radius from any gas & oil platform, fishing, navigation and mooring are forbidden. Where pipelines are laid there is a 250m stripe where both fishing and mooring are forbidden.

In Croatia there are 17 platforms, two managed in cooperation with Italy (Ivana A, Annamaria A), two with lodging capability (Marica), one compression platform (Ivana-K) and 13 unmanned (Fig 1.6 & 1.7).

Figure 1.7. A Gas extraction platform in the northern Adriatic Sea (Photo: D.Holcer, BWI)

Therefore gas & oil platforms are *de facto* exerting spatial protection on habitats and species from fishing, navigation and mooring. These platforms in the Adriatic are recognised by locals as 'fish attractors' and are particularly appealing for unregulated recreational fishing activities (Fig. 1.7 and 1.8).

Figure 1.8. Former platform, BPA and SCI Paguro: an artificial reef (source: www.associazionepaguro.org/)

1.2.3.6. Other relevant frameworks

In those European regions still outside the EU, the Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979) provides the option for the creation of Areas of Special Conservation Interest (ASCIs) which make up the Emerald Network, a model used by non-EU countries as a counterpart to NATURA 2000. In addition the Barcelona Convention and its 1995 Protocol Concerning Mediterranean Specially Protected Areas and Biological Diversity in the Mediterranean provide a framework for the designation of Specially Protected Areas of Mediterranean Importance (SPAMI). These are sites of importance for conserving the components of biological diversity in the Mediterranean; which contain benthic assemblages specific to the Mediterranean area or the habitats of endangered species which are of special scientific, aesthetic, cultural or educational interest. Within this

framework, part of the Adriatic Sea has been proposed as a Priority Area of Conservation (PAC, Fig. 1.9) by experts recognising its importance for marine turtles, small pelagic fish, and the nursery ground of elasmobranchs and deep-sea coral reefs.

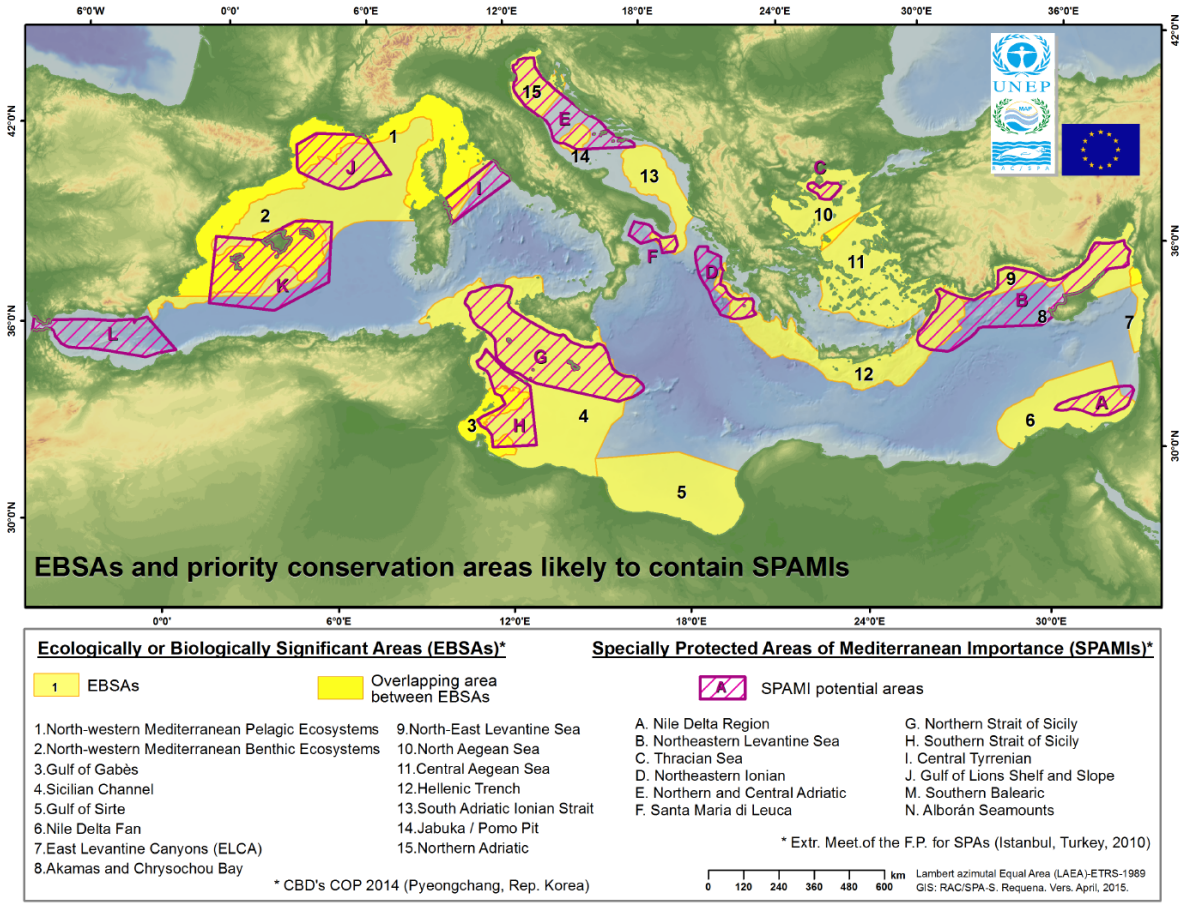

Figure 1.9. Marine Ecologically and Biologically Significant Areas (EBSAs; in yellow) and UNEP-MAP Priority Areas for Conservation (in purple) (source: UNEP/MAP 2015)

In 2014 three rather large portions of the Adriatic (Fig. 1.9) have been identified by the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the Convention for Biological Diversity (CBD; Rio, 1992) as areas meeting the EBSA criteria. Table 1.6 presents this relevant advice which was possible also thanks to the NETCET aerial survey data made available to the technical meetings facilitated by the UNEP RAC/SPA (UNEP/CBD/EBSA/WS/2014/3/4).

The results from NETCET research activities and other available studies (Chapter 2) indicate a number of areas that are potentially important to the large marine vertebrates in the Adriatic Sea. These partially overlap with the proposed Adriatic Sea EBSA and UNEP-MAP PACs and with some of the existing MPAs (in broad terms). However, some of the key areas (e.g. the southern region) have not yet been recognised as regions of importance for conservation. Chapter 2 of this report will fully consider the distribution of relevant species and propose specific areas of priority importance.

Table 1.6 - Description of areas meeting the EBSA criteria in the Adriatic Sea (CBD SBSTTA, 2014)

Northern Adriatic						
Part of the Northern Adriatic Basin, off the coasts of Italy, Slovenia and Croatia. The area is roughly delimited by the 9m isobaths, encompassing the area above the straight line linking Ancona (Conero) and the island of Ilovik. The area is located in the northern part of the North Adriatic Sea Basin, with an average depth of 35 m and is strongly influenced by the Po river plume. It includes mobile sandy bottoms, seagrass meadows, hard bottom associations and unique rocky outcrops called "trezze" and "tegnue". The area is important for several threatened species. It hosts a population of the highest density of bottlenose dolphin (*Tursiops truncatus*) in the Mediterranean, it is one of the most important feeding grounds in the Mediterranean of the Loggerhead turtle (*Caretta caretta*) and it is a nursery area for a number of vulnerable species (blue shark (Prionace glauca), sandbar shark (*Carcharinus plumbeus*), anchovies (*Engraulis encrasicolus*), etc.). The area hosts a strong diversity of benthic and pelagic habitats due to an important gradient of environmental factors from its western portion to its eastern coasts. It is also one of the most productive areas in the Mediterranean Sea.						
Uniqueness or rarity	Special importance for life-history stages of species	Importance for threatened, endangered or declining species and/or habitats	Vulnerability, fragility, sensitivity, or slow recovery	Biological productivity	Biological diversity	Naturalness
M	H	H	M	H	M	L
Jabuka/Pomo Pit						
The area encompassing three distinct, adjacent depressions, with maximum depths of ca. 270, respectively. The area extends 4.5 nautical miles from the 200 m isobath. The area encompassing the adjacent depressions, the Jabuka (or Pomo) Pit is situated in the Middle Adriatic Sea and has a maximum depth of 200 - 260 m. It is a sensitive and critical spawning and nursery zone for important Adriatic demersal resources, especially European hake (*Merluccius merluccius*). This area hosts the largest populations of Norway lobster (*Nephrops norvegicus*) and is important especially for juveniles in the depths over 200 m. Based on available scientific data it is a high density area for the giant devil ray (*Mobula mobular*), an endemic species listed on Annex II SPA/BD protocol and listed as endangered on the IUCN Red List. The Pit could function as a favourable environment for some key life history stages of the porbeagle shark, and *Lamna nasus*, which is critically endangered (IUCN 2007), and both of which are listed on Annex II SPA/BD Protocol. Regarding benthic species, several types of corals can be found (Scleractinia and Actiniaria).						
Uniqueness or rarity	Special importance for life-history stages of species	Importance for threatened, endangered or declining species and/or habitats	Vulnerability, fragility, sensitivity, or slow recovery	Biological productivity	Biological diversity	Naturalness
H	H	M	M	H	M	L
South Adriatic Ionian Straight						
The area is located in the centre of the southern part of the Southern Adriatic basin and in the northern part of the Ionian Sea. It includes the deepest part of the Adriatic Sea on the western side and it encompasses a coastal area in Albania (Sazani Island and Karaburuni peninsula). It also covers the slopes in near Santa Maria di Leuca. The area is located in the centre of the southern part of the Southern Adriatic basin and the northern Ionian Sea. It is characterized by steep slopes, high salinity and a maximum depth ranging between 200 m to 1500 m. Water exchange with the Mediterranean Sea takes place through the Otranto Channel, which has a sill that is 800 m deep. This area contains important habitats for Cuvier's beaked whales (*Ziphius cavirostris*), an Annex II species of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) in the framework of Barcelona Convention, and significant densities of other megafauna such as the giant devil ray (*Mobula mobular*), striped dolphin (*Stenella coeruleoalba*), Mediterranean monk seal (*Monachus monachus*) and loggerhead turtle (*Caretta caretta*), all of which are listed in Annex II of SPA/BD Protocol. Benthos includes deep-sea cold-water coral communities and deep-sea sponge aggregations, representing important biodiversity reservoirs and contributing to the trophic recycling of organic matter. Tuna, swordfish and sharks are also common in this area.						
Uniqueness or rarity	Special importance for life-history stages of species	Importance for threatened, endangered or declining species and/or habitats	Vulnerability, fragility, sensitivity, or slow recovery	Biological productivity	Biological diversity	Naturalness
H	H	H	H	M	H	M

1.3. Characterisation of human activities' distribution

This section includes the available information on distribution of selected human activities in the Adriatic region. This information constitutes the basis for a preliminary risk assessment.

1.3.1. Map of population size and distribution

In terms of the population potentially affecting the Adriatic area, it seems clear that Italy has the greatest potential to have an impact. As an example, Figure 1.10 shows the population density (number of people per km²) in the Adriatic region. This figure should be considered with caution, since is not based on particularly refined nor equally comparable administrative sub-areas (e.g. provinces v. counties v. national level, etc.).

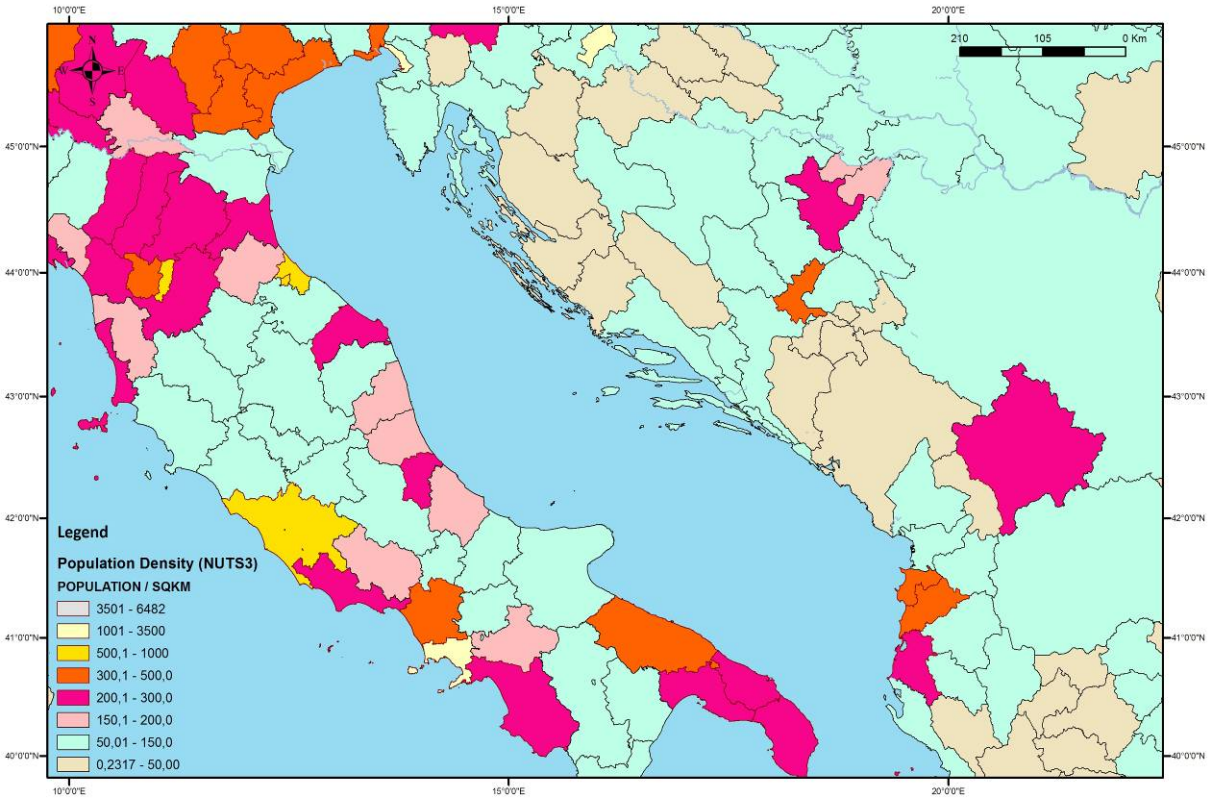

Figure 1.10. Population density (NUTS3) in the Adriatic region (persons per km²) (source: Drasko Holcer, BWI, NETCET)

In order to have a slightly more accurate idea on the potential pressure exerted by the distribution of human population around the Adriatic Sea, we also considered data from the following administrative divisions:

- Albania: prefectures of Shkodër, Lezhë, Durrës, Tiranë, Fier, Vlorë;
- Bosnia-Herzegovina: Herzegovina-Neretva Canton;
- Croatia (areas as in NUTS3): counties of Istria, Primorje-Gorski kotar, Lika-Senj, Zadar, Šibenik-Knin, Split-Dalmatia, Dubrovnik-Neretva;
- Montenegro (finer subdivision than in NUTS3): municipalities of Kotor, Herceg Novi, Tivat, Budva, Bar, Ulcinj;
- Italy (areas as in NUTS3): provinces of Ancona, Ascoli Piceno, Bari, Barletta-Andria-Trani, Brindisi, Campobasso, Chieti, Fermo, Ferrara, Foggia, Forlì-Cesena, Gorizia, Lecce, Macerata, Pesaro e Urbino, Pescara, Ravenna, Rimini, Rovigo, Teramo, Trieste,

Udine, Venezia;

- Slovenia (finer subdivision than in NUTS3): regions of Goriška and Obalno-kraška.

Data are summarised in Table 1.7. Despite being a more accurate reflection of the population that actually live along the Adriatic coasts, these data also need to be carefully considered as in some case the population included in this table lives rather far from the coastal area (e.g. the figure for Tirana includes the metropolitan area, and the Italian provinces of the Marche Region, and some of the Croatian counties extend west-east from the mountains to the coast). An even more accurate calculation could be obtained by considering as sampling unit for all countries the municipality.

Table 1.7 - Adriatic population (number of persons per administrative area)

Albania (Prefectures)		Bosnia-Herzegovina (Cantons)		Croatia (Counties)		Montenegro (Municipalities)		Slovenia (Regions)	
Shkoder	215.347	Herzegovina-Neretva	236.278	Istria	208.055	Kotor	22.601	Goriska	119.146
Lezhe	134.027			Primorje-Gorski kotar	296.195	Herceg Novi	30.864	Obalno-kraska	110.760
Durres	262.785			Lika-Senj	50.927	Tivat	14.031		
Tirane*	749.365			Zadar	170.017	Budva	19.218		
Fier	310.331			Sibenik-Knin	109.375	Bar	42.048		
Vlora	175.640			Split-Dalmatia	454.798	Ulcinj	19.921		
				Dubrovnik-Neretva	122.568				
AL TOTAL	***1.847.495***	***BH TOTAL***	***236.278***	***HR TOTAL***	***1.411.935***	***MN TOTAL***	***148.683***	***SLO TOTAL***	***229.906***
Italy (Provinces)									
Gorizia	140.143	Ravenna	384.761	Campobasso	226.419	Foggia	626.072		
Trieste	232.601	Rimini	321.769	Chieti	387.956	Lecce	802.018		
Rovigo	242.349	Ancona	473.865	Pescara	314.661				
Udine	535.430	Ascoli Piceno	210.407	Teramo	306.349				
Venezia	846.962	Fermo	174.857	Bari	1.247.303				
Ferrara	353.481	Macerata	319.607	Barletta-Andria-Trani	391.723				
Forlì-Cesena	390.738	Pesaro e Urbino	362.583	Brindisi	400.801	***IT TOTAL***	***9.692.855***		

1.3.2. Map of maritime traffic

The Mediterranean Sea is among the busiest shipping routes in the world accounting for 15% of global shipping. The major shipping route that accounts for about 90% of Mediterranean traffic connects Gibraltar (Atlantic) with Suez (Red sea) and Bosporus (Black sea) (Fig. 1.11). Passenger ships and dry cargo ships make up most of the traffic between Mediterranean ports.

Figure 1.12 gives a general idea of the traffic density within the Mediterranean region over the main and secondary shipping routes. Figure 1.13 is a snapshot of the maritime traffic density over the Adriatic Sea, which shows that only in the deepest part of the southern Adriatic that the traffic is lower than in the northern and central parts.

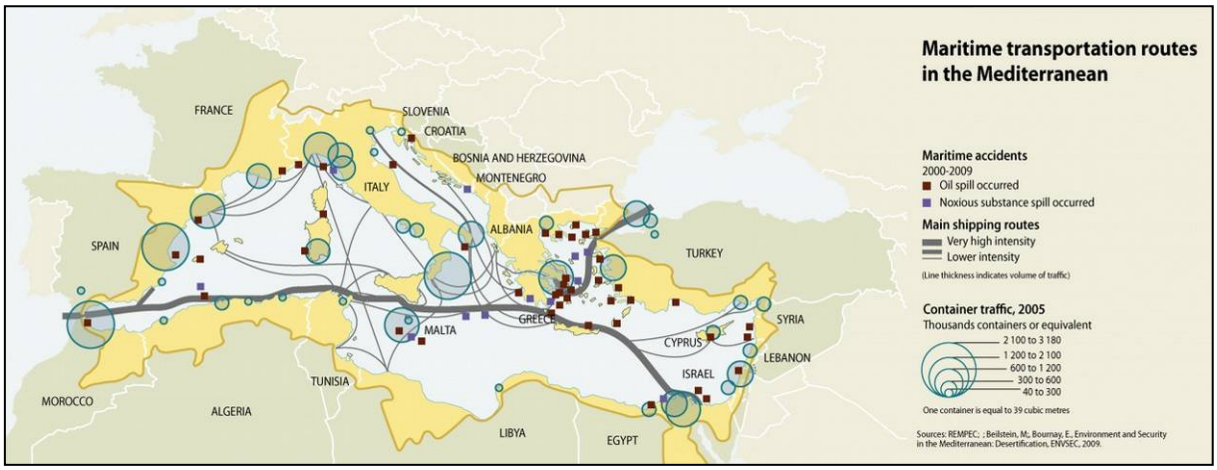

Figure 1.11. Map of maritime transportation routes in the Mediterranean Sea: GRID-Arendal map (Source: www.grida.no)

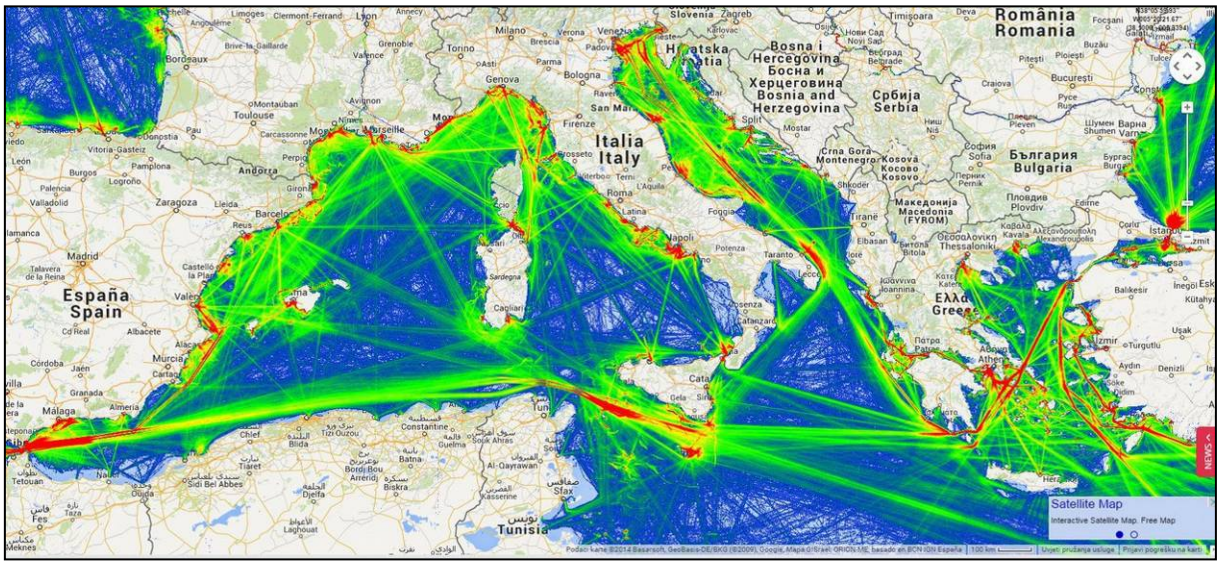

Figure 1.12. A snapshot of maritime traffic density (all types of vessels) over primary and secondary maritime routes in the Mediterranean Sea based on Automatic Identification System (AIS): Marine Traffic data (Source: www.marinetraffic.com)

Within the Adriatic Sea there is a relatively moderate traffic branch towards the northern Adriatic ports of Venice, Trieste, Koper and Rijeka. Relatively, there is lower traffic going to the other Adriatic ports of Zadar, Split, Ploče, Dubrovnik in Croatia, Bar in Montenegro, Bari, Ancona, Brindisi in Itay, and Durrës and Vlorë in Albania. The Northern Adriatic Port Association (NAPA) intends to increase marine traffic by over 200% in the coming years with major expansions for the ports of Venice, Trieste, Koper and Rijeka. The red areas highlighted in Fig. 1.13 are due to the existing traffic separation schemes (see Fig. 1.15 for more details).

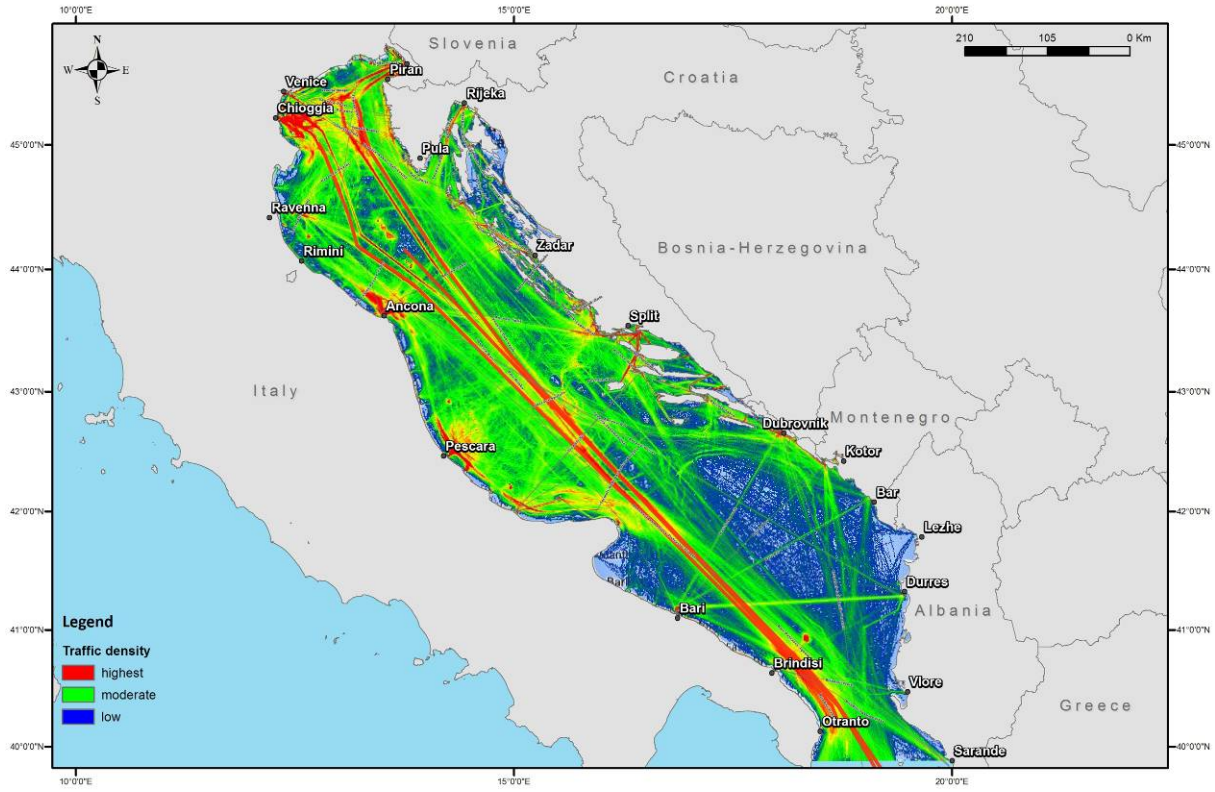

Figure 1.13. A snapshot of maritime transportation routes and traffic density (all types of vessels) in the Adriatic Sea (Source: SHAPE project WMS and www.marinetraffic.com)

Maritime traffic in the Adriatic includes transport routes for tankers with crude oil to the northern Adriatic ports, liquefied gas transport to the Rovigo LNG terminal, dry cargo and container ships, chemical tankers and passenger ships. In addition, fishing vessels, yachts, recreational boats, military and research vessels contribute to the general and heavy local maritime traffic. Figure 1.14 gives an example of the traffic of different types of ships. This figure is only a snapshot indicative for the time of the day in which the screenshot was taken. However the Marine Traffic Database, which is based on the positioning data of vessels taken from the Automatic Identification System (AIS) (http://www.marinetraffic.com) constitutes an excellent tool for evaluating daily and seasonal traffic. From this picture it appears that fishery is one of the existing activities that produces the highest density of traffic, especially within Italian territorial waters.

Such busy shipping traffic increases the risk of negative effects on the marine environment. Particularly considering ballast waters, pollution and oil spills, collision, noise and habitat degradation. Therefore the Adriatic Sea is regarded as a high risk area for accidents.

Figure 1.14. A snapshot of the distribution of boats in the Adriatic Sea: fishing boats over 15m LOA (blue), tankers (orange), cargos (green) and passengers ships (yellow) (Source: www.marinetraffic.com)

Concerning the issue of safety at sea, the International Maritime Organization (IMO) has recorded that, in terms of the frequency of accidents, the Adriatic Sea shows a five times higher level than the world average. A fact mostly due to accidents related to seasonal nautical tourism. Furthermore, the IMO noted that where routing systems have been established, cases of collisions and groundings did significantly reduce. Due to the sensitivity and high-intensity of maritime traffic the Adriatic Sea has been proposed as Particularly Sensitive Sea Area (PSSA) to the IMO (Vidas 2005). A PSSA is an area that needs special protection through IMO management actions given its significance for recognised ecological, socio-economic or scientific features, and that may be vulnerable to damage by international maritime activities. At the time of designation of a PSSA, the IMO adopts an Associated Protective Measure in order to prevent, reduce, or eliminate an identified threat or vulnerability. The only example of a PSSA in the Mediterranean is the Bonifacio Strait (France, Italy 2011). The IMO is recognized as the only international body for developing guidelines, criteria and regulations on this matter. However Contracting Governments must initiate the actions for establishing a ship routeing system, singularly or jointly with other Contracting Governments.

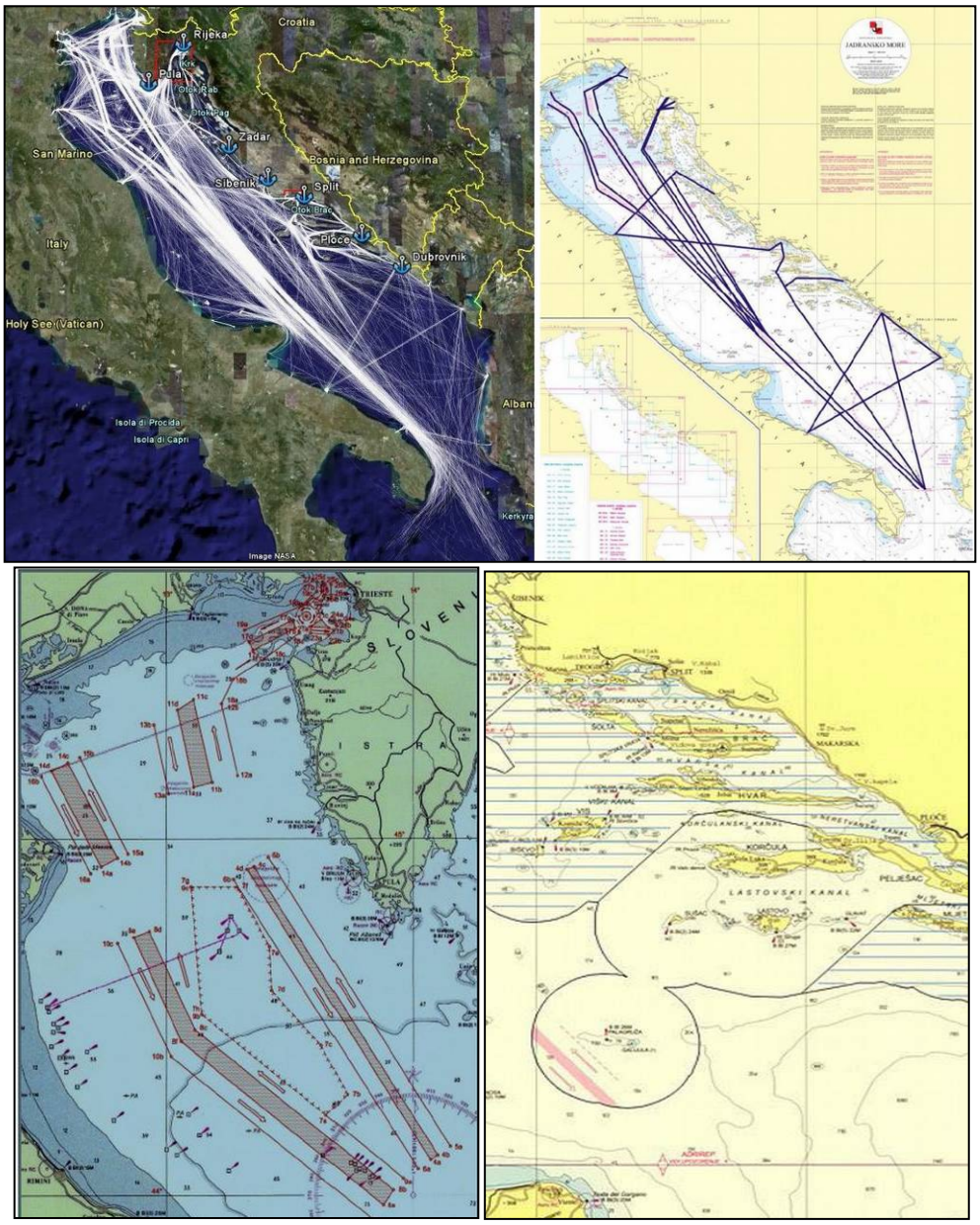

Figure 1.15. Maritime routes and traffic separation scheme in the Adriatic Sea (Source: IMO 2003; Policy Research Corporation 2011)

The ship routeing system efficiently contributes to safety of life at sea, safety and efficiency of navigation, and the protection of the marine environment. These systems can be recommended for use by all or only certain types of ships. In some cases they are mandatory. Ship routeing systems include traffic separation schemes, traffic lanes, separation zones or lines, roundabouts, inshore traffic zones, recommended routes, deep-water routes, precautionary areas and area to be avoided. Figure 1.15 shows the existing maritime recommended routes and traffic separation schemes in the Adriatic Sea.

1.3.3. Map of oil and gas explorations

The exploration of offshore oil and gas fields in the Adriatic Sea started in the 1960's with the Ravenna Mare and Porto Corsini fields. In Croatia the commercial exploration and

production of gas started in 1999. Currently, there are 131 different gas and oil extraction platforms in this basin (Fig. 1.16). Other platforms have been dismantled as hydrocarbon reserves were exhausted. Being this one of the most important areas in the Mediterranean region for oil and gas industry, seismic prospections have regularly continued in search for gas and oil exploitable fields.

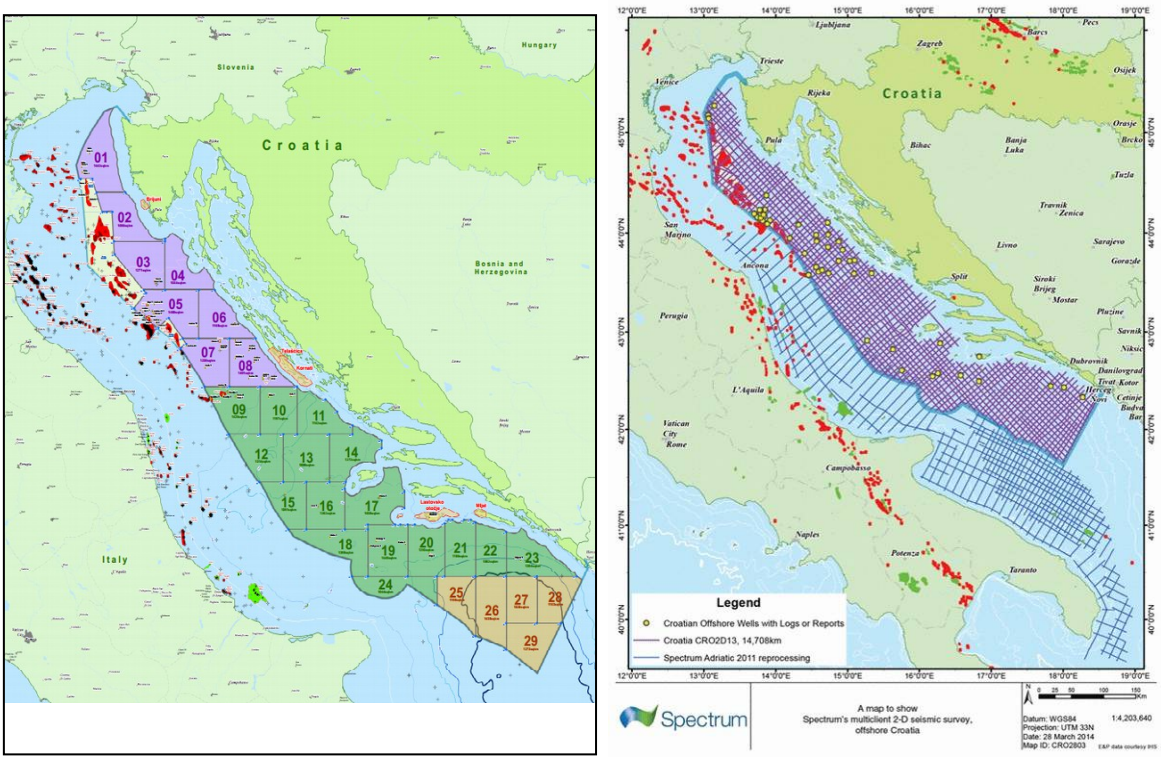

Figure 1.16. Gas and oil explorations in the Adriatic Sea: a) the 29 blocks for gas & oil exploration established by Croatia (source: Spectrum website); b) 2D multi client seismic survey carried out by Spectrum (Norway) (Source: Doric et al 2014)

The most recent economic crisis and high prices of oil products have even further stimulated research in hydrocarbon deposits in the Adriatic Sea. In Croatia, the entire territorial waters and ecological zone has been surveyed with 2D seismic technique in 2013-2014 (Fig. 1.16). The Government held exploration and extraction bidding over 29 blocks covering the entire epicontinental shelf of Croatia. In Italy gas & oil explorations are recurrent and systematic, including those using the 3D seismic technique. In Montenegro, in 2014 the first bid for awarding concessions for oil and gas exploitation in the offshore was launched. Finally, in Albania two blocks covering most of the territorial sea and the Otranto strait have already been licensed to different oil and gas operators, while an additional three blocks covering deepest parts of Albanian Adriatic EEZ and border with Montenegro remain unsigned.

In addition to these oil and gas platforms, since 2009, a liquid natural gas (LNG) offshore terminal has operated in the northern Adriatic, 9nm offshore of Porto Viro (Porto Levante, Rovigo, Italy). Additional offshore terminals are proposed in the Gulf of Trieste in Italy (off

Slovenia) and in Croatia (Krk island, Kvarner region). The current political situation and the need for new sources of energy in Europe have made the development of the Krk LNG terminal promising, at least in the short term.

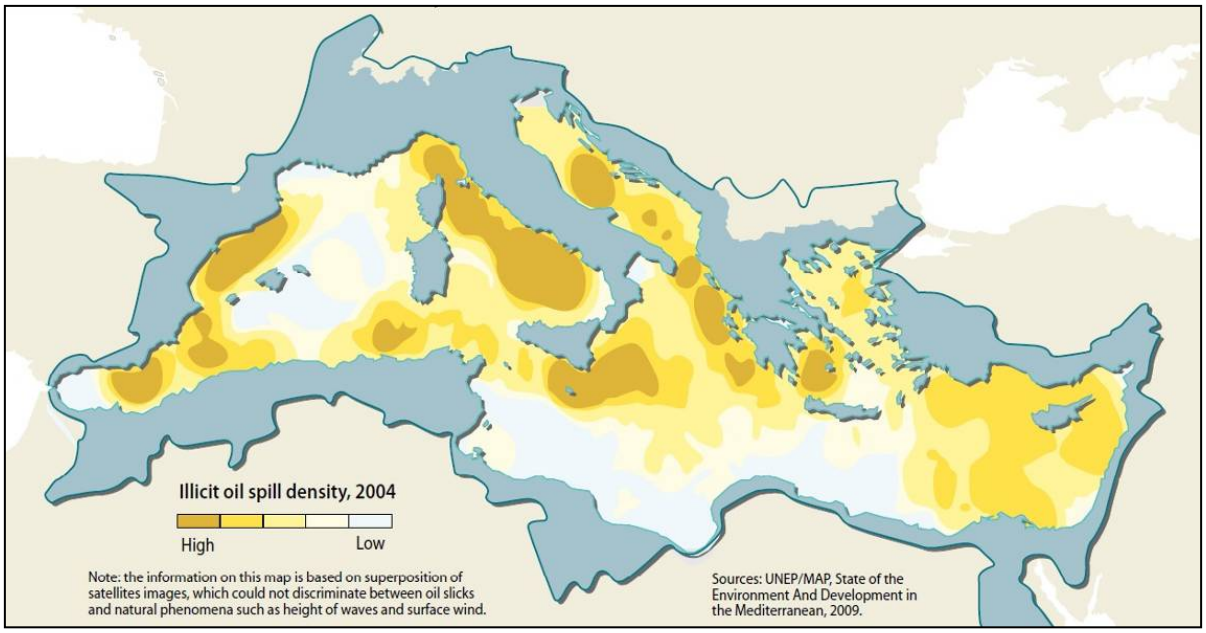

Figure 1.17. Potential oil slicks detected by satellites (source: GRID-Arendal, based on UNEP/MAP report 2013.; http://www.grida.no/graphicslib/detail/possible-oil-slicks-detected-by-satellites_e265#)

Given the high intensity of maritime traffic and the importance of the Adriatic for oil and gas exploration, this appears to be one of the Mediterranean regions with the highest potential presence of oil slicks (Fig. 1.17).

1.3.4. Map of fishery activities

The Adriatic Sea, one of two Mediterranean areas with the largest continental shelf (the other being the Gulf of Gabès), is the most heavily bottom trawled area in the region (Fig. 1.18).

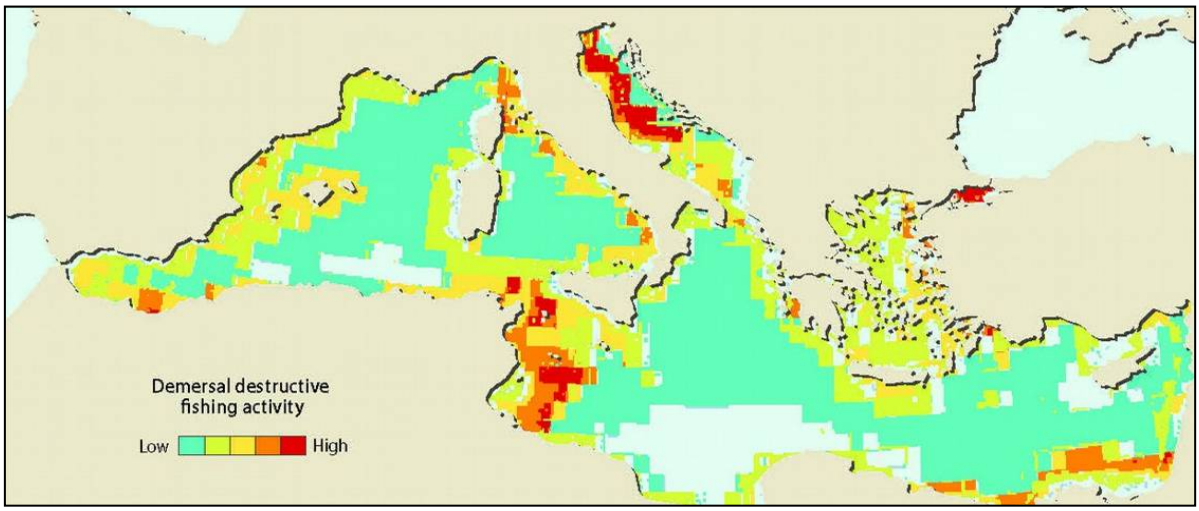

Figure 1.18. Demersal fishing impact in the Mediterranean Sea (Source: GRID-Arendal, http://www.grida.no/)

Exact data on the status of Adriatic fisheries (including information on actual fleets, annual fishing effort, and fishery production) is rather difficult to obtain. One source of information is the FAO Fishery Statistical Collections and the GFCM Task 1 data. Other sources for EU MSs are the fleet register and Eurostat.

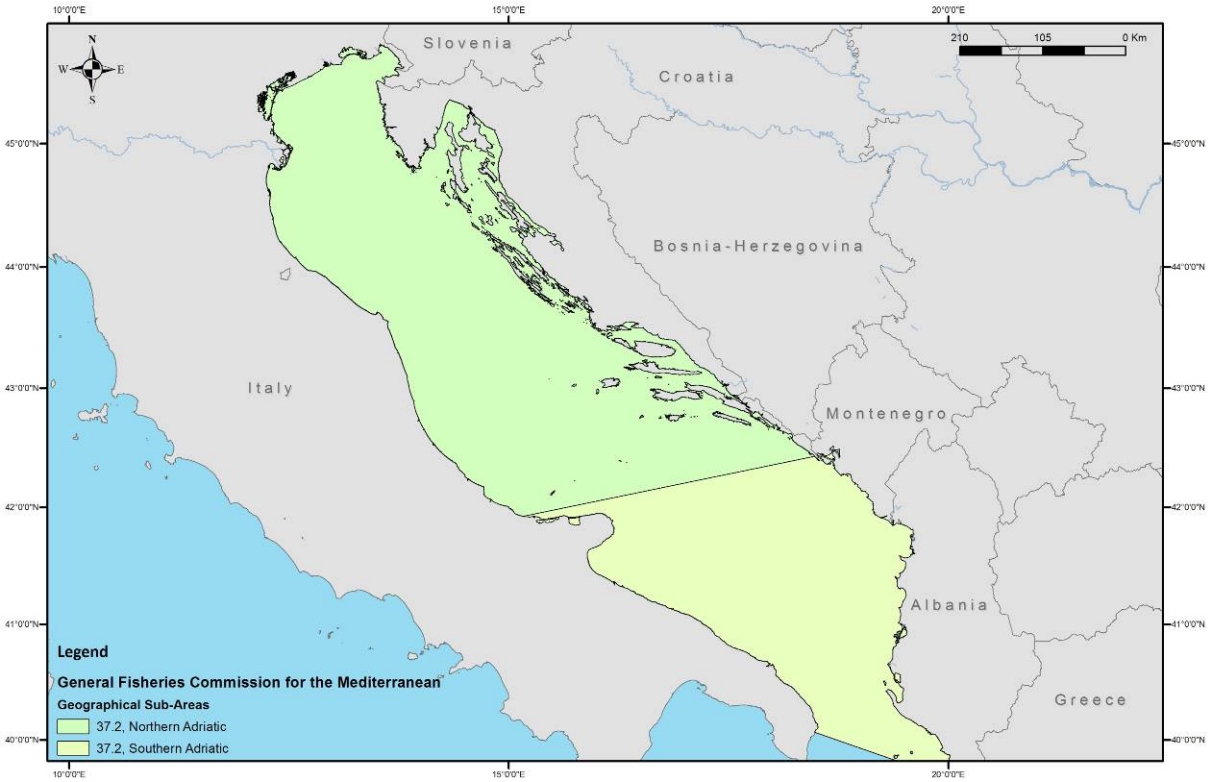

Figure 1.19. Adriatic Geographical Sub-Areas (GSA) of the General Fisheries Commission for the Mediterranean: GSA 17 (green) and GSA 18 (yellow) (source: Drasko Holcer, BWI, NETCET)

Within the Adriatic Sea fisheries are managed between two GFCM Geographical Sub-Areas (GSAs; see Fig. 1.19): the GSA 17 (north and central Adriatic) and the GSA 18 (southern Adriatic). Croatia, Bosnia-Herzegovina, Italy and Slovenia border the GSA 17. The GSA 17 lies northward to the straight line connecting the point of 41° 55' N and 15° 08' E on the Italian coastline and the terrestrial border between Croatia and Montenegro. Albania, Italy and Montenegro border the GSA 18, which extends down to the Albania-Greece border (line crossing the 40º 04' N and 18º 29' E point). Unfortunately, the GFCM fishery statistics are still partial and it is not possible to form a fair opinion on the potential pressures to the marine ecosystem from fisheries based on official data.

Table 1.8 summaries the data for the Adriatic Sea from the FAO Fishery Statistical Collections for the 2012 fishery production, as a proxy for the share of the different countries in this sector. Please note that the figure on the Italian fishery production refers to all its seas and that the Italian fishery production in the Adriatic Sea represents about 50% of its total. From these

figures it seems that Italy and Croatian have the larger production, Albania shows a very small production; whereas Slovenia and Montenegro show an almost negligible fishery production. See http://www.fao.org/fishery/statistics/en for more detail.

Table 1.8. Summary of data on 2012 fishery production in the Adriatic Sea (Source: FAO Fishery Statistical Collections and MSFD Italian report; F=FAO estimated value)

Country	Ocean Area	Species	2012
Albania	Mediterranean marine areas	Marine fishes *Total*	***3,444***
		Flounders, halibuts, soles	113
		Cods, hakes, haddocks	328
		Herrings, sardines, anchovies	176
		Marine fishes not identified	1,088
		Miscellaneous coastal fishes	1,425
		Miscellaneous demersal fishes	98
		Miscellaneous pelagic fishes	106
		Sharks, rays, chimaeras	100
		Tunas, bonitos, billfishes	10
Bosnia & Herzegovina	Mediterranean marine areas	Marine fishes *Total*	***102 F***
		Marine fishes not identified	102 *F*
Croatia	Mediterranean marine areas	Marine fishes *Total*	***67,505***
		Cods, hakes, haddocks	1,145
		Flounders, halibuts, soles	274
		Herrings, sardines, anchovies	52,254
		Marine fishes not identified	3,964
		Miscellaneous coastal fishes	6,770
		Miscellaneous demersal fishes	283
		Miscellaneous pelagic fishes	1,072
		Sharks, rays, chimaeras	162
		Tunas, bonitos, billfishes	1,581
Italy	Mediterranean marine areas	Marine fishes *Total*	***63,320****
		Cods, hakes, haddocks	7,808
		Flounders, halibuts, soles	1,769
		Herrings, sardines, anchovies	37,781
		Marine fishes not identified	3,188
		Miscellaneous coastal fishes	7,002
		Miscellaneous demersal fishes	2,065
		Miscellaneous pelagic fishes	2,870
		Sharks, rays, chimaeras	530
		Tunas, bonitos, billfishes	307
Montenegro	Mediterranean marine areas	Marine fishes *Total*	***662***
		Cods, hakes, haddocks	24
		Herrings, sardines, anchovies	110
		Marine fishes not identified	226
		Miscellaneous coastal fishes	213 *F*
		Miscellaneous pelagic fishes	45
		Sharks, rays, chimaeras	28
		Tunas, bonitos, billfishes	16
Slovenia	Mediterranean marine areas	Marine fishes *Total*	***338***
		Cods, hakes, haddocks	85
		Flounders, halibuts, soles	15
		Herrings, sardines, anchovies	64
		Marine fishes not identified	3
		Miscellaneous coastal fishes	152
		Miscellaneous demersal fishes	6
		Miscellaneous pelagic fishes	12
		Sharks, rays, chimaeras	1
Grand total			

Key: *These data refer to the sum of GSA 17 and 18 Italian landings and are based on 2011 statistics. Elaboration: ISPRA on MSFD datasets.

Mid-water pair pelagic trawls and purse seines are used to catch small pelagics, in particular sardines and anchovies. Bottom trawls are used to fish demersal species such as red mullet, hake, octopus, cuttlefish, squid, shrimp and Norway lobster. Dredges (rapido trawls) are used to catch sole, scallops and other mollusc species including gastropods and cuttlefish. Bottom trawls and dredges generate severe lethal and sub-lethal damages on non-target species. Within the Adriatic there are a few thousand polyvalent small-scale vessels which operate traps, entangling nets and small longlines. Given the boat size and the operational habits, this is the fleet segment most difficult to assess in terms of fishing effort and impact on the marine environment. In addition, recreational fishing, spearfishing and illegal fishing, particularly in coastal areas presents quite large but unaccounted fishing effort.

Offshore purse-seine fishing activities for Bluefin tuna are a very important part of the pelagic fishery within the Adriatic Sea. In Croatia, the purse seine is the principal fishing gear used for its capture. The principal fishing grounds for Croatian Bluefin tuna purse-seiners are the offshore waters of the central part of the Adriatic Sea. After capture, they are transferred into floating towing cages. Once the cages are filled with the right number of tuna they are slowly towed by a tugboat towards the farming locations. The distance between the fishing ground and the farming location can vary from a few to several hundreds of miles (in some cases the fish catch occurs outside the Adriatic Sea).

1.3.4.1. Description of fisheries per country (GFCM Task1 data)

Data presented in this section (Tab. 1.9) for GSA17 refer only to Italy, as Bosnia-Herzegovina, Croatia and Slovenia did not provide the GFCM with their statistics. Data for GSA 18 refer to Albania and Italy only, as data from Montenegro are also missing.

Table 1.9. Summary of the fishing fleets in the Adriatic Sea (GSA 17 and 18) – partial data GFCM (2010)

Fleet segment	GSA 17*	GSA 18**
Polyvalent small-scale vessels without engine (<12 metres)	0	11 (only AL)
Polyvalent small-scale vessels with engine (<6 metres)	726	384 (204 AL, 180 IT)
Polyvalent small-scale vessels with engine (6-12 metres)	1149	377 (68 AL, 309 IT)
Trawlers (<12 metres)	59	40 (2 AL, 38 IT)
Trawlers (12-24 metres)	596	546 (159 AL, 387 IT)
Trawlers (> 24 metres)	88	64 (34 AL, 30 IT)
Purse Seiners (6-12 metres)	0	0
Purse Seiners (>12 metres)	37	11 (4 AL, 7 IT)
Long liners (> 6 metres)	0	44 (only IT)
Pelagic Trawlers (> 6 metres)	102	34 (only IT)
Tuna Seiners (> 12 metres)	0	0
Dredgers (> 6 metres)	587	76 (only IT)
Polyvalent vessels (> 12 metres)	7	28 (only AL)

Key: *available data: IT; missing data: BH, HR, SLO; ** available data: AL, IT; missing data: MN. For details on fishing gears and segments see the FAO classification (http://www.fao.org/fishery/topic/1617/en).

While fishing fleets of Bosnia-Herzegovina and Montenegro are negligible for GSA 17 and GSA 18, respectively, for the GSA 17 the Croatian fleet amount to almost 13,000 fishing boats distributed over several different fishing segments. This figure increases almost three times the number of operating fishing boats in the north-central Adriatic.

In its last report to the GCFM (2010), Italy listed a total of 3,351 fishing vessels for the GSA 17 (northern and central Adriatic) that use seven types of fishing gears (surrounding nets; trawls; dredges; gill-nets & entangling nets; traps; hooks and lines; miscellaneous gears). Traps are by far the most used fishing gear in this area, followed by gill-nets and entangling nets, trawls and dredges. In terms of fleet segments, 6-12m long polyvalent small-scale vessels are the most common (34%), followed by <6m polyvalent small-scale vessels (22%), 12-24m trawlers (18%) and > 6m dredges (17%). Small pelagic fish are mostly targeted with pelagic/mid-water trawlers (> 6m) and purse seiners (>12m); whereas large pelagic fish are targeted with polyvalent vessels (> 12m) and purse seiners (>12m). Demersal shelf species are targeted mostly with polyvalent small-scale vessels (both 6-12m and <6m) and trawlers (both 12-24m and >24m); whereas demersal slope species are fished with Trawlers (>24m).

The GCFM (2010) GSA18 (southern Adriatic) reports data from Italy and Albania. A total of 1651 fishing vessels were registered, 501 of which in Albania. Six types of fishing gears are used in this area: surrounding nets, seine nets, trawls, dredges, gill-nets and entangling nets, hooks and lines. Trawls are by far the most used fishing gear in this area, followed by gill-nets and entangling and purse-seine. In terms of fleet segments, the 12-24m long trawls are the most common (34%), followed by <6m and 6-12 metres polyvalent small-scale vessels (24% and 23% respectively). Longliners >6m represent only the 5%. As in GSA 17, within GSA 18 small pelagic fish are mostly targeted with pelagic trawlers (> 6m) and purse seiners (>12m); whereas large pelagic fish are mostly targeted with long-liners (> 6m) by Italian fishing boats. Demersal shelf species are targeted mostly with trawlers (12-24m) followed by polyvalent small-scale vessels (6-12m) and trawlers >24m; whereas demersal slope species are fished with trawlers (both 12-24m and >24m). See Table 1.9 for details.

According to the EU Fishing Fleet Register, Croatia has 12,698 registered fishing vessels (8.7% of the EU-28 fishing fleet). Compared to the Italian fleet, these vessels are on average much smaller in terms of both total length (usually <12m) and engine Horse Power of about 50% and 30% respectively. Nevertheless, the Croatian fishing fleet operating in the Adriatic is over 60% more numerous than the Italian Adriatic fleet, but it operates exclusively in Croatian territorial waters. Thirteen percent of the Croatian fleet are trawlers. Sixty-five percent of the Croatian catches are of sardines, followed by anchovies (20%). A real-time database of the fishing fleet for Italy, Slovenia and Croatia can be accessed at the EU Fleet Register website: http://ec.europa.eu/fisheries/fleet/.

Despite the increasing amount of controls on boat activities at sea and fishing effort (e.g.

Vessel Monitoring Systems (VMS), blue box, AIS, logbooks, etc.), for those that may want to estimate spatial seasonal or monthly fishing effort for the different fleet segments or metiers, the situation appears extremely daunting. Datasets go from "not existing" to "not accessible" (often given some unclear form of privacy right). Also, the current EU requirements for logging of fishing operations differ, with boats smaller than 12 m not being required to have VMS installed. This threshold is currently extended to up to 15m for Italian vessels which operate daily fishing trips, further restricting the capability to track fishing effort of a large number of vessels. Nevertheless when assessing the potential impact of any fishery, either on the marine environment as whole or on single species and habitats, fair effort data needs to be available, in order to limit the scope of monitoring programmes to those areas of higher risk.

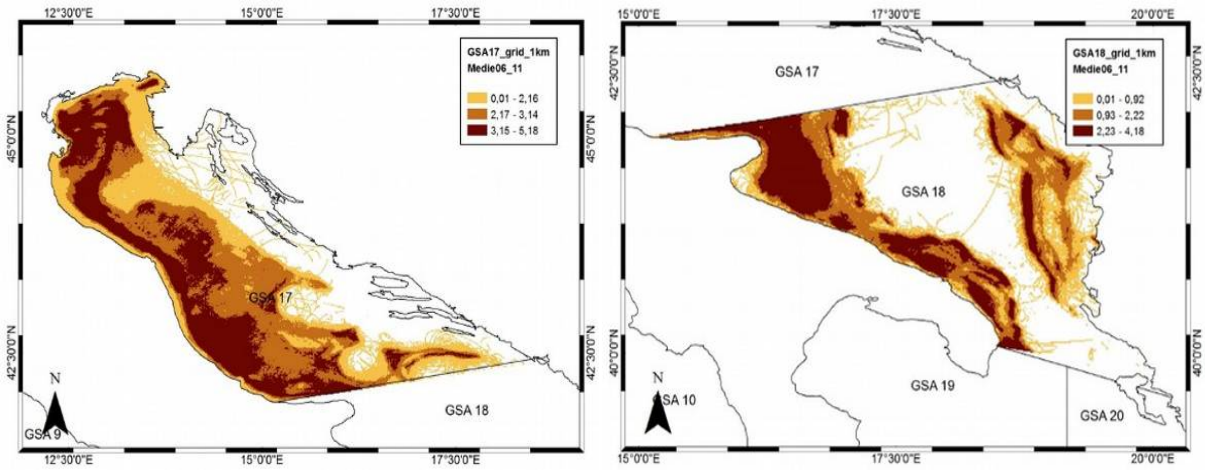

Figure 1.20. Average bottom trawlers fishing effort in GSA 17 and GSA 18. The fishing effort is expressed as average swept area in each km² cell. (Source: MSFD reporting 2012- ISPRA 2013)

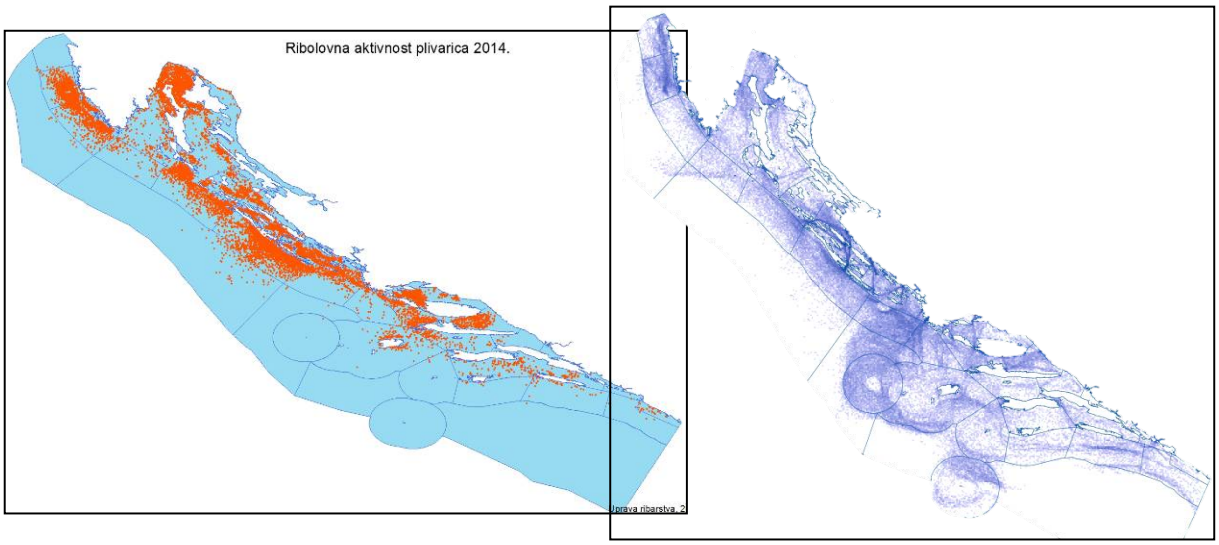

Figure 1.21. Fishing activity of Croatian fishing fleet: a) cumulative effort of purse seiners in 2014, b) cumulative effort of entire fishing fleet in 2013 (Source: Ministry of agriculture of the Republic of Croatia, Fisheries directorate, http://www.azu.hr/)

Figure 1.20 shows some examples of the average intensity of bottom trawlers fishing and passive fishing gears (boat size >12) within GSA 17 and GSA 18, as reported by Italy in the

MSFD reporting 2012 (ISPRA 2013). Figure 1.21 shows the fishing activity of the Croatian fishing fleet: a) cumulative effort of purse seiners in 2014 and b) cumulative effort of entire fishing fleet in 2013. From these two figures, it is apparent that the Croatian fishing effort is almost exclusively limited to Croatian territorial waters, whereas the Italian fishing effort uses both the Italian territorial waters and the international waters.

In order to be able to estimate the total impact of each fleet segment in terms of, for example, by-catch on cetaceans and other protected species, in addition to spatial data it is also necessary to have access to data on the temporal variation of fishing effort. This type of data is indispensable to scale any rate of accidental captures to the total of each fleet segment. Table 1.10 gives an example of the required data on fishing effort, according to the official reporting of Regulation (CE) n. 812/2004. For fishing segments with multi gears, as hoc analyses should be carried out by gear.

Table 1.10 - Minimum required information on fishing effort by fleet segments by fishing ground Regulation (CE) n. 812/2004.

Fleet segment	Fishing ground (region /area)	No of vessels	Annual days at sea	Average annual fishing days	Annual No. hauls	Annual average No. hauls	Length of net/line	Annual soak time (km*hrs or No. hooks*hrs)
Bottom trawlers	x	x	x	x	x	x		
Dredge	x	x	x	x	x	x		
Mid-water pair trawlers	x	x	x	x	x	x		
Purse seine	x	x	x	x	x	x		
Longlines	x	x	x	x			x	x
Gill-nets & entangling nets	x	x	x	x			x	x

In relation to the NETCET objectives it is worth noting that the "*Maritime Strategy for the Adriatic and Ionian Seas*" (EU COM (2012) 713 final) states that in regard to sustainable and responsible fishing activities "*[t]he strategy should enhance efforts towards long-term sustainable and responsible fisheries so that fishing activities can continue to provide an economic resource for coastal areas. [...] Common principles and tools for marine protected areas of fishery interest including the adoption of measures for the protection of sensitive habitats and certain species (e.g. turtles, dolphins), would also be beneficial for this area*". The reference to the NETCET target species it is not accidental: these are considered charismatic species with a sensitive biological cycle that need particular attention. Other particularly vulnerable species are the elasmobranchs. It is therefore clear why mapping of fishing activities becomes a fundamental element for the sustainable use of the marine environment.

1.3.5. Map of tourism

All six countries bordering the Adriatic Sea are important tourist destinations. Obviously

numbers related to the coastal and nautical sea tourism vary mostly in relation to the extension of their coastline and their historical attractions. Tourism is a significant source of income for Croatia and Montenegro relative to their Gross Domestic Product (GDP). Table 1.11 shows the different shares in relation to GDP (source: http://www.wttc.org/, Workbank-World Development Indicators and official national statistics).

Table 1.11 - Tourist arrivals and overnight stays in 2012 for Adriatic countries (whole countries) and contribution of Travel&Tourism to their GDP in 2013.

	2012 Tourist arrivals Mln	2012 Tourist overnight stays mln	2013 Travel&Tourism direct contribution to GDP in US$bn	2013 Travel&Tourism total contribution to GDP in US$bn
Albania	3.4	3.6	0.6 (4.8%)	2.1 (16.7%)
Bosnia-Herzegovina	0.7	1.6	0.5 (2.5%)	1.7 (9.3%)
Croatia	11.8	62.7	6.1 (12%)	14.0 (27.8%)
Italy	48.7	180.5	81.9 (4.2%)	201.8 (10.3%)
Montenegro	1.4	9.1	0.5 (9.8%)	1.1 (20.0%)
Slovenia	3.3	9.5	1.6 (3.6%)	5.7 (12%8%)

In 2012 Albania welcomed about 3.4 million foreign visitors (60% of the total tourism), mostly from EU countries. This figure increased by 26% from the previous year, by 20% in 2014. Between 2005 and 2012 the increase of foreign visitors was 840%. The majority of the Albanian tourist industry is concentrated along the Adriatic and Ionian coasts, with the latter known as "Albanian Riviera" because of its beautiful and less impacted beaches.

Bosnia-Herzegovina also relies on foreign tourists from Croatia (16.2%), Serbia (13.1%), Poland (8.1%), Slovenia (7.4%) and other countries (55.2%). Given the extent of its coastline, Bosnia-Herzegovina has only one sea resort.

From tourism that was equally balanced between domestic and foreign visitors during the 1980s (50-50%), Croatia has evolved a tourism industry mostly of foreigners (88%) in 2012. This is true even considering that 11% of former domestic tourism of people are from Bosnia-Herzegovina, Montenegro and Slovenia and are now registered as foreign tourists.

The largest tourist accommodation capacity in Croatia lies in the coastal regions. Interestingly, in 2010 private rooms provided 34% of the total tourist overnights, with hotels only 27% and campsites 24%. In terms of seasons, July and August show by far the highest number of overnights (around 18-21mln), followed by June and September (around 7.7mln), and May and October (around 1.4-1.7mln). In 2013, 18% of arrivals were German, followed by Slovenians (10%), Italians and Austrians (9% each). It is worth noting that despite an increase of about 20% of tourist arrivals along the Croatian seaside locations, compared to the 1980s, this has not been mirrored by comparable structural investments (e.g. sewage systems, litter management, eco-compatible accommodation facilities, etc.).

In 2012 in Montenegro 88.9% of overnight stays were foreign tourists (28.9% from Serbia, 24.4% from Russia with all other nationalities being below 10%). Concerning the total distribution of the overnight stays most of them are registered in resort accommodation (96.8%).

In Slovenia, foreign tourists accounted for 61% of overnight stays. Most of them from Italy (17%), followed by Austria (12%) and Germany (12%). The tourism in Slovenian coastal regions account for 28% of the national total (2012 data). Table 1.12 summarises 2012 statistics on tourist overnight stays by area, either by Regions, Counties and Municipalities.

Table 1.12 - Tourist overnight stays by administrative area (2012 data)

Country	Area	Overnight stays
Albania	Shkoder	NA
	Lezhe	NA
	Durres	NA
	Tirane	NA
	Fier	NA
	Vlora	NA
Bosnia-Herzegovina	Herzegovina-Neretva	NA
Croatia	Istria	19,877,368
	Primorje-Gorski kotar	11,973,931
	Lika-Senj	1,824,036
	Zadar	6,783,072
	Sibenik-Knin	4,139,536
	Split-Dalmatia	10,518,880
	Dubrovnik-Neretva	5,188,091
	Croatia Total	***60,304,914***
Montenegro	Kotor	303,900
	Herceg Novi	1,817,434
	Tivat	389,812
	Budva	4,198,773
	Bar	1,226,010
	Ulcinj	921,946
	Montenegro Total	***8,857,875***
Italy	Veneto	40,387,375
	Emilia-Romagna	9,632,676
	Friuli-Venezia Giulia	4,263,162
	Puglia	2,286,595
	Marche	1,854,481
	Abruzzo	1,030,797
	Molise	41,813
	Italy Total	***59,496,899***
Slovenia	Goriška	611,635
	Coast-Karst	2,138,035
	Slovenia Total	***2,749,670***

Considering nautical tourism and the resulting maritime traffic, according to a recently published report by Risposte Turismo (2014), in the last ten years the Adriatic Sea has

increased in importance for cruising. In 2013 Adriatic cruise passenger movements represented 22,3% of overall traffic and 18,9% in terms of cruise calls for the Mediterranean. There were more 5.2mln of passengers' movements and 20 cruise ports. This represents a threefold increase in cruise passenger movements in the last 10 years. The highest frequency routes connect Venice, Dubrovnik and Bari; but other ports are also important and allow different options of itineraries for cruise companies. Figure 1.22 shows the cruise routes in the Adriatic Sea.

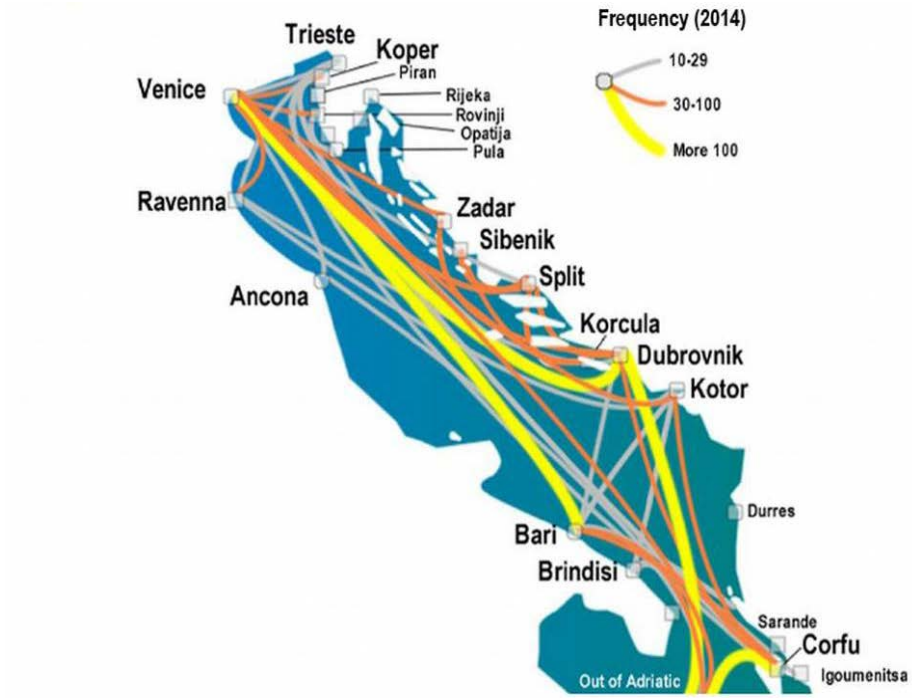

Figure 1.22. Main cruise routes in the Adriatic Sea in 2014: high (yellow), medium (orange) and low (grey) frequency (Source: Risposte Turismo 2014, Adriatic Sea Tourism Report)

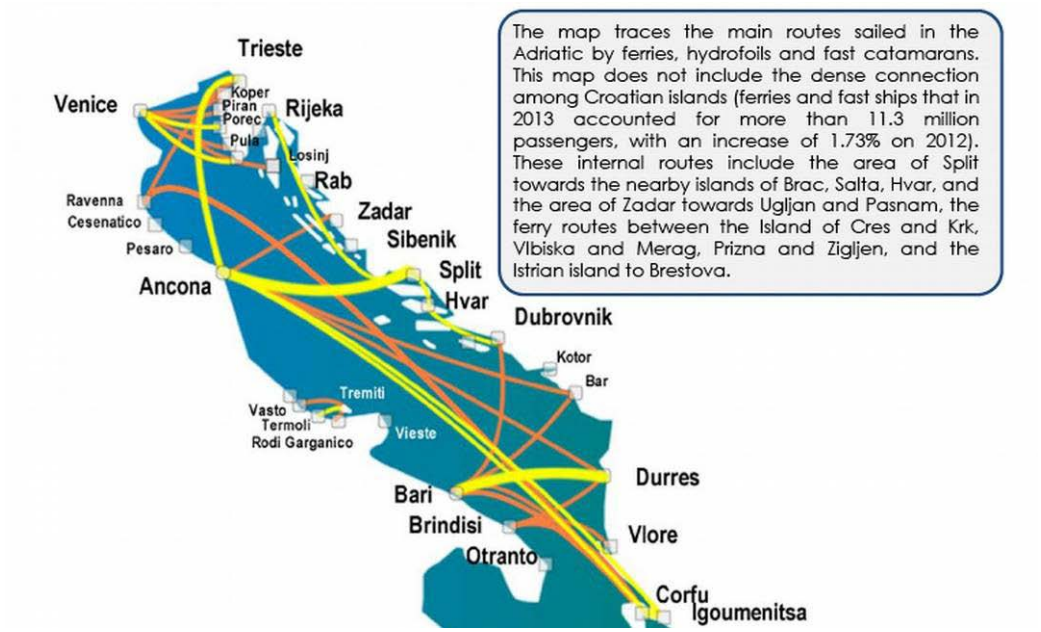

Figure 1.23. Main Adriatic ferry, hydrofoil and fast catamaran routes (Source: Risposte Turismo 2014, Adriatic Sea Tourism Report)

In addition to the traffic caused by cruisers, tourism generates traffic in terms of ferries, large hydrofoils and fast catamarans. In 2013, 17mln passengers were recorded in ferries, large hydrofoils and fast catamarans over 40 ports. Figure 1.23 shows the main routes for these types of transportation in the Adriatic Sea.

In terms individual nautical tourism (marinas and small ports) in 2013 over 300 structures accounted for almost 80,000 moorings. Italy is the country with the largest share both in terms of berths (61.5%) and structures (55.7%). The average number of berths per structure in the Adriatic is around 240. Bosnia and Herzegovina is the only country that does not have a marina or a dedicated structure for nautical tourism. Albania has only one marina located in the Vlore region. This type of tourism has a classic peak in the summer months. The number of berths per km of coast in Adriatic show that Friuli Venezia Giulia accounts for about 89 berths per km, followed by Veneto (66) and the Karst region in Slovenia (62). Given to its numerous islands and coastline extension, Croatia shows lower values.

Figure 1.24 depicts a generalisation on the tourism intensity when cruise, ferries and nautical tourism aspects are combined.

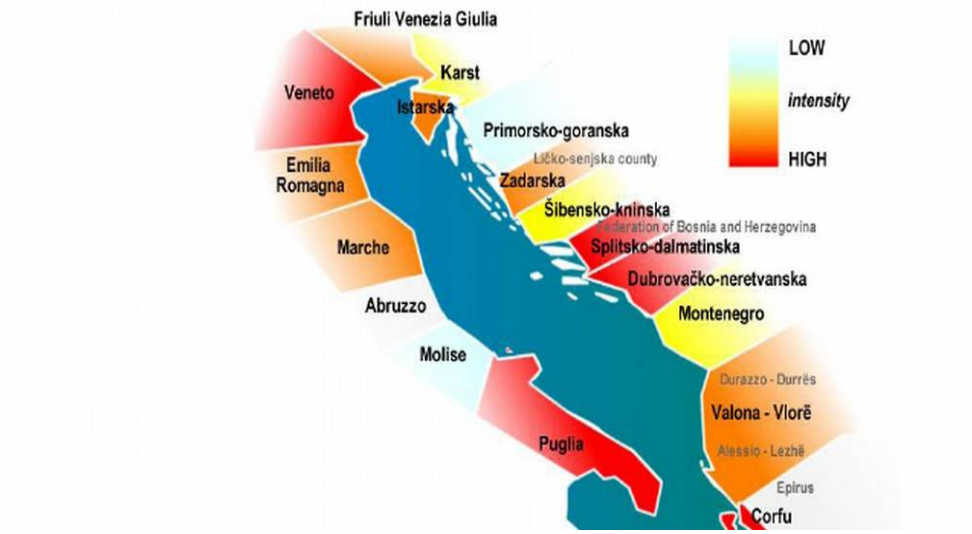

Figure 1.24. Maritime tourism intensity in the Adriatic Sea as a combination of cruise, ferry and nautical transportation (Source: Risposte Turismo 2014, Adriatic Sea Tourism Report)

Chapter 2 - Status of Cetacean populations in the Adriatic Sea

Editors: Caterina Fortuna, Drasko Holcer, Peter Mackelworth

2.1. Historic and current knowledge on species' presence in the Adriatic Sea

Historically, only two cetacean species were considered to be regularly present in the Adriatic Sea: the common bottlenose dolphin (*Tursiops truncatus*), and the short-beaked common dolphin (*Delphinus delphis*). Other species - the striped dolphin (*Stenella coeruleoalba*), the fin whale (*Balaenoptera physalus*), the sperm whale (*Physeter macrocephalus*), Risso's dolphin (*Grampus griseus*), Cuvier's beaked whale (*Ziphius cavirostris*) and the long-finned pilot whale (*Globicephala melas)* - were considered visitors or vagrant individuals. However, current knowledge has changed on both fronts. In particular, the dramatic decline in numbers of the short-beaked common dolphin in the past 40 years has led to regional extinction with only vagrant individuals recorded occasionally. Striped dolphins, Risso's dolphins and Cuvier's beaked whales are now considered regular species in the southern Adriatic. The fin whale is considered a seasonally regular species in the central-southern Adriatic. Finally, the long-finned pilot whale is believed to be a rare visitor to the entire eastern Mediterranean (including the Adriatic).

Two more species, considered visitors in the Mediterranean Sea, have been also recorded in the Adriatic Sea. These are the false killer whale (*Pseudorca crassidens*) and the humpback whale (*Megaptera novaeangliae*).

Species which were probably never found in the Adriatic Sea, but were listed in the literature either due to misidentification or because of uncritical interpretation of past records, include the northern right whale (*Eubalaena glacialis*), the blue whale (*Balaenoptera musculus*), the minke whale (*Balaenoptera acutorostrata*), the northern bottlenose whale (*Hyperoodon ampullatus*), the white-sided dolphin (*Lagenorhynchus acutus*) and the harbour porpoise (*Phocoena phocoena*).

Table 2.1 contains a description of historic and current knowledge on the presence and distribution of cetacean species in the Adriatic Sea considering confirmed records only. The term "regular species" used in this report refers to species that are either always present or occurring in the Adriatic at regular intervals (e.g. seasonally). The term "occasional" means species that may enter the Adriatic from time to time with no detectable temporal pattern. "Rare" species are those that occur only a few times in a decade.

Table 2.1 - Cetacean species recorded and confirmed in the Adriatic Sea

Common name	Scientific name	Presence	Type of observation	Current distribution	Current type of occurrence
		Historic, Current	*Wild, Stranded*	*All basin, north, central, south Adriatic*	*Regular, occasional, rare/visitor, not occurring*
Common bottlenose dolphin (EN) Dobri dupin (HR) Tursiope (IT)	*Tursiops truncatus*	Historic & Current	Wild, Stranded	All basin	Regular
Short-beaked common dolphin (EN) Obični dupin (HR) Delfino comune (IT)	*Delphinus delphis*	Historic	Wild, Stranded	All basin	Rare/visitor
Striped dolphin (EN) Prugasti dupin (HR) Stenella (IT)	*Stenella coeruleoalba*	Historic & Current	Wild, Stranded	Southern Adriatic	Regular (SA), occasional (NCA)
Risso's dolphin (EN) Glavati dupin (HR) Grampo (IT)	*Grampus griseus*	Historic & Current	Wild, Stranded	South Adriatic	Regular (SA)
Long-finned pilot whale (EN) Bjelogrli dupin (HR) Globicefalo (IT)	*Globicephala melas*	Historic	Stranded	Caught	Not occurring
Cuvier's beaked whale (EN) Krupnozubi dupin (HR) Zifio (IT)	*Ziphius cavirostris*	Historic& Current	Wild, Stranded	South Adriatic	Regular (SA)
Sperm whale (EN) Uljeśura (HR) Capodoglio (IT)	*Physeter macrocephalus*	Historic & Current	Wild, Stranded	South Adriatic	Rare/visitor (all basin), potentially regular (SA)
Fin whale (EN) Veliki sjeverni kit (HR) Balenottera comune (IT)	*Balaenoptera physalus*	Historic & Current	Wild, Stranded	Central-south Adriatic	Seasonally regular (CSA)
False killer whale Crni dupin (HR) Pseudorca (IT)	*Pseudorca crassidens*	Historic	Caught	-	Not occurring
Humpback whale Grbavi kit (HR) Megattera (IT)	*Megaptera novaeangliae*	Current	Wild	All basin	Rare/visitor/Not occurring

2.1.1 NETCET contribution to the current knowledge on cetaceans and sea turtles: new data

2.1.1.1 The NETCET Adriatic aerial survey 2013

Activity 4.3 of the NETCET project included the second full aerial survey over the entire Adriatic, carried out by ISPRA and the Blue World Institute, in cooperation with experts of the International Whaling Commission Scientific Committee. The aims of this activity were: i) establish baseline data on the distribution and abundance for cetaceans and sea turtles; ii) identify hot-spots for cetaceans and sea turtles; iii) analysis of overlaps between distribution of species and human-activities.

Prior to the NETCET project the first aerial survey was carried out in 2010 by the same three scientific organisations within the framework of the monitoring programme implemented under Regulation (EC) no. 812/2004 (funded by the Italian Ministry of Agriculture, Fishery Department). Results from the NETCET aerial survey will be compared to those collected in 2010.

2.1.1.1.1 SURVEY DESIGN, FIELD WORK AND ANALYSES

The survey design was made in cooperation with the IWC Head of Science (Dr Greg

Donovan). The original design entailed 53 parallel transects spaced 15 km, from Venice to Otranto, coverage of an area of 133,000 km² (Fig. 2.1). Because of extreme weather conditions in the Otranto Strait only 49 transects were surveyed (over an area of 128,000 km²).

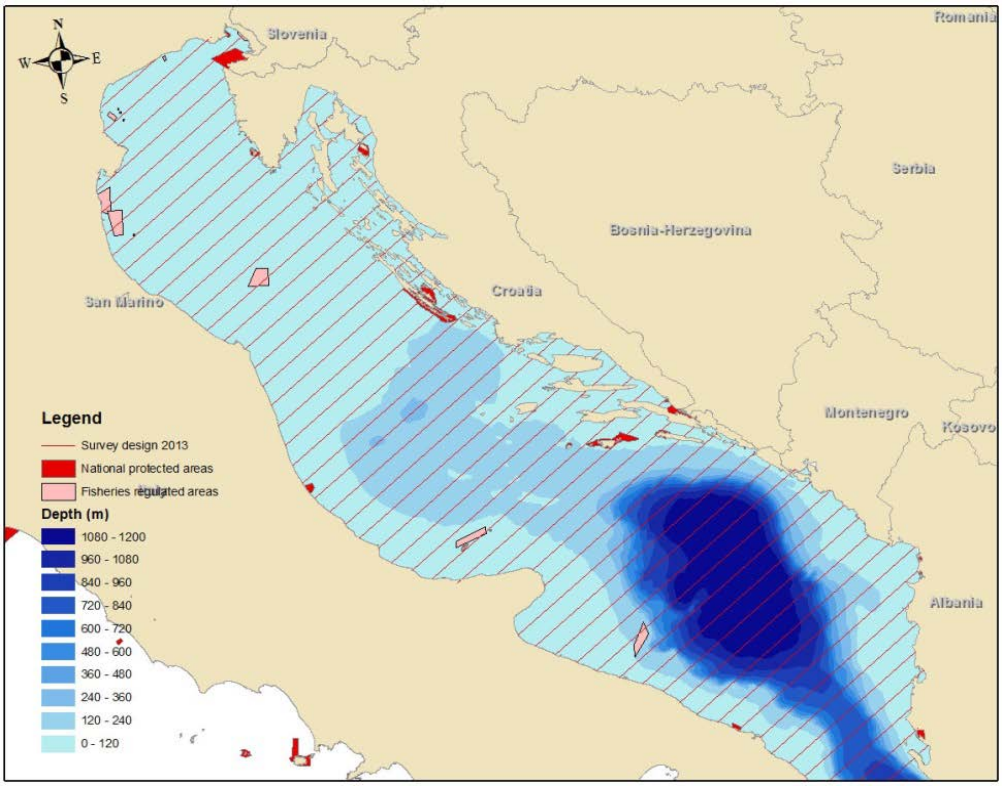

Figure 2.1. Survey design for the NETCET Adriatic Aerial Survey (source: Drasko Holcer, BWI, NETCET)

The research platform was a Partenavia P-68 (Fig. 2.2) equipped with two sets of bubble-windows (Fig. 2.2). This configuration allowed for the correction of perception bias (see Distance Sampling theory, Buckland *et al.* 2004). The team was composed of an experienced pilot (Albertario), three main observers taking turns for the observation duties (Filidei/ISPRA, Fortuna/ISPRA, Holcer/BWI) and two secondary observers (Donovan/IWC, Jensen/IWC) dedicated to the data collection for the correction of perception bias.

Figure 2.2. Research platform: Partenavia P-68 (Photo: Elio Filidei jr, ISPRA)

The survey was scheduled to be concluded within three weeks (15 July - 8 August 2013). However due to extreme weather at the end of July and beginning of August the survey was suspended on the 31st of July 2013. At that point 39 transects from the planned 53 were fully completed and transects from 40 to 49 were partially incomplete (Fig. 2.3). Due to the general weather instability in August in the remaining part of the study area, and a number of logistic issues, including a previous booking of MACH014 the company owning the research plane, seasonal holidays, and the required periodic service to the plane, the survey was finalised only in September (31 August-6 September). During this period transects from 39 to 49 were completed, but given the persistent bad weather conditions, it was decided to close the survey without covering the last 4 transects. This cut essentially means 358 km of transects not covered and a study area reduced by 3.8% from the original plan (and compared to the 2010 study area).

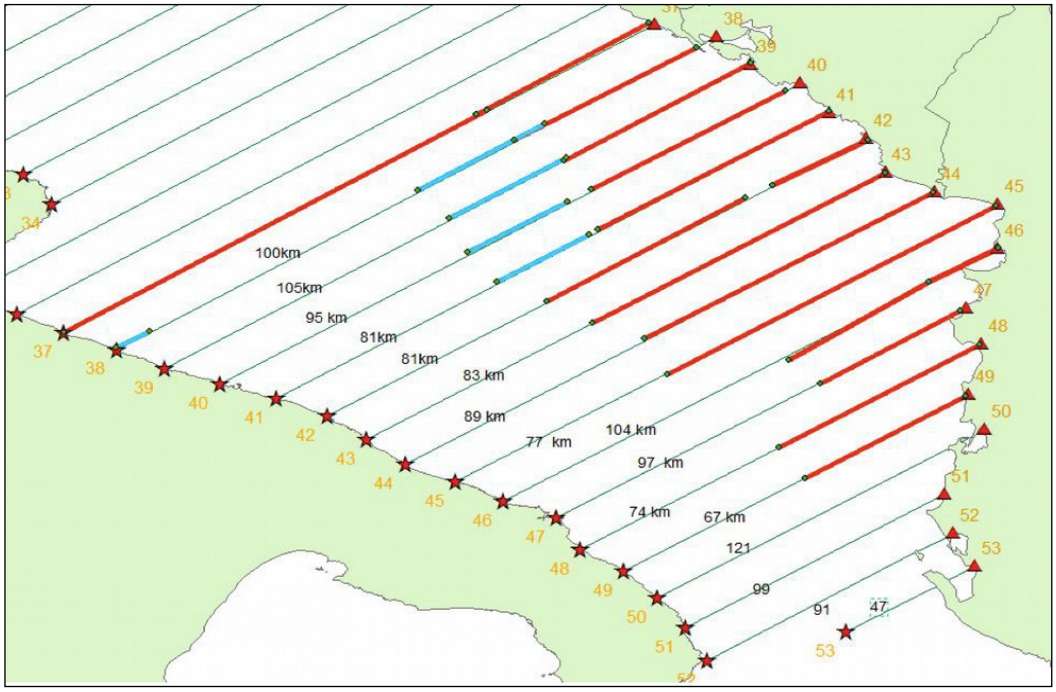

Figure 2.3. Green lines show the transects completed in September 2014 (source: Drasko Holcer, BWI, NETCET)

Abundance estimate analysis was performed in DISTANCE 6.2.

An aerial survey technically produces a snapshot of species distribution and abundance at the time when is carried out (e.g. summer distribution and abundance). However for certain species, which are not migratory nor display a strong seasonal habitat use, these surveys give an accurate picture of species' distribution pattern and total abundance.

Over 14,000 km were covered in 100 hours of flying time (including transfers) with different general observation conditions, including Beaufort scale, sea state, glare, water clarity, etc. Figs. 2.4 and 2.5 show the recorded wind state (Beaufort scale 1-4) and observers' subjective conditions (good, moderate and poor). A total of 7,854 km was covered on transects searching for cetaceans and sea turtles in appropriate searching conditions.

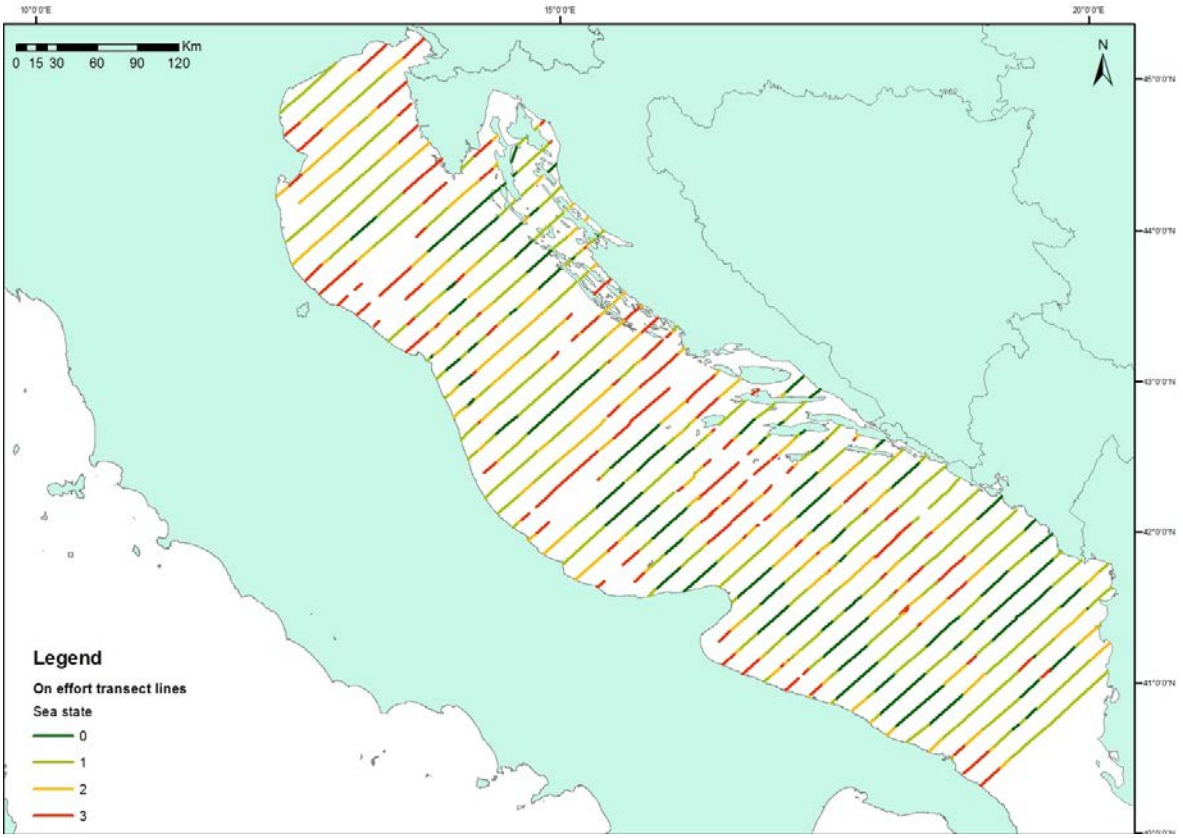

Figure 2.4. Observation conditions during the aerial survey: wind state (Beaufort scale 1-3) (source: Drasko Holcer, BWI, NETCET)

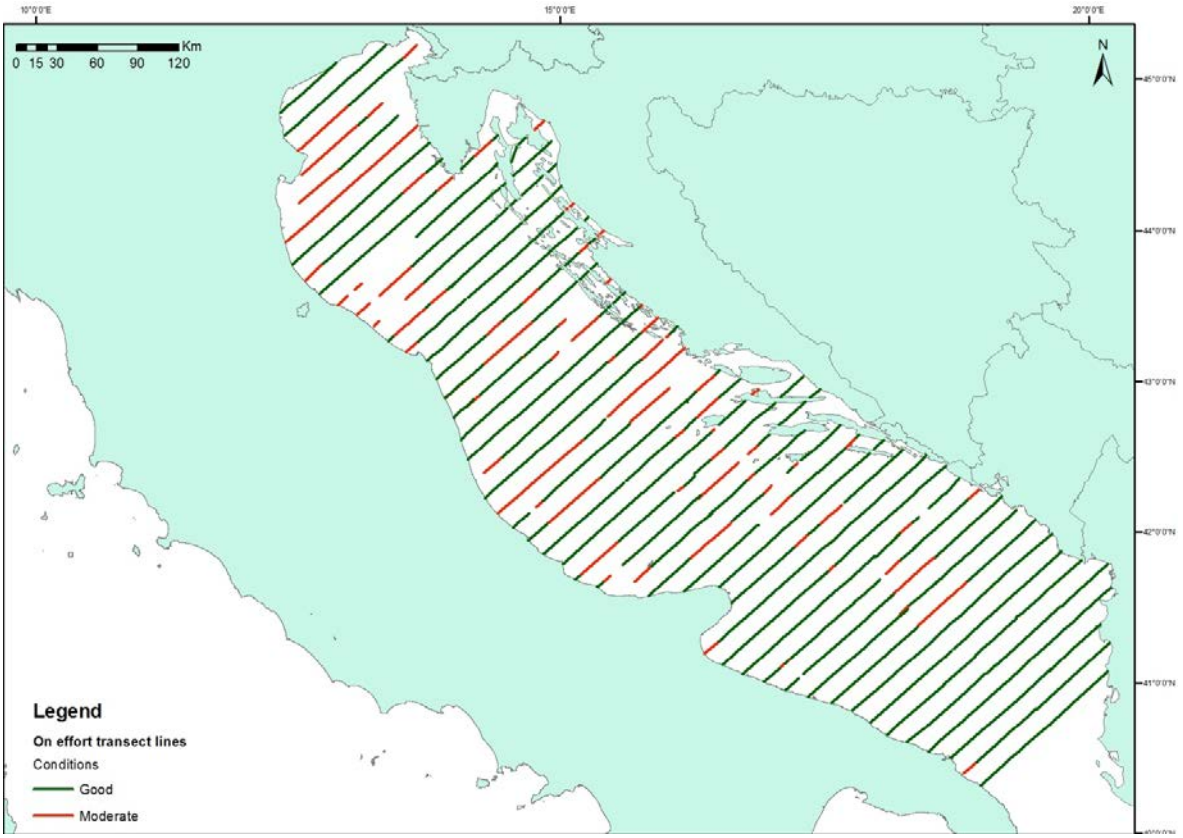

Figure 2.5. Observation conditions during the aerial survey: subjective conditions (G=good-green, M=moderate-red) (source: Drasko Holcer, BWI, NETCET)

2.1.1.1.2 SURVEY RESULTS

During the survey, a total of 1278 sightings were recorded (on- and off-effort) for both cetaceans and sea turtles (Fig. 2.6 and 2.7).

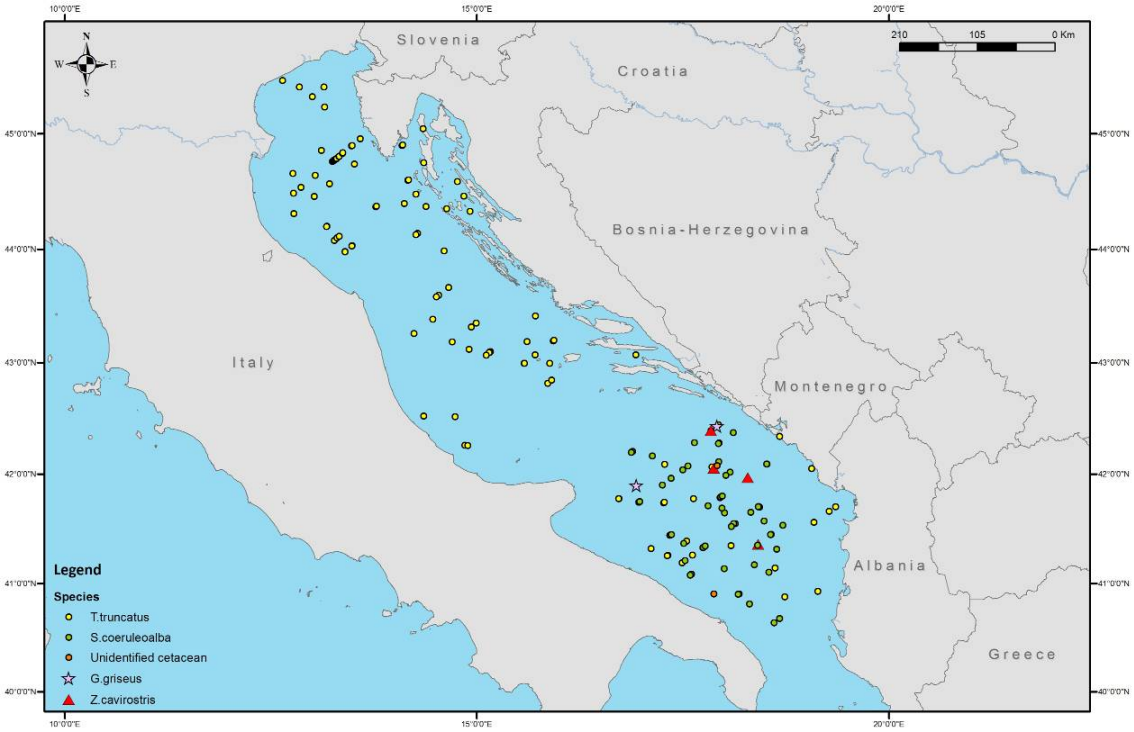

Figure 2.6. Aerial survey 2013, sightings of cetaceans in the Adriatic Sea: bottlenose dolphin (yellow dots), striped dolphins (green dots), Risso's dolphins (pink stars), Cuvier's beaked whales (red triangle) (source: Drasko Holcer, BWI, NETCET)

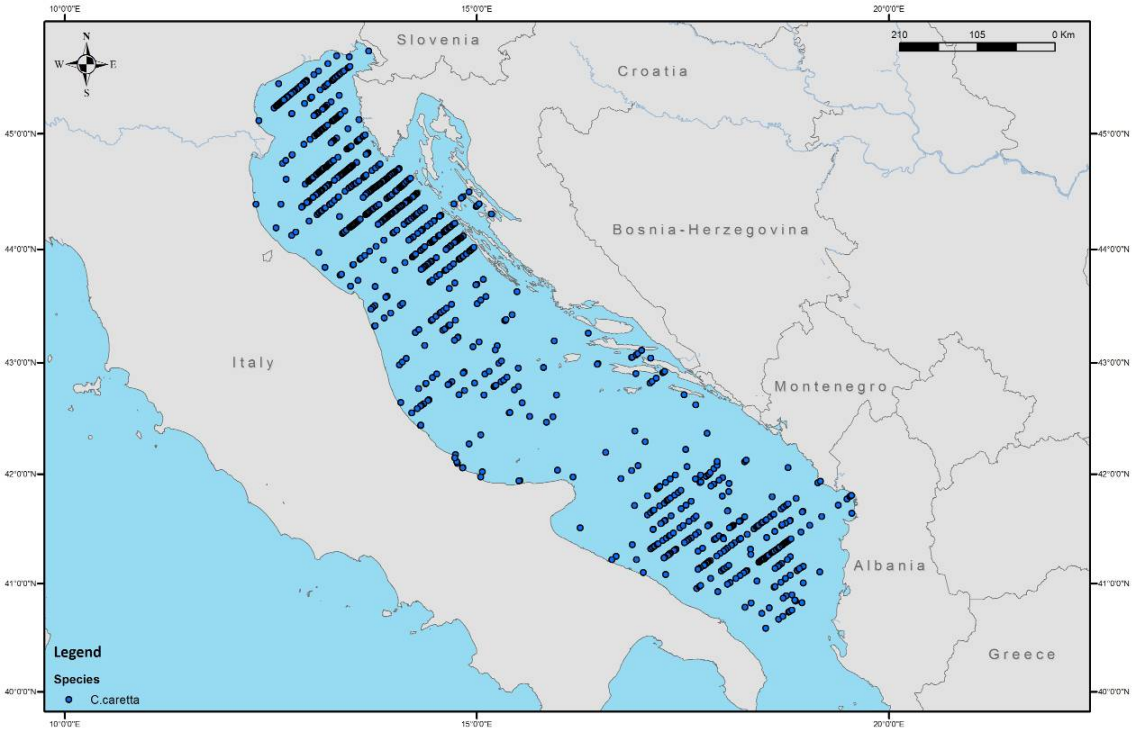

Figure 2.7. Sightings of sea turtles in the Adriatic Sea during the aerial survey 2013 (source: Drasko Holcer, BWI, NETCET)

A summary on species' sightings is given in Table 2.3. The aerial survey allowed additional sightings of other protected species (i.e. 101 confirmed sightings of the giant devil ray (*Mobula mobular*) and other species of conservation concern (i.e. 72 sightings of sharks and rays and 36 sightings of swordfish).

Table 2.3 - Summary of cetaceans and sea turtles sightings during the aerial survey 2013

Species	No. of sightings	Group size min-max; mean (SD)
Bottlenose dolphin	114	1-40; 3.6 (4.4)
Striped dolphin	61	2-200; 20.5 (31.4)
Risso's dolphin	2	6-12; 9.0 (4.2)
Cuvier's beaked whale	4	1-5; 2.3 (1.9)
Sea turtles	1096	1-2; 1.0 (0.1)

The observed distribution of cetacean species reflects their general ecology, with bottlenose dolphins more abundant on the continental shelf and striped dolphins, Risso's dolphins and Cuvier's beaked whales regularly present in the deeper waters of the southern Adriatic Sea. The Conventional Distance Sampling (CDS) abundance estimates for bottlenose dolphins, striped dolphins and sea turtles uncorrected for perception and availability bias are presented in the relevant paragraphs.

2.1.1.2 The NETCET photo-identification programme

Although widely distributed along the continental shelf, in coastal areas bottlenose dolphins exhibit residency, forming small, local populations. This "patchwork" of local groups gives the impression of relatively unique distribution. Although groups regularly communicate and exchange, anthropogenic influence can present serious threats leading to local isolation or limiting access to parts of their habitat. In order to identify local populations and enable their monitoring, one of the activities carried out within the NETCET project was the organisation of photo-identification studies on a number of locations within the partner's countries. See Table 2.4 below for general details on these studies.

Surveys were organised following the standard procedure as described in Pleslić et al. (2013). Research platforms 5-8m Rigid Inflatable Boats (RIB) with plastic keel were used. Researchers of the BWI carried out training in Montenegro (in 2013) and in Italy (in 2014). Surveys in Slovenia were carried out by Morigenos/University of Primorska, in Croatia by BWI on two locations (Vis and North Dalmatia), in Montenegro by IMB and in Italy by Fondazione Cetacea. Due to logistical issues, the survey in Albania has been delayed to 2015.

Table 2.4 - Summary of NETCET photo-identification projects

Project	Study area	Period	N. of sightings	N. of photo-identified dolphins	N. of newly photo-identified dolphins
Albania	Albanian waters	2015	10	-	-
Croatia	ADP Kvarner	2013	107	264	36
	ADP Kvarner & Istria	2014	122	503	222
	ADP Kornati	2013-2014	-	321	321
	ADP north Dalmatia	2013	-	176	-
		2014	-	183	79
	ADP Vis	2013	7	23	-
		2014	56	175	25
Italy	Fondazione Cetacea	2014	15	191	191
Montenegro	Montenegrin waters	2013	21	72	72
Slovenia	Istrian waters	2014	14	108	1

2.1.1.2.1 PHOTO-IDENTIFICATION PROGRAMME IN ALBANIA

During 20 days NETCET partners Association for Protection of Aquatic Wildlife of Albania, Tirana, AL (APAWA), Institute of Marine Biology, Kotor, MN (IMB) and Blue World Institute of Marine Research and Conservation, Veli Lošinj, HR (BWI), carried out Cetaceans field survey in the area of Vlora. The area covered with daily surveys was approximately 2500 km^2.

Survey was carried out with Zodiac PRO inflatable boat equipped with 150HP engine, property of IBM. The boat and the crew was transported to Vlora with BWI car. Accommodation for the participants was organised at the Hotel Pavaresia in Vlora. The boat was anchored in Radhima, at the small marina "Baçi", about 15 km south of Vlora, so crew transferred to Radhima every day when there was a survey.

Before the survey all permits were obtained from relevant Albanian national authorities. Also, the Vlora harbour authorities were regularly informed on our activities and relevant documents were submitted.

During the survey period, the crew rotated on the boat in order to perform not only the survey but also local staff training. Aboard the boat there were always 3 to 5 persons depending on the availability. All crew members have passed a short training in survey techniques and data collection by BWI staff. During the surveys, the actual hands on field work training was carried out and experience on the sea was gathered by all members of the crew. BWI crew members and other participants were continuously exchanging advices and were correcting field methods applied on the spot including how to log data, how to take photographs, how to identify species, behaviour, group size, the importance of knowing weather conditions and constant monitoring while on the sea, how to approach and drive around the animals etc.

During the surveys standard photo-ID survey procedure was followed. Data on the weather

and effort were collected during the trips and additional data on the sighting location, species observed, group size, composition and behaviour of animals were collected during the sightings. Sightings were always documented with photographs and on a number of occasions with video camera.

In total survey covered almost 1600 km of track, and the approximate size of the area covered was about 2000 km^2, from the area of Karavasta lagoon in the north up to Dhermi in the south.. The survey was carried out within the Vlora bay (where the effort was highest, due to the survey boat anchoring harbour) and in the open sea, within Albanian territorial waters (up to approximately 6-8 NM from the coast).

During the surveys weather was mostly favourable, what enabled us to carry out high effort in surveying. In total, there were 21 sightings of three Cetacean species – 10 of bottlenose dolphins, 10 of striped dolphins and one sighting of two Cuvier's beaked whales.

2.1.1.2.2 PHOTO-IDENTIFICATION PROGRAMME IN CROATIA

Between July 2013 and October 2014 the Blue World Institute of Marine Research and Conservation (BWI) carried out photoidentification surveys in two sites in the Croatian Adriatic. In total appoximately 11,700km were covered over 652 hours in survey.

Figure 2.8. Blue World Vis research team in action (Photo: BWI)

The surveys were carried out using a 6m rigid inflatable boat with a 90HP 4 stroke engine around the island of Vis (Fig. 2.8) and a 5.2m rigid inflatable boat with a 40HP 4 stroke engine

in the North Dalmatia region. A total of 17,245 photographs of bottlenose dolphins were taken during all sightings. The BWI has all the relevant research permits from the Croatian Authorities to carry out these surveys.

2.1.1.2.3 PHOTO-IDENTIFICATION PROGRAMME IN ITALY

Photo-identification surveys were also undertaken by Fondazione Cetacea Onlus (CF) around the port of Ravenna. These surveys were carried out in cooperation with the Blue World Institute of Marine Research and Conservation (BWI). Training by BWI researchers of CF researchers took place between 25th May 2014 and 7th June 2014. CF made several trips after this training, but surveying stopped due to bad weather. In 2015 surveys were carried out between July and September. A 7 m RIB was used as the survey platform. Between two to five observers consistently scanned the area in 270 degrees.

2.1.1.2.4 PHOTO-IDENTIFICATION PROGRAMME IN MONTENEGRO

In the summer of 2013, a cetacean photo-ID survey was performed for the first time in Montenegrin waters. The first part of the survey, from 27 May to 10 July, lasted a total of 57 hours, during which 1064 km were covered, with an average speed of 19 km/h. The second part of the survey took place from 7 August to 27 September, with 96 hours at sea during which 1696 km were covered. Average moving speed was also 19 km/h. Area covered during the survey was the Montenegrin territorial waters, from the border with Croatia to Montenegro-Albania border at the Bojana River estuary, including the Boka Kotorska Bay. Survey was performed using a 6.5 m RIB with an 115HP two-stroke outboard engine. A total of 27 field trips were performed 9 in the first part of the survey and 18 in the second part. Dolphins were sighted on 14 trips (4 in the first part of the survey, 10 in the second part). A total of 74 individual bottlenose dolphins were identified during the survey.

2.1.1.2.5 PHOTO-IDENTIFICATION PROGRAMME IN SLOVENIA

The photo-identification survey for bottlenose dolphins in Slovenia was carried out by Morigenos/University of Primorska between 1st July and 19th August 2014. The weather was highly unpredictable and variable this summer, which often hampered fieldwork. Nevertheless, fieldwork was possible on 29 days, during which 1,592 km were covered resulting in 14 sightings. The data processing is still ongoing and will be completed by 2015.

2.1.1.3 The NETCET stranding data

This section has been prepared by Sandro Mazzariol (University of Padua, Italy).

Thanks to the NETCET project in 2013-2014 cetacean strandings were regularly reported by regional and/or national stranding networks and post-mortem analyses were systematically carried out by personnel belonging to several veterinary institutions, as the Department of Comparative Biomedicine and Food Science - University of Padova, Istitutiti Zooprofilattici Sperimentali (IIZZSS) facing the Adriatic coastlines (IZS delle Venezie, IZS Lombardia ed Emilia

Romagna, IZS Marche, IZS Abruzzi e Molise, IZS Puglia) and veterinary labs of neighboring countries, as Faculty of Veterinary Medicine in Zagabria with SINP.

Table 2.5 - Summary of received NETCET data in 2013-2014 strandings

2013			
	Croatia	**Italy**	**Slovenia**
No. animals stranded	27	58	1
Species	- 18 *Tursiops;* - Nine undetermined;	- 42 *Tursiops;* - one *Stenella;* - 15 Undetermined.	- one *Tursiops*
Conservation status		- one code 1; - eight code 4-5; - 22 unknown.	
Total length		Measured in 17 animals: - one 300 cm, - ten animals 200 < n < 300 cm, - six animals < 200 cm	Calf
Alive	Two injured	One animal	
Infectious/cause of death		Two animals positive to Dolphin Morbillivirus.	
Human Induced Mortality/cause of death		- One gill net in the stomach. - One with features suggesting by-catch.	One by-caugth
2014			
	Croatia	**Italy**	**Slovenia**
No. animals stranded	43	69	
Species	- 40 bottlenose dolphins; - one sperm whale; - two undetermined whales.	- 40 bottlenose dolphins; - five 5 striped dolphin; - eight sperm whale; - 16 undetermined.	
Conservation status		Five code 2-3; - 23 code 4-5; - 35 unknown.	
Total length	Measured in 12 animals: - one animals >300cm; - two animals 200<n<300cm; - nine animals <200cm	Measured in 25 animals: - 2 animals >300cm, - 15 animals 200<n<300cm; - 8 animals <200cm.	
Alive	12 animals: - 9 bottlenose dolphins; - one sperm whale; - two undetermined whales.	5 animal: - one bottlenose dolphin; - four sperm whales.	
Infectious/cause of death		- two bacteria (E. coli and Mycoplasma) - four septicaemic shock; - Sperm whales still under study.	
Human Induced Mortality/cause of death	Four alive specimens were entangled in fishing nets.	Three with features suggesting by-catch.	

Thanks to the increasing involvement of well-trained veterinarians and to an evidence-based approach, in the last two years a more definite picture of what threatened Adriatic cetaceans has emerged. Protocols used aim to underline mechanisms and circumstances of death and, when possible, the likely cause of death using veterinary forensic techniques. Despite an increase knowledge[2] and the use of standardize procedures dedicated to the

[2] Cause of death: all those diseases, morbid conditions or injuries which either resulted in or contributed to death and the circumstances of the accident or violence which produced any such injuries Circumstances of manner of death: the fashion or circumstances that result in death, which are designated either natural or unnatural. Unnatural deaths are designated as accidental, homicidal, suicidal, or, in absence of a determination based on the balance of probabilities of the manner of death, undetermined. Mechanisms of death: defined as the immediate physiologic derangement resulting in death.

assessment of human induced mortality, a limited number of carcasses were necropsied, mainly for poor condition of stranded carcasses: in this two years, the 17% of the stranded animals in Italy (21 out of 127 carcasses found dead along the Italian Adriatic coastline) were recovered and analyze 100% in Slovenia (3 bottlenose dolphins) and 1 out of 21 in Croatia . Table 2.5 summaries all information received by the Action coordinator in 2013 and 2014.

2.1.1.3.1 REPORT ON CETACEANS STRANDINGS 2013

A total of 87 animals were reported stranded along the Adriatic coastline in 2013 by NETCET partners. Most of the carcasses were badly preserved and no post-mortem examinations were carried out. Most of the carcasses were bottlenose dolphins and only in one case a striped dolphin, which stranded on the southern coast of Italy. Figures 2.9 and 2.10 summarise the NETCET data on total and monthly strandings events by sub-basin and by country reported in 2013.

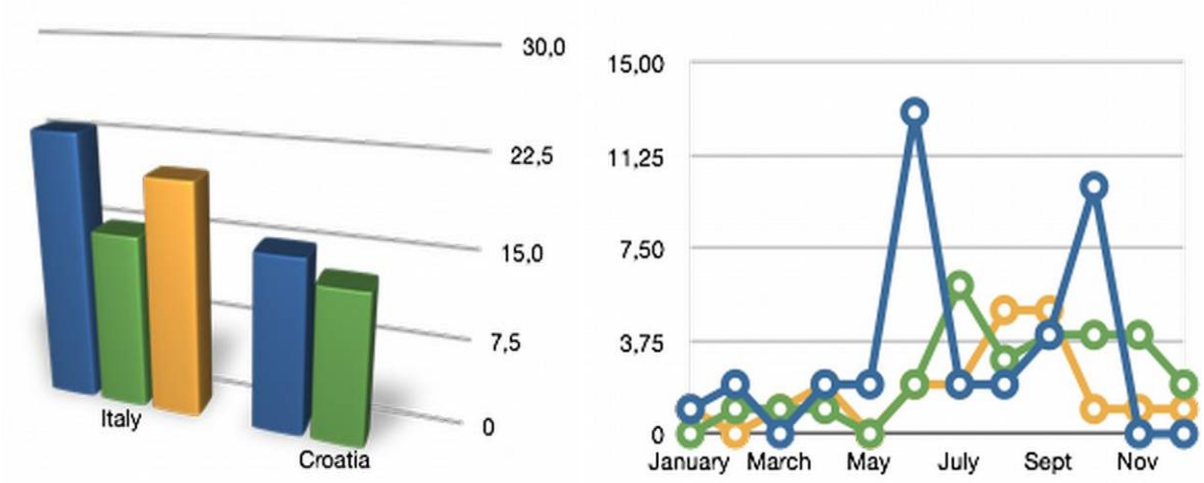

Figure 2.9. Adriatic strandings data 2013 for Italy and Croatia: total (a) and monthly (b) strandings by country and area. Key: northern (blue), central (green) and southern (yellow) Adriatic Sea. *Note: Slovenia recorded an additional stranding in the northern Adriatic that does not appear in these graphs.*

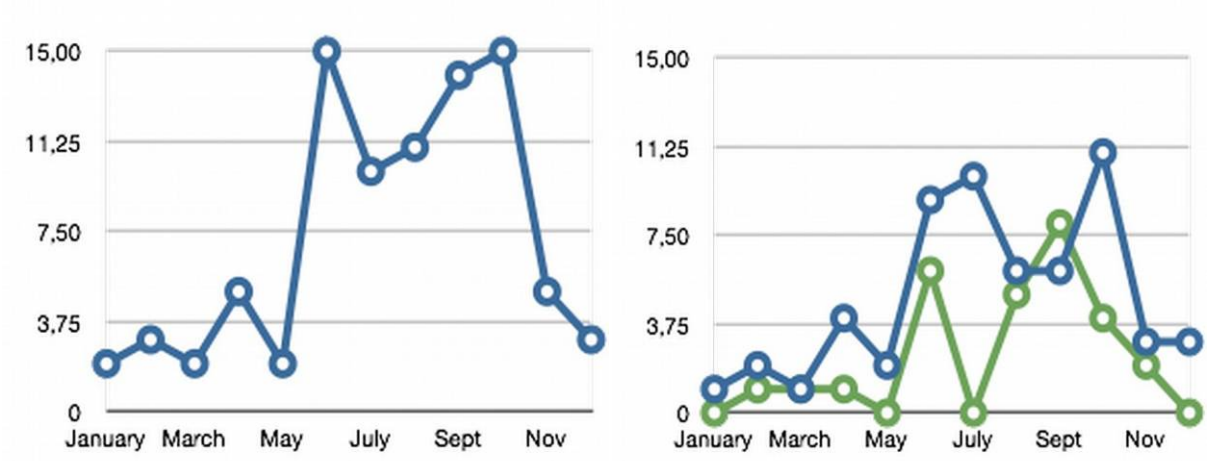

Figure 2.10. Adriatic strandings data 2013 for Italy and Croatia: total (a) and by country (b: Italy in blue and Croatia in green) in the Adriatic Sea; *Note: Slovenia recorded an additional stranding in the northern Adriatic that does not appear in these graphs* (source: Sandro Mazzariol, UNIPD, NETCET)

The analysis on strandings data reported in 2013 shows two major mortality events in the periods June/July and September/October. However, these events occurred mostly in the northern Adriatic Sea: the first event mainly involved Italy, whereas the second began in Croatia and later extended along the Italian coast. We have no specific result to highlight regarding the first episode; while for the second one, we report that two animals (out of six examined) that stranded along the Italian coastline resulted positive for *Dolphin Morbillivirus*.

Other relevant observed issues, which are common to different seasons and areas are those related to negative interactions with human-activities or illegal behaviour. Three cases where registered of animals that died showing signs of interactions with fishing activities. An additional case of illegal activity was observed in Croatia on 23th of August 2013 (near Island of Olib) where a bottlenose dolphin was observed with a spearfishing harpoon on its back. Fortunately the next sighting of 'Bojan' on the 17th September 2013 this animal was seen without the harpoon and went on to make a full recovery without human intervention.

2.1.1.3.2 REPORT ON CETACEANS STRANDINGS 2014

By the end of October, a total of 112 animals were reported stranded along Adriatic coastline in 2014. This number represents a clear increase in recovered carcasses compared to 2013. Figure 2.11 shows the monthly trend of recovered stranded animals in 2014.

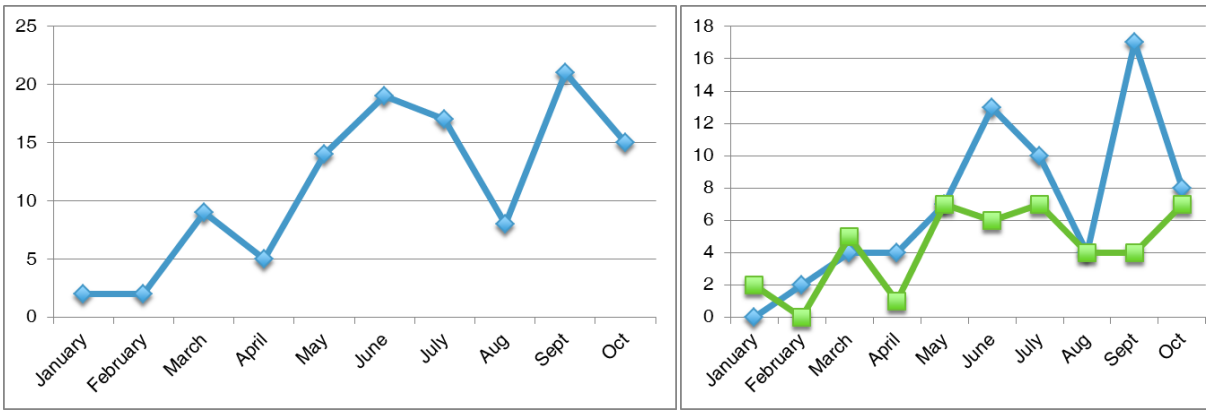

Fig. 2.11. Cetacean strandings in the Adriatic Sea: total (a) and by country (b: Italy in blue and Croatia in green) in the Adriatic Sea (source: Sandro Mazzaiol, UNIPD, NETCET)

Most of the carcasses were *Tursiops truncatus* (80), five were *Stenella coeruleoalba*, nine *Physeter macrocephalus* and 18 was unknown species. A lot of carcasses were badly preserved and no post-mortem examinations were carried out. Personnel of the UPD performed 14 necropsy and Faculty of Veterinary Medicine, University of Zagreb (entitled by SINP for national stranding network) also performed 14 necropsies.

This brief analysis on stranding data reported in 2014 shows two relevant peaks in mortality events in the periods June/July and September/October, similar to what happened in 2013. Again, this trend occurred mostly in the northern Adriatic, around the Po River delta. We have

no information regarding potential causes of the first peak in 2013; however, it was possibly due to an increase in monitoring efforts under the NETCET project. The second peak could be higher due to the sperm whale mass stranding (seven specimens) that occurred in September in the central Adriatic.

Again in 2014 lethal interaction with fisheries, a significant problem, occurred throughout the year along the entire Adriatic Sea. At least three animals where found with clear evidences of deadly interactions with fishing activities. In addition four live animals were reported entangled in fishing nets in the northern Adriatic Croatia waters.

Figure 2.12 shows the Italian strandings events by sub-basin in 2014.

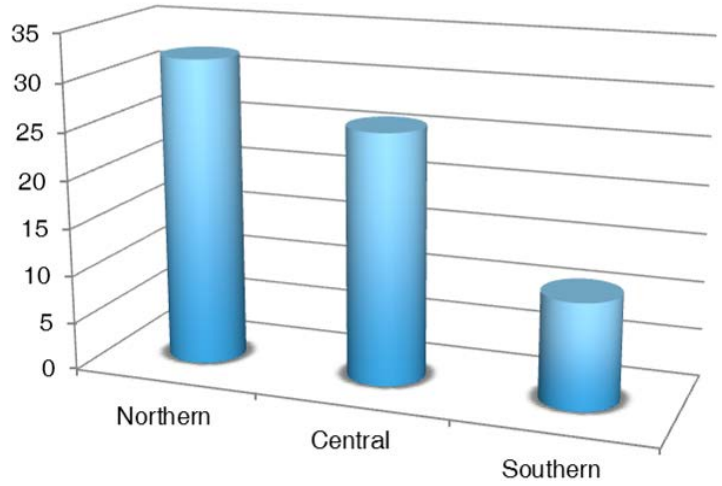

Figure 2.12. Italian strandings in 2014 by sub-basins: northern, central and southern Adriatic (source: Sandro Mazzariol, UNIPD, NETCET)

Based on this data we recommend the continuation of consistent monitoring of cetacean strandings and an increase in post-mortem analyses to be performed on all reported strandings (only about 10% of the stranded animals were fully inspected), including poorly preserved carcasses, in order to assess the extent of human-induced mortalities and possible disease outbreaks.

2.2. The common bottlenose dolphin's (*Tursiops truncatus*)

The common bottlenose dolphin (*Tursiops truncatus*; Fig. 2.13) is one of the most widely distributed species in the Mediterranean Sea. This species is regular in regions where the continental shelf is predominant or important; for example, the northern Adriatic Sea (Fig. 2.14), the Gulf of Gabes and the north eastern Tyrrhenian Sea. Being extremely adaptable, common bottlenose dolphins are found in a wide variety of other habitats, ranging from lagoons and river deltas to oceanic waters.

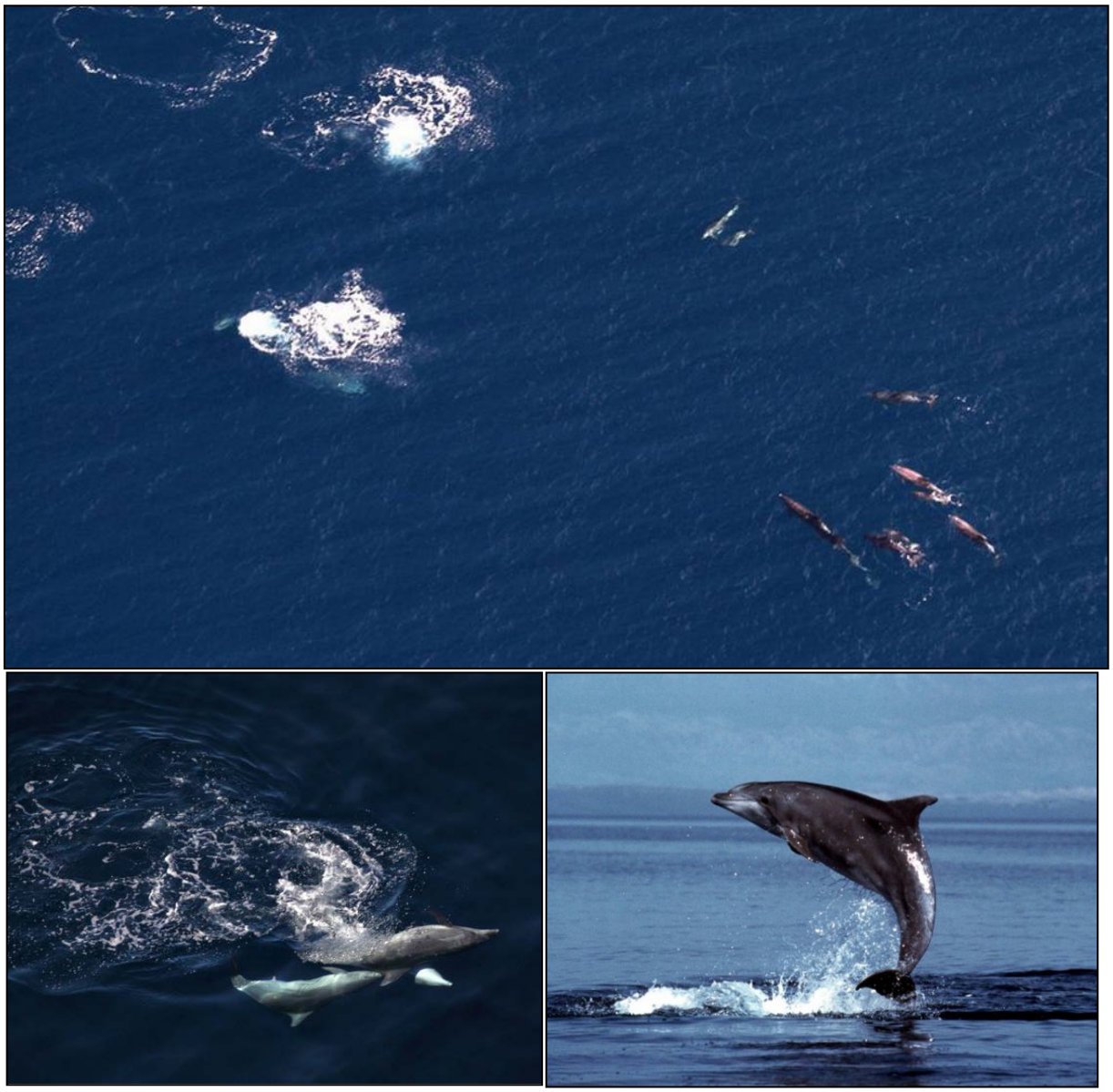

Figure 2.13. Bottlenose dolphins mating/socialising in the Adriatic Sea from different perspectives: A & B) aerial photographs (Photos: Elio Filidei jr, ISPRA); C) photograph taken from a RIB (Photo: Caterina Fortuna, BWI)

2.2.1. Distribution and abundance

Prior to the 2010 aerial survey, knowledge of the bottlenose dolphin was based on occasional reports of its presence from many corners of the Adriatic Sea and some systematically collected data that were limited to a few local research studies (Table 2.6). Anecdotal reports were mostly confirmed occasional sightings by researchers, fishermen, tourists and others. Some additional data from short and medium-term projects on distribution, relative abundance, interactions with fisheries and social structure were collected and published about Croatian, Italian and Slovenian waters. From a overall Adriatic prospective, apart from few national/local exceptions (e.g. Croatia and some Italian region) data on stranded animals were and are still considered to be part of unsystematic. This is due to the lack of a coherent Adriatic stranding network, fully structured both at national and local level. The

NETCET project has contributed to the improvement of the level of coverage and cooperation.

Table 2.6 - Long term photo-identification projects in the Adriatic Sea

Project name, area	Photo-id. period	Type of annual research effort (occasional, seasonal, annual)	Type of overall research effort (continuos, with gaps, occasional)	Leading organisation
Adriatic Dolphin Project (ADP), Losinj (Croatia)	1990-ongoing	Seasonal (1990-2001) Annual (2002-)	Continuous	Tethys Research Institute (1990-2000); BWI (2001-)
Venice Dolphin Project, Venice (Italy)	2000-2008	Seasonal	Continuous	Tethys Research Institute
Kornati Dolphin Project (Croatia) ADP north Dalmatia	2002-ongoing	Occasional (2002-2003) Seasonal (2013-)	With gaps. Continuous	MarineLife, Italy; BWI, Croatia
Morigenos Dolphin Project (Slovenia)	2002 (ongoing)	Seasonal	Continuous	
Save the last Adriatic Dolphins Project (Croatia)	2003 (ongoing)	Occasional	With gaps.	Faculty of Veterinary Medicine, University of Zagreb and Gesellschaft zur Rettung der Delphine, Munich
ADP Vis (Croatia)	2007 (ongoing)	Seasonal	Continuous	

Figure 2.14 shows two maps of the pattern of distribution and relative density of bottlenose dolphin recorded during the NETCET 2013 aerial survey.

The two aerial surveys confirmed that the bottlenose dolphin is the only cetacean species widely spread in the Adriatic Sea.

Data collected in other large scale year-round projects (i.e. the Regulation (EC) no. 812/2004 Italian monitoring programme on cetaceans on mid-water trawlers) highlighted that bottlenose dolphins are permanently present in at least the north and central Adriatic and do not seem to show different seasonal distribution patterns in these portions of the basin. This is confirmed at local level by all the long-term studies based on photo-identification, where only a relatively small-scale temporary emigration/immigration pattern has been described. In addition, genetic studies did not detect any major migratory patterns within and outside this region.

Published data on abundance estimates obtained for local putative populations of bottlenose dolphins are shown in Table 2.7. These selected examples show three cases where the sizes of local populations range from less than 100 individuals to 400 individuals. It is worth noting that in these three examples are one from the Gulf of Trieste (probably not capturing the entire population), one from a relatively closed archipelago (Kvarner- Kvarnerić) and another from a rather open sea archipelago (Vis-Lastovo). These studies are also characterised by study areas with rather different sizes. All of these facts could partially explain the difference in local population sizes.

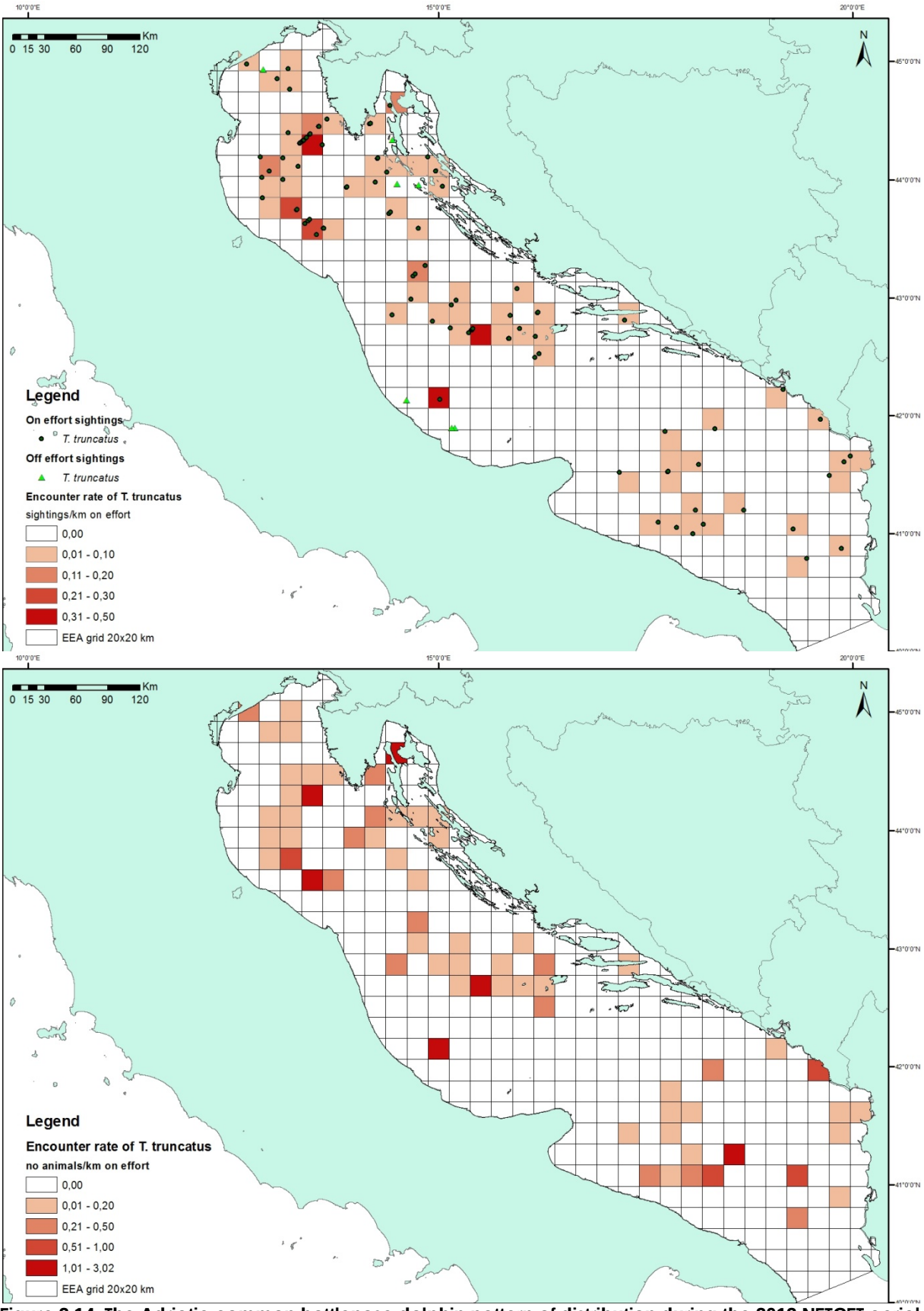

Figure 2.14. The Adriatic common bottlenose dolphin pattern of distribution during the 2013 NETCET aerial survey: a) relative density of encounters (group/linear km of effort) and relative density of animals (n. of animals/linear km of effort) over a 400 km² cell grid (source: Drasko Holcer, BWI, NETCET)

Table 2.7 - Selected mark-recapture abundance estimates of common bottlenose dolphins in the Adriatic Sea.

Location (Sampling year)		Model (estimator)	Total estimate (CV; 95% CIs)	Source
North-western Adriatic Sea, Slovenia & Croatia	2005	M_{th} (Chao)	68 (0.18; 62-81)	Genov *et al.* 2008
	2008	M_t	69 (0.08; 68-70)	
Lošinj-Cres archipelago, Croatia	1995	M_{th} (Chao)	168 (0.14; 132-229)	Fortuna 2006
	1998	M_{th} (Chao)	130 (0.11; 108-152)	
	2001	M_{th} (Chao)	105 (0.20; 76-160)	
	2004	M_{th} (Chao)	197 (0.16; 162-272)	Pleslić *et al.* 2013
	2007	M_{th} (Chao)	200 (0.13; 172-252)	
	2010	M_{th} (Chao)	186 (0.11; 164-230)	
Vis-Lastovo archipelago, Croatia	2008	M_h (Jacknife)	396 (0.09; 350-456)	Holcer 2012
	2010	M_{th} (Chao)	474 (0.22; 352-638)	

The aerial surveys (2010 and 2013) provided the first overall picture of the distribution of bottlenose dolphins throughout the entire Adriatic Sea. They also provided reliable abundance estimates for this species for the entire region. Table 2.8 summaries the results of the 2013 NETCET aerial survey.

Table 2.8 - Conventional Distance Sampling estimates for the bottlenose dolphin (2013 data; uncorrected for availability and perception bias)

Species	Stratum	Density of groups (CV; 95% LF)	Density of animals (CV; 95% LF)	Total abundance (CV; 95% LF)
Bottlenose dolphin	Adriatic Sea	0.025 (21%; 0.016-0.037)	0.083 (23%; 0.052-0.123)	10,573 (23%; 6,726-16,621)

Note: these estimates are to be considered as minimum estimates, since they are uncorrected for availability and perception bias. Corrections could double these numbers.

Densities are not particularly high, however, they are comparable to other areas of the Mediterranean Sea (i.e. Alboran Sea, Balearic Islands). Densities and abundance estimates obtained using the distance sampling method, when corrected for availability bias (diving behaviour), increase by over 20%.

The past perception of the Adriatic bottlenose dolphin being mostly scattered into relatively small inshore 'local populations' has been replaced by a new picture. The former perception was largely affected by the fact that the existing studies were mainly coastal. A biased view-point gained working in relatively small study areas (100-3,000 km^2). The new picture, based on wide-basin surveys, clarify certain questions on the general extension and patterns of this species distribution and its total numbers in the Adriatic region. The new determination of the distribution range and patterns of the bottlenose dolphin benefits from a multidisciplinary approach, combining results from studies looking at different geographical scales on different fields: population dynamics, genetic, behavioural and fishery studies.

Total numbers gathered by NETCET will allow comparison with existing data and will help researchers and the relevant authorities to embark on realistic assessment of the potential impact of direct morality induced by human activities, especially those caused by fishery. This can be done through Population Viability Analysis (PVA) or similar modelling exercises.

2.2.2. Trends in distribution & abundance

There is no quantitative historical information that can be used to infer historical population trends in the Adriatic Sea. A recent genetic study does not support the previous held concept that the common bottlenose dolphin numbers declined by at least 50% in the second half of the 20th century. This was suggested as largely a consequence of deliberate killing followed by habitat degradation and overfishing of prey species. Culling campaigns might have had a severe impact at local level, but their extent was not enough to produce a detectable signature in the genetic assets of population of Adriatic common bottlenose dolphins.

The existing knowledge on current local populations shows that they can fluctuate over 7-10 years cycles, due to a number of potential causes (including seasonal tourism and overfishing). An example is the case of the Lošinj study area where between 1995 and 2001 a decline of about 30% was recorded followed by a similar increase between 2004 and 2010.

The aerial survey data collected in 2010 and 2013 could allow the first quantitative comparison for the entire basin and for its sub-regions at different times.

2.2.3. Population structure (Unit To Conserve)

Genetics has provided new tools to define the 'Units To Conserve' (UTC) for marine mammals. In a broad sense, UTCs are segments of vertebrate populations, sometimes also called "local populations", "putative populations" or "sub-populations", which represent discrete units ecologically meaningful for conservation and management purposes. According to the US legislation UTCs are defined according to a number of characteristics of three sequential elements: i) discreteness, ii) significance and iii) status. See Table 2.9 for full details.

Habitat diversity plays a significant role in shaping the genetic structure of cetacean populations. Nevertheless the Adriatic Sea is a region characterised by both diverse marine ecosystems and high levels of anthropogenic activities, which may also play a role in structuring cetacean populations.

The most recent study on genetic structure of the Adriatic common bottlenose dolphin population showed that although this species seems almost uniformly distributed throughout the Adriatic, genetic evidence rejected the hypothesis of a single population. This study also points out that the Adriatic common bottlenose dolphins show a sufficient degree of differentiation to be treated as "entity" separated from bottlenose dolphins inhabiting the Ionian and Tyrrhenian seas.

Table 2.9 - US approach to the identification of "Unit to Conserve" (UTC)

Discreteness	A population segment of a vertebrate species may be considered discrete if it satisfies one of the following criteria: 1. It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioural factors. 2. It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(1)(1)(D) of the Endangered Species Act.
Significance	If a population segment satisfies at least one of the criteria for discreteness, its biological and ecological significance will then be considered. This consideration may include, but is not limited to the following: 1. Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon. 2. Evidence that the loss of the discrete population segment would result in a significant gap in the range of the taxon. 3. Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant as an introduced population outside its historic range. 4. Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics. Because precise circumstances are likely to vary considerably from case-to-case, it is not possible to describe prospectively all the classes of information that might bear on the biological and ecological importance of a discrete population segment.
Status	If a population segment is discrete and significant (i.e., it is a distinct population segment), its evaluation for endangered or threatened status will be based on the Act's definition of those terms and a review of the factors enumerated in section 4(1). It may be appropriate to assign different classifications to different distinct population segments of the same vertebrate taxon.

Females appear to be the principal gene flow mediators and recent migration rates indicate a relatively high level of gene flow from the north Adriatic towards adjacent areas. A fine-scale genetic structure has been identified at nuclear and mitochondrial DNA level, showing a differentiation between north and central-south sub-basins, as well as between the west and east coasts. This structure seems to reflect the major differences in terms of ecosystems found along the Basin. The Adriatic Sea has very different characteristics both in terms of physiographic and oceanographic attributes: a sandy, fairly linear and shallow west side opposed to a karst rocky, rugged and deep east side. In addition the north-central and south Adriatic sub-basins are characterised by different depth gradients, water mass circulations and productivity.

Photo-identification data have also suggested that the common bottlenose dolphins of the Adriatic Sea are structured into putative local populations. Social characteristics can also play an important role in structuring a meta-population and should be investigated to inform managers on *inter alia* average home ranges of populations.

According to all these indications, despite potential partial limitations of sample sizes, it seems appropriate to address the conservation issues of the common bottlenose dolphin in the Adriatic Sea at the 'sub-regional' level, rather than focussing on the entire basin. Potential threats should be evaluated accordingly.

The indication of a fine-scale population structure across the Adriatic Sea is a factor to be carefully considered also in the emerging marine management scenario set by the implementation of the EU Marine Strategy Framework Directive (2008/56/CE), particularly

when assessing and managing direct mortality caused by human activities (e.g. fisheries or maritime traffic). Good knowledge of the population structure of the common bottlenose dolphin at the basin level is also fundamental for the identification of potential Special Areas of Conservation under the Habitats Directive (Council Directive 92/43/EEC) and for their effective management. For example, the results of this study, describing possible south-eastward migration routes from the north Adriatic, advocate for a coherent development of a Natura 2000 network, including a proper network of inter-connected corridors.

2.2.4. Feeding ecology and behaviour

As in other parts of the world, the common bottlenose dolphins of the Adriatic Sea appear to have highly adaptive hunting and feeding habits. Results of the analysis of stomach contents of the common bottlenose dolphins in the Kvarnerić region (north-eastern Adriatic) indicates that their prey are very diverse and include a large number of species of demersal and pelagic bony fish and cephalopods and that their preferences are likely driven by prey availability.

Studies on stomach contents analysis are scarce and based on very small sample sizes, therefore any conclusion on the common bottlenose dolphin feeding preferences in this region would be tenuous. However, the existing data shows that the prevalence of different species has been changing both seasonally and annually, and that some results were probably highly affected by the preservation of the stomach contents. *Sparidae,* horse mackerel (*Trachurus* sp.), hake, European conger and mullet (*Mullus* sp) represented the main food at different times, drastically shifting in their relative importance. Very little data was available on small pelagic species presence, which could have been an artefact of the conditions of the recovered stomachs as their otoliths are very small and fragile.

Results from the analysis of stable isotopes (C, N) on samples from common bottlenose dolphins biopsied in the central Adriatic Sea show a partially different story. For these dolphins there is a seasonal shift in prey species. At the end of the winter almost 90% of sampled dolphins feed nearly exclusively on small pelagic fish, mostly sardines. These findings could indicate that other fish species are less available, rather than a real preference. According to a number studies in the central Adriatic, at the end of winter sardines migrate from the open sea towards the coastal areas for spawning and are present in large numbers. In spring red mullet become available in large quantities along the eastern Adriatic coast. This is the period when, according to interviews with local fisherman, most depredation by dolphins on small scale fisheries occur. Biopsy samples taken in spring and summer show a diet similar to that found in the analysis of north-eastern stomach contents. Individual diet differences were also recorded, this could indicate either individual preferences and/or different prey availability.

The fact that common bottlenose dolphins are feeding on demersal and pelagic species is

also confirmed by observations of this species regularly following both bottom (targeting hakes and mullets) and mid-water trawlers (targeting anchovies) for feeding purposes.

In the 1990s a study looked at the diurnal behaviour of bottlenose dolphin in the north-eastern Adriatic showing a predominance of activities (about 80% of the behavioural budget) characterised by long dives (>30 sec). These were suggested to be largely related to prey search or feeding. Foraging near the surface was observed rarely and following bottom trawlers accounted for 4.5% of the behavioural budget. These were considered as indications of alternative strategies for finding food. The spatial overlap between dolphin distribution and fishing activities was confirmed in a number of studies.

Finally an interesting study analysed the behaviour of the common bottlenose dolphins around and within the offshore gas fields off Ravenna (Italy). This showed that dolphin density was approximately 80% higher within 750m of gas platforms (compare to densities >750 m from platforms). In addition dolphins showed slightly higher frequencies of feeding and milling closer to gas platforms, whereas dolphins further away exhibited higher frequencies of socialising and travelling. This study concluded that dolphins may utilise gas platforms opportunistically as feeding sites. These observations support the theory that gas platforms act as aggregation points for pelagic fish and to provide a refuge for demersal fish.

2.2.5. IUCN regional status

The common bottlenose dolphin is listed worldwide as "Least Concern". The IUCN justification for this listing is the following: "*Although there are many threats operating on local populations, the species is widespread and abundant, and none of these threats is believed to be resulting in a major global population decline*".

When reducing the scale of the assessment to Europe, the IUCN lists the bottlenose dolphin as "Data Deficient" with the following justification: "*This species has a varying status in different parts of its European range. In the Mediterranean and Black seas there have been substantial population declines; the Mediterranean population was recently assessed as Vulnerable (A2cde), and the Black Sea subspecies T. t. ponticus was classed as Endangered (A2cde). However, although there are no estimates of population size or trend from offshore waters of the North Atlantic, the population there is likely to be large and shows no evidence of significant decline. Overall in the European Mammal Assessment region, it is not possible to quantify the population trend because the relative size of the different subpopulations is not known. Consequently the species is assessed as Data Deficient at the European regional level*".

Concerning the justification for the Mediterranean listing (Vulnerable), this was based on inferred data trends between about 1940 and 2080 (six generations). The full justification states that "*in northern portions of the Mediterranean basin, there is a well-known history of intentional killing, including extensive extermination campaigns conducted until at least the early 1960s, and there has been (and continues to be) substantial incidental mortality in fishing gear (A2d). It is not possible, however, to make robust estimates of either kind of mortality for other than short time periods and*

limited areas within the total subpopulation range. There is strong evidence that overfishing of dolphin prey has resulted in a form of habitat loss and degradation and likely also in a decline in area of occupancy (A2c). Other factors, such as disturbance by marine traffic, may be contributing to those processes. High levels of contamination by pollutants are another source of concern (A2e). Of the identified threats, only the extermination campaigns have ceased. According to literature from the 19th century, "dolphins" were abundant throughout Mediterranean coastal waters. On the northern side of the basin, the animals were mostly seen as vermin, and one of the main concerns of fishery managers from the late 18th century onwards was to develop and deploy new means of killing the largest possible number of dolphins. Conflict with fisheries was reportedly acute in several areas of Spain (A. Aguilar, pers. comm.), France, Italy, and former Yugoslavia (today's Slovenia, Croatia, Serbia and Montenegro), where thousands of animals were killed for bounties. Bottlenose and Common Dolphins were the main targets of the extermination campaigns in Mediterranean coastal areas. Numbers of Bottlenose Dolphins in some areas where they were formerly high are now lower, and this pattern can reasonably be extrapolated to other areas in the northern part of the basin. Given this, a reduction in population size of more than 30% since 1940 is suspected. Thus, the main drivers to justify a listing of Vulnerable are (a) the extensive extermination campaigns in the northern part of the western basin that ceased in the 1960s followed by (b) more recent bycatch in fisheries and prey depletion in a number of areas as well as generalized deterioration in quality of habitat (see 'Threats' section). It is suspected that even though substantial recovery may have occurred as the culling came to an end several decades ago, the other threats that have developed and increased in recent decades have either kept numbers down or slowed recovery so that the population is still at least 30% below its 1940 level. This extrapolation from a small number of areas to the rest of the Mediterranean, for much of which there is little or no information on the status of Bottlenose Dolphins, represents a precautionary rather than evidentiary interpretation of evidence. As explained in the March 2010 Guidelines for Using the IUCN Red List Categories and Criteria, version 8.0 (sections 3.2.3, 3.2.4 and 3.2.5 in particular), assessors are encouraged to 'adopt a precautionary but realistic attitude, and to resist an evidentiary attitude to uncertainty when applying the criteria'.

Note on population structure: although this listing treats the Bottlenose Dolphins throughout the entire Mediterranean Sea as a single unit, separate subpopulations probably exist in some areas, e.g., the Adriatic Sea, where the species has declined dramatically (quite likely by at least 50%) over the past 50 years. Other geographically distinct subpopulations are known to reside within relatively small semi-closed basins such as the Amvrakikos Gulf in western Greece (400 km²), where they exhibit specialized behaviour and feeding habits. Therefore, the listing of Mediterranean Bottlenose Dolphins as a single subpopulation should not be interpreted to mean there is no further subpopulation structure within the region".

In 2013, Italy published its national Red List where the bottlenose dolphin is identified as "Near Threatened".

2.2.5.1 Adriatic listing

There is not an Adriatic red listing for any of the cetacean species. In case of a regional listing the current data would probably allow a "Near Threatened" classification.

Table 2.10 builds on the Italian Initial Assessment for this species which was drafted considering available data from the entire Adriatic Sea in 2012. This table incorporates an update of the Italian Initial Assessment based on more recent studies including the NETCET research activities.

Table 2.10 - Initial Assessment on the status of the common bottlenose dolphin under the MSFD

MSFD topic	Criterion	Evaluation	Reliability of data
Initial Assessment	**Distribution (1.1.)**	Within the norm for the entire Adriatic Sea	High
	Abundance (1.2.1)	Minimum estimate for the entire Adriatic Sea: over 5000 specimens	High
	Genetic population structure (1.3.2)	At least two general subdivisions (north and central-south Adriatic) and an additional differentiation east/west for males.	High
Potential threats	**Fishery accidental captures (bycatch)**	Unknown cumulative impact of all fisheries. Bycatch rate in Italian mid-water trawlers (GSA 17) = 0.001 animal/haul, for an average total of 36 specimens (CV=36%; 95%CIs 27-47) per year in this fishery alone in the last 7 years.	High
	Chemical pollution	Unknown	Medium
	Overfishing	Unknown	Low

Key: MSFD=Marine Strategy Framework Directive; High=based on reanalyses of robust data collected of the subregion; Medium=based on published data collected from some part of the region; Low=based on expert opinion; This table is largely based on ISPRA (2013), revised after Gaspari *et al*. (2013), Pleslic *et al*. (2013), Fortuna and Filidei (2014) and NETCET data.

In its MSFD report to the European Commission Italy provided an initial assessment (IA) for the bottlenose dolphins in the Adriatic Sea considering the entire basin (not only the Italian territorial waters). This report argues that any assessment at the sub-region level - of both cetacean species and potential threats to these species - can only be meaningful if carried out cooperatively with all bordering countries (not only the European Member States).

As an initial step for the assessment of the potential impact of accidental mortality caused by fisheries, we propose to use two UTC: northern Adriatic (northern portion of GSA 17 up to the 100m isobath) and central-south Adriatic (southern portion of the GSA 17 and GSA 18). These subdivisions should be revised as soon as additional genetic data will be made available from wild animals (through biopsy).

2.3. The striped dolphin (*Stenella coeruleoalba*)

2.3.1. Distribution and abundance

Figure 2.15. Striped dolphins, southern Adriatic (Photo: E.Filidei jr., ISPRA)

The striped dolphin (*Stenella coeruleoalba*) is considered the most abundant cetacean species in the Mediterranean Sea (Fig. 2.15). This also appears to be the case in the Adriatic Sea, although it is only regularly present in the southern and deepest part of the basin in >300m waters depth (Fig. 2.16). Usually striped dolphins tend to occur in waters depths greater than 600 m. It is only occasionally found in areas shallower than 200m. This happens also in the Adriatic with solitary dolphins and stray small groups swimming up to the northern portion of the basin (30-100m). Stranding data from the Italian database seem to indicate a year-round presence in the region.

Some authors argue that the more frequent reports of striped dolphins along the northern Adriatic coastline is possibly an expansion of the distribution range as has been reported for other Mediterranean areas. Others suggest that an increased interested and ease of documentation of cetacean sightings may explain this increased number of reports even on single individuals. Some also suggest that historical reports of common dolphins could have included sightings of striped dolphins.

Data on the abundance of this species in the Adriatic Sea is summarised in Table 2.11.

Table 2.11 - Conventional Distance Sampling estimates for the striped dolphin (2013 data; uncorrected for availability and perception bias)

Species	Stratum	Density of groups (CV; 95% LF)	Density of animals (CV; 95% LF)	Total abundance (CV; 95% LF)
Striped dolphin	Adriatic Sea	0.025 (23%; 0.015-0.040)	0.324 (29%; 0.184-0.573)	41,533 (29%; 23,511-73,370)

Note: these estimates are to be considered as minimum estimates, since they are uncorrected for availability and perception bias. Corrections could double these numbers.

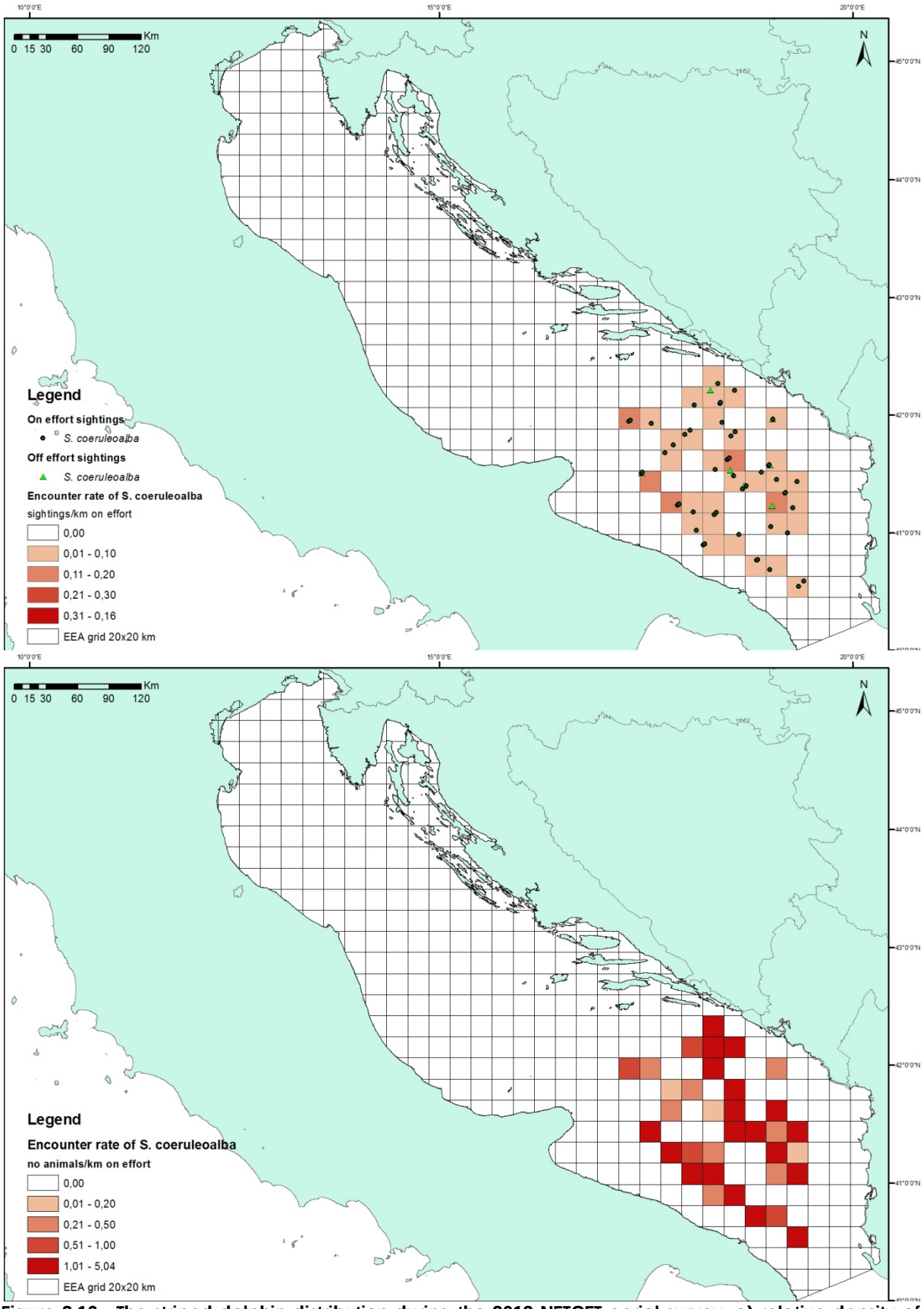

Figure 2.16. The striped dolphin distribution during the 2013 NETCET aerial survey: a) relative density of encounters (group/linear km of effort) and relative density of animals (n. of animals/linear km of effort) over a 400 km² cell grid (source: Drasko Holcer, BWI, NETCET)

2.3.2. Trends in distribution & abundance

No data on the trends in distribution and abundance exist for this species at the Adriatic level. Data from the 2010 aerial survey and the NETCET 2013 aerial survey could provide the first baseline evaluation on which trends of the general distribution and abundance could be based.

2.3.3. Population structure (Unit To Conserve)

Little is known on the genetic population structure of the striped dolphin in the Adriatic Sea. However, from a very preliminary study (n=15) it seems that specimens using the Adriatic Sea are not strongly differentiated from those of other parts of the Mediterranean Sea.

2.3.4. Feeding ecology and behaviour

Striped dolphins feed mostly on cephalopods and epipelagic fish.

The striped dolphin is a gregarious species. In the southern Adriatic Sea is found in large herds (>100-200 individuals and more), whereas in the northern Adriatic the group size of occasional visitors ranges from one to three specimens.

2.3.5. IUCN regional status

The striped dolphin is listed worldwide as "Least Concern" with the following justification "*Given the estimated population of over 2 million individuals worldwide, despite mortality due to direct and incidental takes in many parts of the world, there is no evidence of a major global decline that would warrant listing in a category of threat*".

The Mediterranean subpopulation of the striped dolphin is listed as "Vulnerable" under IUCN (World Conservation Union) criterion A2bcde. The IUCN justification is the following: "*This subpopulation of Striped Dolphin has been, and is currently, subject to a number of threats that, cumulatively, reduced its size and may still be slowing its recovery. An abrupt reduction in population size occurred in 1990–1992 due to a die-off involving many 1,000s of deaths. Immediately after this die-off, the mean school size was found to be less than one third of prior levels, which implied a proportional reduction in overall population size. In 2001–2003, the density (0.49 dolphin/km²) of Striped Dolphins estimated in the Gulf of Valencia was again close to the maximum reported for this species in the western Mediterranean. No similar information is available from other areas. In a 17-year study of variability in group size, Gaspari et al. (in prep.) have found a gradual increase over time in the Ligurian Sea. The primary cause of the die-off was a morbillivirus infection. PCBs and other organochlorine pollutants with potential for immunosuppressive effects were suggested to have enhanced its lethality. In 2006–2007 another morbillivirus outbreak affected the species off the coasts of Spain and later extended to France and the Italian Ligurian Sea. The mortality associated with that event seemed more moderate (though at least 200 carcasses were reported in Spain), probably because part of the adult population still preserved antibodies against morbillivirus. The reduction of the organochlorine load in the population resulting from a general decline in pollutant levels in the Mediterranean may also have implied a reduction in mortality. Besides their immunosuppressive action, PCBs and other organochlorines impair reproduction through a variety of mechanisms. Past and current levels much*

exceed thresholds from which reproductive effects have been observed in Bottlenose and other dolphins. PCBs may have played a role in the occurrence of luteinized cysts in the ovaries of four of 56 (7.1%) Mediterranean Striped Dolphins although there is no evidence that these cysts have impaired reproduction to such an extent that it would affect the overall population. Incidental capture in fishing gear, particularly in pelagic driftnets, has been high in at least the last two decades, causing thousands of deaths per year. Finally, given the overexploited state of most fishing resources in the Mediterranean, decreased food availability caused by fishing may be an added limitation on the recovery of the Striped Dolphin population, although the significance of such a potential threat has not been assessed. It is suspected that a reduction in population size of >30% occurred over the last three generations (ca. 60 years) (Criterion A2) based on the 2/3 reduction in mean school size in the 1990s (here considered an index of abundance) (A2b), a decline in quality of habitat, particularly food availability (A2c), past and current high levels of exploitation in the form of incidental mortality in fisheries (A2d), and the effects of pathogens and pollutants (A2e). The causes of the population reduction may be reversible but are neither clearly reversible nor understood; moreover, none of the threats (i.e. potential or likely causes of the decline) has ceased except for pollution by organochlorine pollutants, which has declined in the last two decades. Reducing the health threats still caused by PCBs and others pollutants such as brominated flame retardants, polycyclic aromatic hydrocarbons and perfluorinated compounds may require that these pollutants decrease to a non-effect threshold".

2.4.The Risso's dolphin (*Grampus griseus*)

Risso's dolphins (Fig. 2.17) are relatively large dolphins measuring up to 4m in length. Most distinctive is the blunt head without beak and dark coloration dominated by whitish scars which they accumulate throughout life, making older animals appear almost white.

2.4.1. Distribution and abundance

Risso's dolphins are distributed worldwide in tropical and temperate seas with preference for deep offshore waters and coastal areas with narrow continental shelves. The Risso's dolphin is present in the entire Mediterranean Sea and is considered a regular inhabitant, although its abundance throughout the basin is unknown. Within the Mediterranean Sea, the Risso's dolphin is mostly encountered in deep pelagic waters, in particular over steep shelf slopes and submarine canyons.

Since the 19th century, the Risso's dolphin has been recorded on numerous occasions in the Adriatic Sea. Figure 2.18 shows a map of existing records on encounters and strandings along the Italian and Croatian coasts. Additional opportunistic observations were made from the ferries in southern Adriatic Sea. No observations and/or strandings were reported for Slovenia, Montenegro and Albania.

Figure 2.17. Risso's dolphins, southern Adriatic. (Photo: Drasko Holcer, BWI).

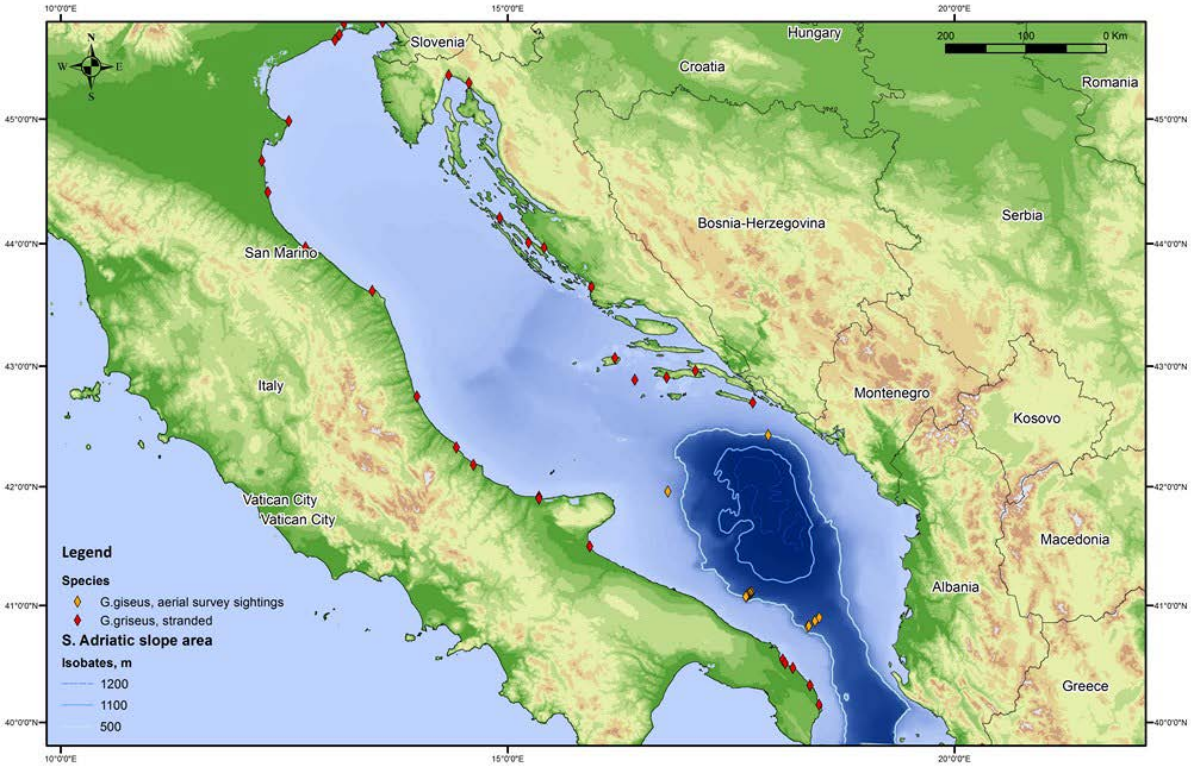

Figure 2.18. Map of strandings (1986-2013) and sightings of Risso's dolphins during 2010-2013 aerial surveys (source: Drasko Holcer, BWI)

Regardless of the relatively high numbers of strandings and their presence throughout the Adriatic basin, the Risso's dolphin was considered as only occasional. This categorisation has been partially revised based on data collected by the 2010 aerial survey that indicated the important presence of this species in the southern part of the Adriatic, in particular in areas with steep slope and depths between 600-900m (Fig. 2.18). The southern Adriatic clearly represents a suitable habitat for the Risso's dolphin. This is also confirmed by the NETCET 2013 aerial survey.

2.4.2. Trends in distribution & abundance

No data on the trends in distribution and abundance for this species exist. Data from the 2010 aerial survey and the NETCET 2013 aerial survey cannot be used to provide an estimate of abundance or an evaluation of trends, as the number of sightings were too few.

2.4.3. Population structure (Unit To Conserve)

Available data based on the microsatellite and mitochondrial DNA analysis show that Mediterranean Risso's dolphins are genetically differentiated from the eastern Atlantic population and the gene flow is limited. It also indicates potential Mediterranean population structuring. No data on DNA analysis on Adriatic specimens exist.

A photo-identification study carried out in the Ligurian Sea indicates that animals show site fidelity, but seasonal (summer/winter) differences in density indicate possible temporary migrations within the Mediterranean. This could apply to the southern Adriatic, with at least a regular seasonal presence in summer, although strandings data from the Italian database seem to indicate a year-round presence.

2.4.4. Feeding ecology and behaviour

Risso's dolphins seem to prefer areas over the continental slope with higher depth and steep slope gradients, suggesting a feeding specialisation. Analysis of stomach contents of stranded specimens indicates that this species feeds mostly on cephalopods inhabiting oceanic waters over steep continental slopes. In particular it seems to be feeding on cephalopods from the middle slope (600-800m depth).

Groups of Risso's dolphins (Ligurian Sea) show generally weak inter-individual associations, with some consistent longer term relationships between individuals over periods of years.

2.4.5. IUCN regional status

The Mediterranean subpopulation of the Risso's dolphin is listed by the IUCN as "Data Deficient".

2.5. The Cuvier's beaked whale (*Ziphius cavirostris*)

Cuvier's beaked whale (Fig. 2.19) is a large-sized odontocete with adults reaching between 5.5 and 7m in length.

2.5.1. Distribution and abundance

Of all the beaked whales the Cuvier's beaked whale has the widest distribution range: global, only absent in polar waters.

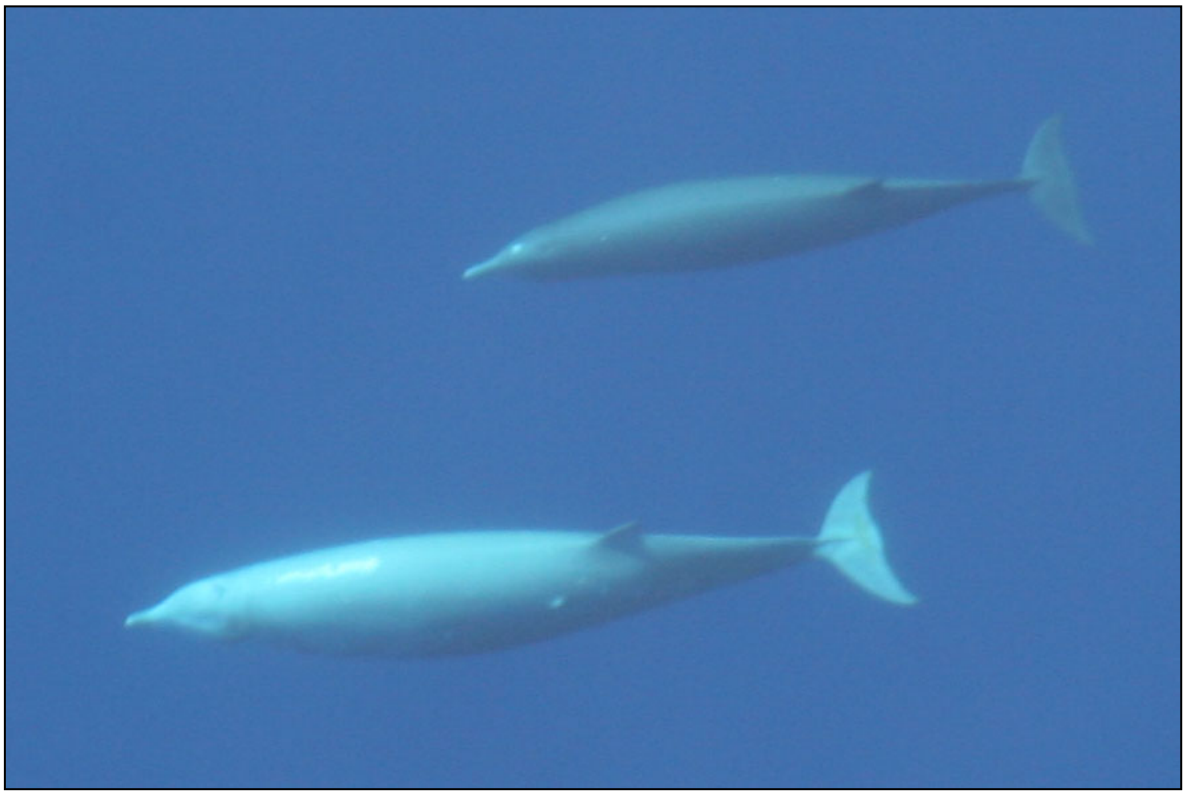

Figure 2.19. Cuvier's beaked whales, southern Adriatic (Photo: Caterina Fortuna, ISPRA).

Of the beaked whale family, Cuvier's beaked whale is the only species known to regularly occur throughout the entire Mediterranean Sea, with no notable difference in distribution between the western and the eastern basins. Research on this species in the Mediterranean Sea revealed relatively higher abundance in the areas of Alboran Sea, along the Hellenic trench and in the Ligurian Sea, although, these areas are the only regions where systematic research has been carried out since early 1990s. Population size estimates exist only for small areas of the Alboran sea and the Gulf of Vera, and for a portion of the northern Ligurian Sea.

The Cuvier's beaked whale is often associated with deep slope habitats and shows a preference for areas characterised by submarine canyons, steep slopes, scarps or submarine mounts. In the area of Pelagos Sanctuary Cuvier's beaked whales encounter rate was higher in waters with greater depths (about 1400-2000m); whereas around the Hellenic trench this

species was usually observed in depths from 500-1500m on the slopes.

Thanks to a collective effort carried out under the ACCOBAMS umbrella, data collected by numerous organisations between 1990 and 2010, were used to predict preferred habitat of the Cuvier´s beaked whale within the Mediterranean Sea (Fig. 2.20). In addition to the expected areas in the Alboran Sea, central Ligurian Sea, Hellenic Trench and south Aegean Sea (north Cretan Sea), some other area – the Tyrrhenian Sea, southern Adriatic Sea, north Balearic islands, and south Sicily – showed relatively high predicted densities compared to the rest of the Mediterranean. It is interesting to note that this model did not include all the records collected in the Adriatic Sea and did not take into account the distribution of stranded animals along the Mediterranean coasts.

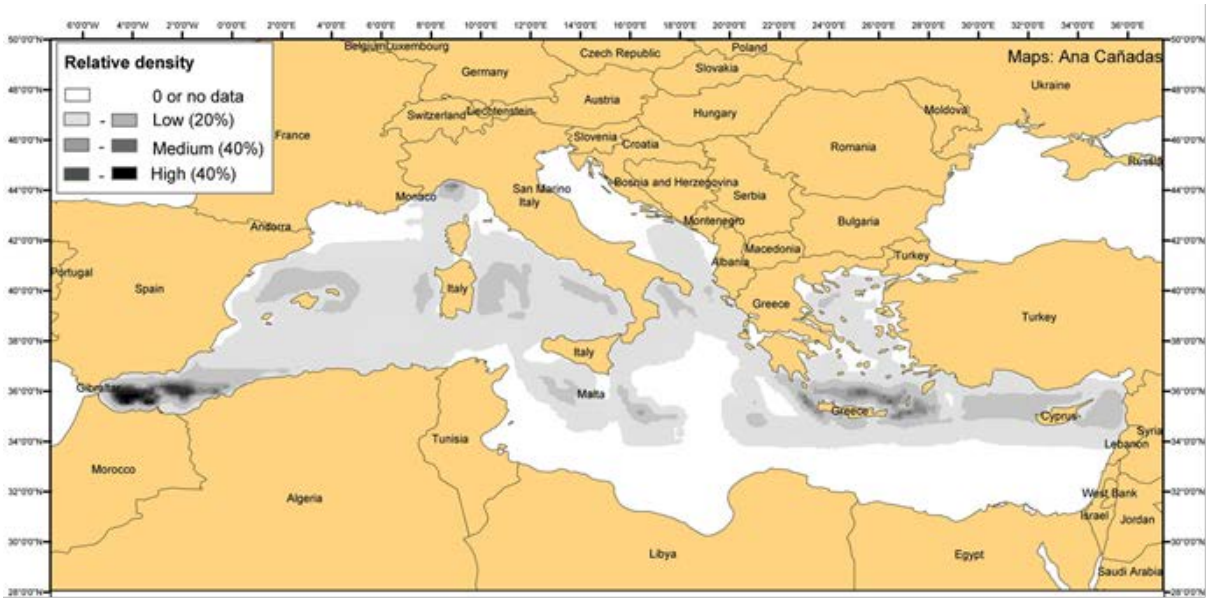

Figure 2.20. Relative density of beaked whales predicted through habitat modelling of 1990-2010 data (Source: Cañadas *et al.* 2011)

Historic information regarding the distribution and occurrence of this species in the Adriatic Sea is scarce. Based on stranded animals this species was considered occasional/rare. A relatively recent review on the occurrence of the species in the Adriatic suggested that the southern Adriatic Sea could actually be an important habitat for Cuvier's beaked whale. Figure 2.21 shows the historical and new information on their sightings (2010-2013) and strandings (1986-2014). This distribution reflects the Cuvier's beaked whale preference for deep waters, slope and canyons of the central and southern Adriatic.

Aerial survey data, including the recent NETCET survey in 2013, confirmed the presence of Cuvier´s beaked whales in the southern portion of the basin. In total, five sightings of were made in 2010 and 2013. Sightings occurred in waters with depths between 700-1200m in the areas of steep bathymetry. It is notable that sightings are grouped along the northern and

eastern part of the south Adriatic basin where there is almost a direct drop to the depth of 1000m. Sightings, included females with juvenile animals (suckling animal), indicating the southern Adriatic as important area for this species.

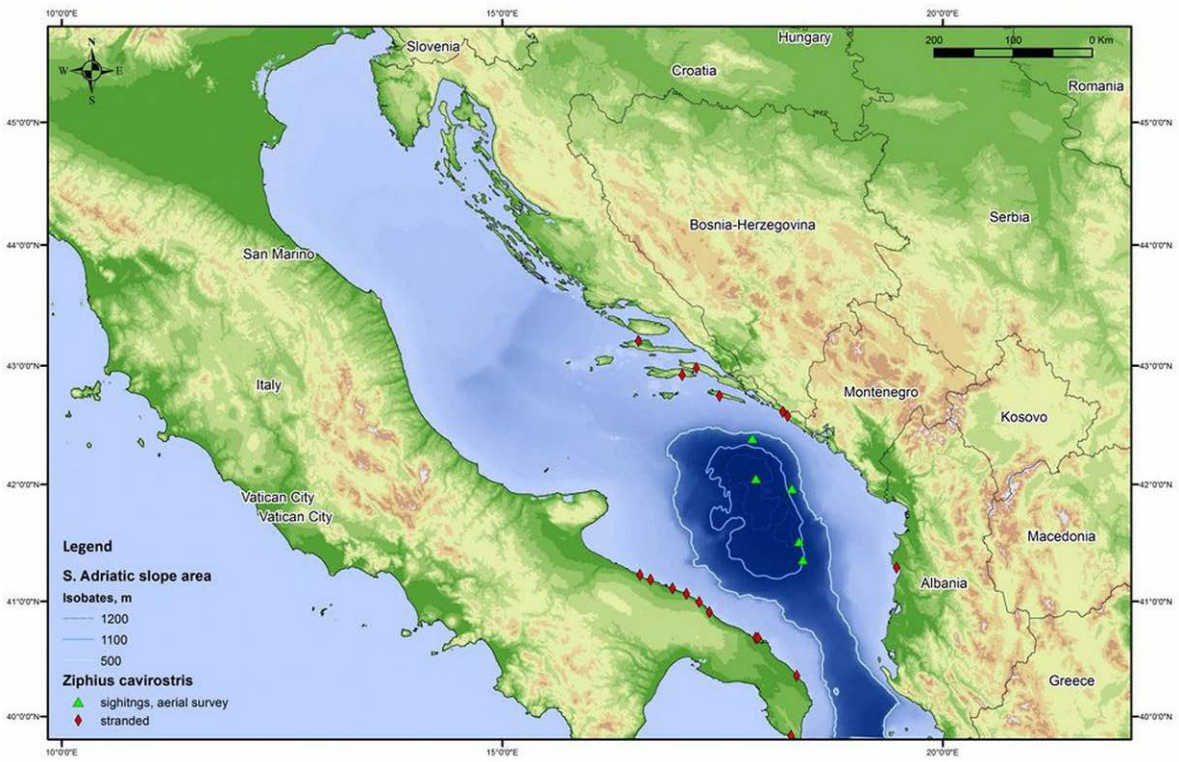

Figure 2.21. Map of strandings (1986-2013) and sightings of Cuvier's beaked whale during the 2010-2013 aerial surveys (source: Drasko Holcer, BWI

2.5.2. Trends in distribution & abundance

Special concern over the status of this species, in relation to the deadly impact of sounds of naval mid-frequency sonars, has been expressed given the occurrence of atypical mass strandings. Additionally, seismic surveys for hydrocarbons and the general increase of sea ambient noise, and its cumulative effects, present additional causes for concern.

2.5.3. Population structure (Unit To Conserve)

No specific information exists on population structure of Cuvier's beaked whales throughout the Mediterranean Sea. The analysis of the genetic diversity of 87 samples obtained worldwide (twelve from the Mediterranean including two from Adriatic) found that mtDNA haplotypes from the Mediterranean Sea were not found elsewhere and were highly distinct from the eastern North Atlantic.

2.5.4. Feeding ecology and behaviour

Cuvier's beaked whale is mainly teuthophagic although fish may also be an important component of their diet. The most common prey in the Mediterranean are oceanic and meso-pelagic or bathy-pelagic cephalopods (Histioteuthidae, Cranchiidae,

Octopoteuthidae).

The analysis of the stomach contents of the Cuvier's beaked whale from the Adriatic Sea revealed similar types of prey. These included: Histioteuthidae (34,7%), Octopoteuthidae (39,1%; not found in the Adriatic), Chiroteuthidae (17,7%), Cranchiidae (8,2%%; not found in the Adriatic) and Sepiolidae (0,2%) occurring in the deep southern Adriatic. Some of the prey found have not been recorded in the Adriatic Sea. This could indicate either a lack of knowledge of the deep living cephalopods of the Adriatic Sea, or some form of migration between Adriatic and the eastern Mediterranean Sea.

The mean group size in the Mediterranean is about 2 individuals. The group size based on five sightings during 2010 aerial surveys in the Adriatic was 3.

2.5.5. IUCN regional status

The Mediterranean subpopulation of the beaked whale is listed as "Data Deficient".

2.6. The fin whale (*Balaenoptera physalus*)

The fin whale is the second largest mysticete on Earth (Fig. 2.22), only the blue whale is larger.

Figure 2.22. Fin whale, central Adriatic (Photo: Caterina Fortuna, ISPRA).

2.6.1. Distribution and abundance

Fin whales in the Mediterranean are most commonly found in deep waters (400-2,500m), but

they can occur on slopes and shelf waters, depending on the distribution of their prey. They favour upwelling and frontal zones and coastal areas with high zooplankton concentrations.

Within the Adriatic Sea most records of this species rely on stranding and sightings of stray individuals scattered around the northern and central Adriatic and some regular seasonal sighting in the central Adriatic likely related to the seasonal presence of prey (Fig. 2.23).

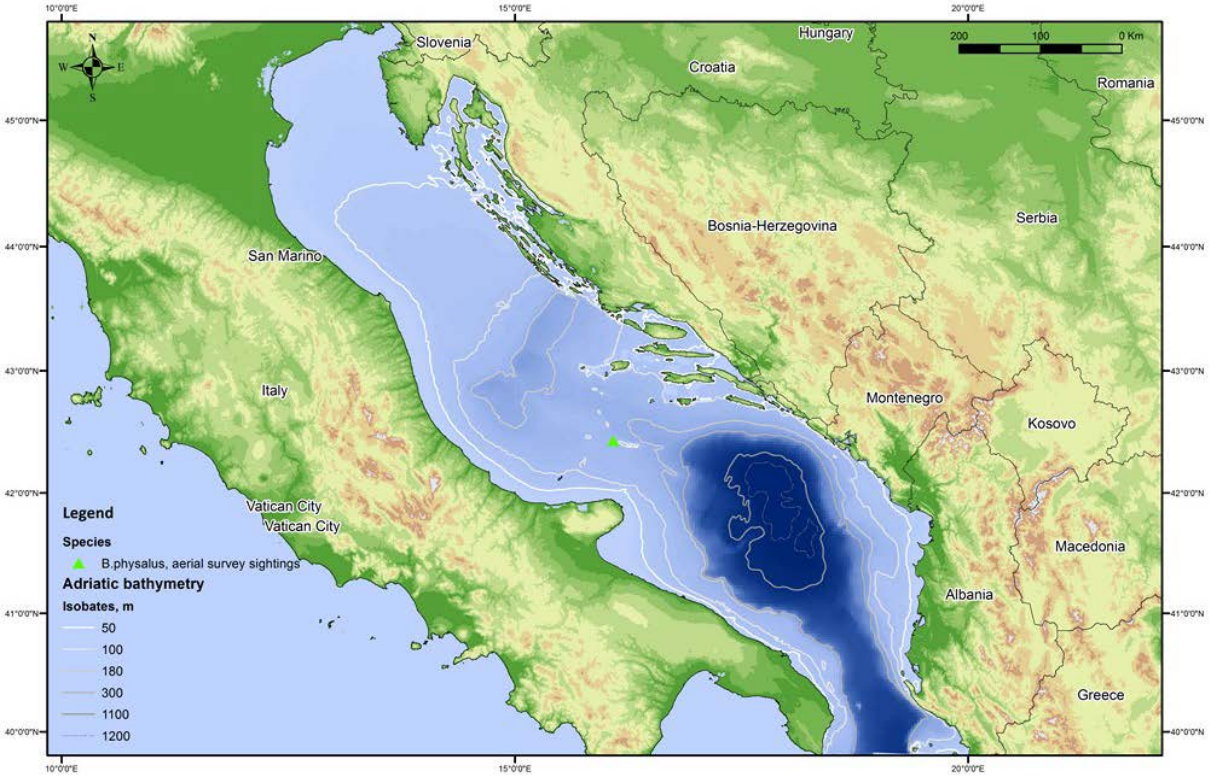

Figure 2.23. Map of sightings of fin whales during the 2010 aerial surveys (source: Drasko Holcer, BWI)

2.6.2. Trends in distribution & abundance

There are no abundance estimates for the fin whale in either the Adriatic Sea or for the eastern Mediterranean.

2.6.3. Population structure (Unit To Conserve)

Genetic analyses indicate that the Mediterranean fin whales are largely resident in the basin, although limited but recurrent gene flow was detected in the samples. According to the IUCN definition for subpopulation (i.e., less than about one migrant/year), the Mediterranean fin whale are considered as sub-population.

The only genetic information available for fin whales frequenting in the Adriatic Sea comes from the analysis of a single specimen that showed an allotype typical from the Ligurian Sea.

2.6.4. Feeding ecology and behaviour

Recent research indicates that fin whales regularly enter the southern and central Adriatic

Sea and their abundance probably depends on the abundance of krill. Large biomass of krill has been recorded in the central Adriatic, particularly in the area of Jabuka pit, but the seasonality of its presence and abundance is unknown. However, observation of fin whales feeding in the vicinity of Vis island and collected faeces indicate that there is a causal connection between fin whales and krill such that the area might have some seasonal importance.

2.6.5. IUCN regional status

The fin whale is listed globally as Endangered. The Mediterranean subpopulation of the fin whale is listed as "Vulnerable" under IUCN (World Conservation Union) criterion C2a(ii). The rationale: "*The Mediterranean subpopulation, which is genetically distinct from Fin Whales in the Atlantic, contains fewer than 10,000 mature individuals. The subpopulation experiences an inferred continuing decline in number of mature individuals. All mature individuals are in one subpopulation. No population estimates exist for the entire region. However, line-transect surveys in 1991 yielded Fin Whale estimates in excess of 3,500 individuals over a large portion of the western Mediterranean, where most of the basin's Fin Whales are known to live. It is reasonable to assume that a realistic estimate for the total basin would not exceed 5,000 individuals, so the threshold of <10,000 mature is easily met. Human-induced mortality from vessel collisions and bycatch in fishing gear (Panigada et al. 2006), together with the potential effects of the disturbance caused by growing whale watching activities, lead to the inference that the subpopulation is declining. Fin Whales have been described as particularly abundant during the summer months in the Corso-Ligurian-Basin, which is considered their major feeding ground in the Mediterranean Sea. A sharp decrease in Fin Whale abundance has been observed in the Pelagos Sanctuary over the last decade, with estimates of 900 individuals reported from the western Ligurian Sea in 1992, declining to significantly lower numbers (N=147; CV=27.04%; 95% CI=86–250) in 2009. While the sharp decrease of Fin Whales in the Pelagos Sanctuary may be due to whales relocating elsewhere within the Mediterranean, their decrease in prime Fin Whale habitat must be addressed with precaution, and a population decline in the Mediterranean cannot be discounted at this time. Fin Whales in the Mediterranean are a subpopulation based on the IUCN definition (less than about one migrant/year; Palsbøll et al. (2004) suggested an estimation of 0.33 migrant/year between Mediterranean and Atlantic). Genetic data from a sample of Fin Whales from the Mediterranean have not provided evidence for within-region population structure (Bérubé et al. 1998); Fin Whales, known as a highly mobile species, are thought to roam widely across the Mediterranean, and the assumption that they form a single subpopulation within the basin is the most parsimonious. Should future research reveal that Fin Whales in the Mediterranean are structured into a western and an eastern subpopulation, this would involve the splitting of the current subpopulation into two even smaller designatable units, possibly subjected to higher levels of vulnerability and threats*".

2.7. The short-beaked common dolphin (*Delphinus delphis*)

The short-beaked common dolphin is a small cetacean species with a world-wide distribution.

2.7.1. Distribution and abundance

It was distributed throughout the Mediterranean Sea and was considered the most abundant

Cetacean species. Currently the abundance is in steep decline throughout the central and eastern Mediterranean with the only notable population remaining in the Alboran sea. The overview of species status and ecology is reviewed in Bearzi *et al.* (2003).

Mediterranean short-beaked common dolphins can be found in pelagic and neritic habitat.

2.7.2. Trends in distribution & abundance

The short-beaked common dolphin was widely present in the Adriatic Sea until the mid-19th century. Numerous records by respected researchers of the time noted the species as the most common in the Adriatic Sea. During the late 1970s a decrease in the numbers and group sizes of short-beaked common dolphins in the Adriatic was noted. During the following years researchers followed the disappearance of the species throughout the northern Adriatic with documented presence of only solitary individuals or small groups since the late 1990s. The role of overfishing, organised culling and habitat degradation are the main reasons for the decline and disappearance from the Adriatic Sea reviewed by Bearzi *et al.* (2004). Due to the lack of information from the central and southern Adriatic the species was listed as data deficient in the Croatian red list, although it was indicated that species could be critically endangered.

The recent aerial surveys of the entire Adriatic Sea in 2010 and 2013 did not yield any sightings of the short-beaked common dolphin leading to a conclusion that species is regionally extinct in the Adriatic Sea.

2.7.3. Population structure (Unit To Conserve)

Within the Adriatic there is not data on the population structure of the short-beaked common dolphin.

2.7.4. Feeding ecology and behaviour

The short-beaked common dolphin feeds mainly on epipelagic and mesopelagic shoaling fish and cephalopods.

2.7.5. IUCN regional status

The Mediterranean subpopulation of the short-beaked common dolphin is listed as "Endangered" under IUCN (World Conservation Union) criterion A2abc (Bearzi 2003).

2.8. The sperm whale (*Physeter macrocephalus*)

The sperm whale is a largest Odontocete inhabiting Mediterranean Sea. Preferred habitats in the Mediterranean are areas of deep continental slope waters.

2.8.1. Distribution and abundance

The occasional occurrence of sperm whales in the Adriatic Sea including 36 strandings is documented on a number of occasions from as early as 1555. Furthermore, this is the only

Cetacean species that had two mass strandings on the Adriatic Sea coast with the latest occurring in September 2011 when a pod of seven male sperm whales stranded near Vasto (central Adriatic).

As deep diving Cetaceans, sperm whales do not have a suitable habitat in the central and northern Adriatic. The southern Adriatic, although deeper, may host animals coming from the Ionian Sea or animals arriving during seasonal migration. The two aerial surveys and a passive acoustic hydrophone survey did not produce any sightings of sperm whales. No estimate of population size exists for the region.

2.8.2. Trends in distribution & abundance

No data on trends in distribution & abundance exist for the region.

2.8.3. Population structure (Unit To Conserve)

The population of the Mediterranean is genetically distinct.

2.8.4. Feeding ecology and behaviour

The sperm whale feeds almost exclusively on mesopelagic cephalopods.

2.8.5. IUCN regional status

The Sperm whale is listed as Vulnerable at the global level. The Mediterranean subpopulation is listed Endangered C2a(ii) according to the following rational: "*1) The Mediterranean subpopulation, which is genetically distinct, contains fewer than 2,500 mature individuals. 2) The subpopulation experiences an inferred continuing decline in numbers of mature individuals. 3) All mature individuals are in one undivided subpopulation. 4) Although no past or present abundance estimate is available for the entire range of the subpopulation, some data are available for limited areas within the region. Lewis et al. (2007) estimated overall abundance of sperm whales in the Ionian Sea to be 62 animals (95% CI = 24–165), and zero animals in the Strait of Sicily. By contrast, results from a survey of a large portion of the western basin (from Gibraltar to Sicily and bounded on the north by a line from the Balearics east to Sardinia) in Summer 2003 indicate a Sperm Whale detection rate roughly eight times that in the Ionian Sea. This suggests that Sperm Whale numbers are higher in the western basin than in the Ionian Sea; however, considering that the overall surveyed area by Lewis et al. (2007) is a large portion of the Sperm Whale habitat in the Mediterranean, and that recent surveys made in the remaining portion have not revealed the existence of very high concentrations of sperm whales there (Song of the Whale Team – IFAW 2007), it is suggested that overall Sperm Whale numbers in the Mediterranean are likely to be only in the low to mid hundreds. Concerning the number of mature individuals, if data from the Hellenic Trench (see the 'Population' section) can be extrapolated to the entire region, only 45% of the total present-day Mediterranean subpopulation is mature. In other parts of the world this value can be as high as 85%. Those two extremes would require the total number of Sperm Whales to be either 2,950 (if 85% are mature) or 5,555 (if 45%) if there were to be 2,500 or more mature individuals. Given present knowledge, it is unlikely that there are enough Sperm Whales in the region to infer a number of mature individuals anywhere near 2,500. 5) The Mediterranean subpopulation is subject to a number of threats that can result in direct mortality. These include bycatches in fishing gear*

(especially drift gillnets, still extensively used in the central and eastern Mediterranean, whether legally or illegally) and ship strikes. In addition, the subpopulation may be affected by disturbance, particularly related to intense maritime traffic. It is suspected that a combination of these factors has led to a decline (of unknown magnitude) over the last half-century and it is inferred that, in the absence of effective management to mitigate the ongoing threats, the population decline is continuing. 6) Genetic data from a sample of Sperm Whales across the Mediterranean have not provided evidence for within-region population structure. Sperm Whales are thought to roam widely across the Mediterranean, and it is parsimonious to assume that they form a single subpopulation within the basin".

2.9. Rare species that occurred in the region during the past 50 years

2.9.1. The humpback whale (Megaptera novaeangliae)

The humpback whale is a rare species in the Mediterranean Sea. Only on two occasions was it reported in the Adriatic Sea. The first occurrence was of a 10 m long humpback whale reported off Senigallia, Italy, in August 2002. The second sighting occurred in the Piran bay in 2009 where the animal remained for almost three months.

2.10. Historical and current knowledge on sea turtle species' presence in the Adriatic Sea

Editors: Paolo Casale & Drasko Holcer

Three sea turtle species occur in the Adriatic Sea: the leatherback turtle (*Dermochelys coriacea*), the green turtle (*Chelonia mydas*) and the loggerhead turtle (*Caretta caretta*).

2.10.1. The leatherback turtle (Dermochelys coriacea) in the Adriatic Sea

Figure 2.24. Leatherback turtle tagged in Gabon (Photo: Paolo Casale)

Based on a review paper by Lazar and colleagues (2008) the leatherback turtle (Fig. 2.24) appears rather rare in the area, with 30 individuals recorded in the whole Adriatic since 1894.

2.10.1. The Green turtle (Chelonia mydas) in the Adriatic Sea

The green turtle (Fig. 2.25) is reported in similar low numbers (since 1830) but, since it may be confused with the loggerhead turtle, its presence is likely to be underestimated. In a recent 3-yr survey in a small area (Drini Bay, Albania) there were five green turtles reported in comparison to 402 loggerhead turtles (ratio 1:80; please note that a new still unpublished study by HAS with a bigger sample size indicates a higher incidence of green turtles in the southern Adriatic). Although most records of these two species were from the south Adriatic, this limited number of records does not allow any identification distribution patterns. Moreover, before the NETCET project, green turtles have never been tracked in the Adriatic.

Figure 2.25. Green turtle (Photo: Idriz Haxhiu, HAS)

2.10.2. The loggerhead turtles (Caretta caretta) in the Adriatic Sea

The most abundant sea turtle species in the Adriatic Sea is the loggerhead turtle (Fig. 2.26). Limited breeding occurs in the Adriatic, which is however frequented by high numbers of loggerhead turtles, as evidenced by stranding and bycatch records, and the area is recognised as one of the most important foraging areas for the species in the Mediterranean. Therefore, basically all the individuals frequenting the Adriatic Sea have moved from other places. Genetic markers indicate that the main origin of these animals is Greece from which they probably disperse into the Adriatic in the first period of life, as suggested by post-hatchling dispersal simulations or later from the Ionian, as suggested by capture-mark-recapture data. The Greek origin of these turtles is supported by the movements of individual adults between breeding areas in Greece and foraging grounds in the Adriatic, recorded through capture-mark-recapture and satellite tracking. Turkey and Cyprus are the origin of a lower number of turtles. Samples from animals by-caught in mid-water trawlers operating

mostly in the northern Adriatic showed five haplotypes. Three of these, representing 95% of the sample, were shared with eastern Mediterranean nesting and Atlantic populations and two of still unknown origin.

Figure 2.26. Loggerhead turtle in the central Adriatic Sea (Photo: A.Žuljević, IOR)

2.10.3 The loggerhead turtle movements in the Adriatic Sea

Three types of movement pattern have been observed in the Adriatic so far:

(1) The most obvious is the adult breeding migration from foraging to breeding grounds and vice-versa.

(2) A less obvious pattern, but with a growing body of evidence, is seasonal migration. Satellite tracking of both adults and juveniles indicate southward movements from the northern Adriatic when temperatures fall in the cold season. This is also indicated by a lower occurrence of turtles in this area during winter. However, there is evidence from bycatch and stranding records that at least some loggerhead turtles frequent the wider north Adriatic area also in winter. Moreover, one satellite-tracked turtle was observed in the northernmost part of the Sea (Gulf of Trieste) that is the coldest part of the Mediterranean and its low winter temperatures (below 11–12°C) were thought to induce turtles to leave this area and migrate to the south. The capacity of

loggerhead turtles to maintain some level of activity in comparable, or somewhat higher thermal conditions, is known at minimum of 11.8°C.

(3) A third type of movement is the erratic pattern, with turtles wandering around areas of various size, even as large as part of the Adriatic.

In spite of the relatively high number of tracks available, with some showing individual fidelity to specific areas, these are still too low to identify sub-areas with higher turtle occurrence. However, for both breeding and seasonal migrations, most of the observed routes were along the west and east Adriatic coasts, suggesting that these may be considered as migratory corridors. Regarding non-migrating turtles, information is even more uncertain. Bycatch data indicate higher numbers in the north-east part than the north-west part. Two relatively small highly frequented areas were recently identified in the north-east (Goro) and south-west Adriatic (Gulf of Manfredonia).

2.10.4. NETCET data on sea turtles

NETCET provided new data on sea turtles through a number of Actions, particularly, the aerial survey, satellite tracking and standings data.

2.10.5. NETCET Aerial survey data

Figure 2.27 shows two maps of the pattern of distribution and relative density of sea turtles recorded during the NETCET 2013 aerial survey. The northern Adriatic, known as one of the main feeding ground in the Mediterranean, shows higher densities of sea turtles.

Density and abundance estimates obtained from the aerial survey data are presented in Table 2.12.

Table 2.12 - Conventional Distance Sampling estimates for the sea turtles (2013 data; uncorrected for availability and perception bias)

Species	Stratum	Density of groups (CV; 95% LF)	Density of animals (CV; 95% LF)	Total abundance (CV; 95% LF)
Sea turtles	Adriatic Sea	0.240 (15%; 0.177-0.325)	0.243 (15%; 0.179-0.329)	31,051 (15%; 22,925-42,506)

Note: these estimates are to be considered as minimum estimates, since they are uncorrected for availability and perception bias. Corrections could more than double these numbers.

Since loggerhead and green turtles can be confused from an aerial observation, this abundance estimate may actually include green turtles. However, green turtle reports in the Adriatic are few (see above) and even where green turtles have been found more common (Albania) the recorded loggerhead/green turtle ratio was in the range of 80:1. Therefore it is unlikely that the loggerhead abundance estimation by aerial survey is significantly affected by the possible inclusion of green turtles among the observed turtles. Based on the existing data (published and unpublished) we believe that the potential proportion of green turtles in our estimate will not exceed 2%.

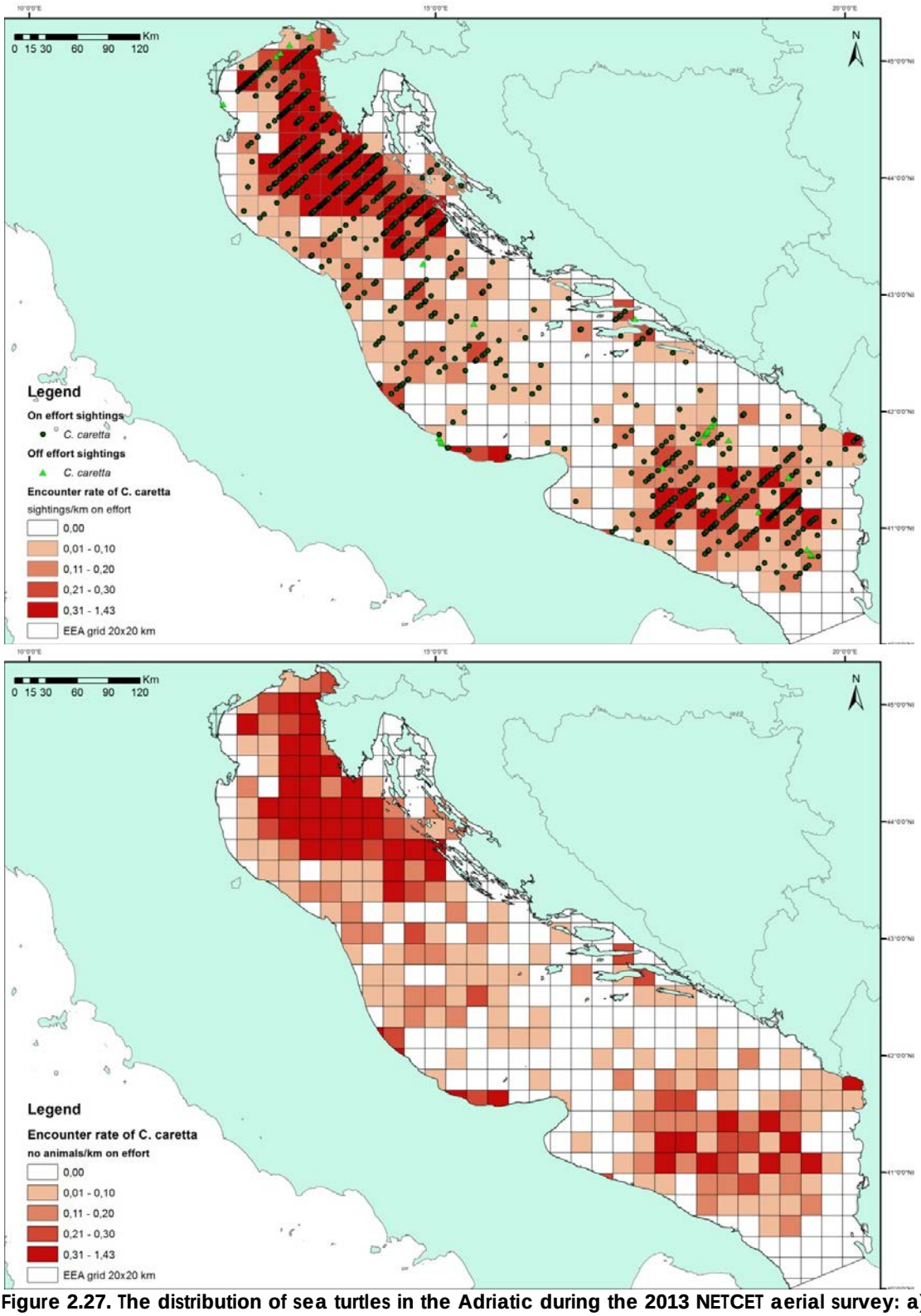

Figure 2.27. The distribution of sea turtles in the Adriatic during the 2013 NETCET aerial survey: a) relative density of encounters (group/linear km of effort) and relative density of animals (No. of animals/linear km of effort) over a 400 km² cell grid.

2.10.6. NETCET satellite tracking data (preliminary data)

Plesea, note that this section and its figures are still preliminary and will be updated before the end of the NETCET project.

The University of Primorska and WWF Italia, in collaboration with the BWI, has tracked 20 loggerhead turtles and 3 green turtles marked with satellite tags (Fig. 2.28). Another 2 will be tracked soon.

Figure 2.28. Two green turtles tagged within NETCET in Albania (Photo: *Idriz Haxhiu, HAS*)

Preliminary maps of the current movements of some of the loggerhead turtles are shown in Fig. 2.29 these can be found on the website (www.seaturtle.org) in the webpage dedicated to the NETCET project (http://www.seaturtle.org/tracking/index.shtml?project_id=1021). Figure 2.30 show the movements of one green turtle tagged in Albania.

These maps are still preliminary, as ten tags are still transmitting and additional 2 tags will be attached to new animals. Based on data gathered by the longer lasting tags, new indications on the movement patterns of loggerhead turtles are expected to be generated by the NETCET project. This insight has an important potential for shaping management advice throughout the Adriatic Sea. Previous studies and these preliminary results show high individual variability which makes a large sample size necessary for obtaining general patterns from satellite tracking data. The project was designed to obtain spatial information about small and large size classes in both summer and winter that complements aerial survey data.

Plesea, note that this section and its figures will be updated before the end of the NETCET project.

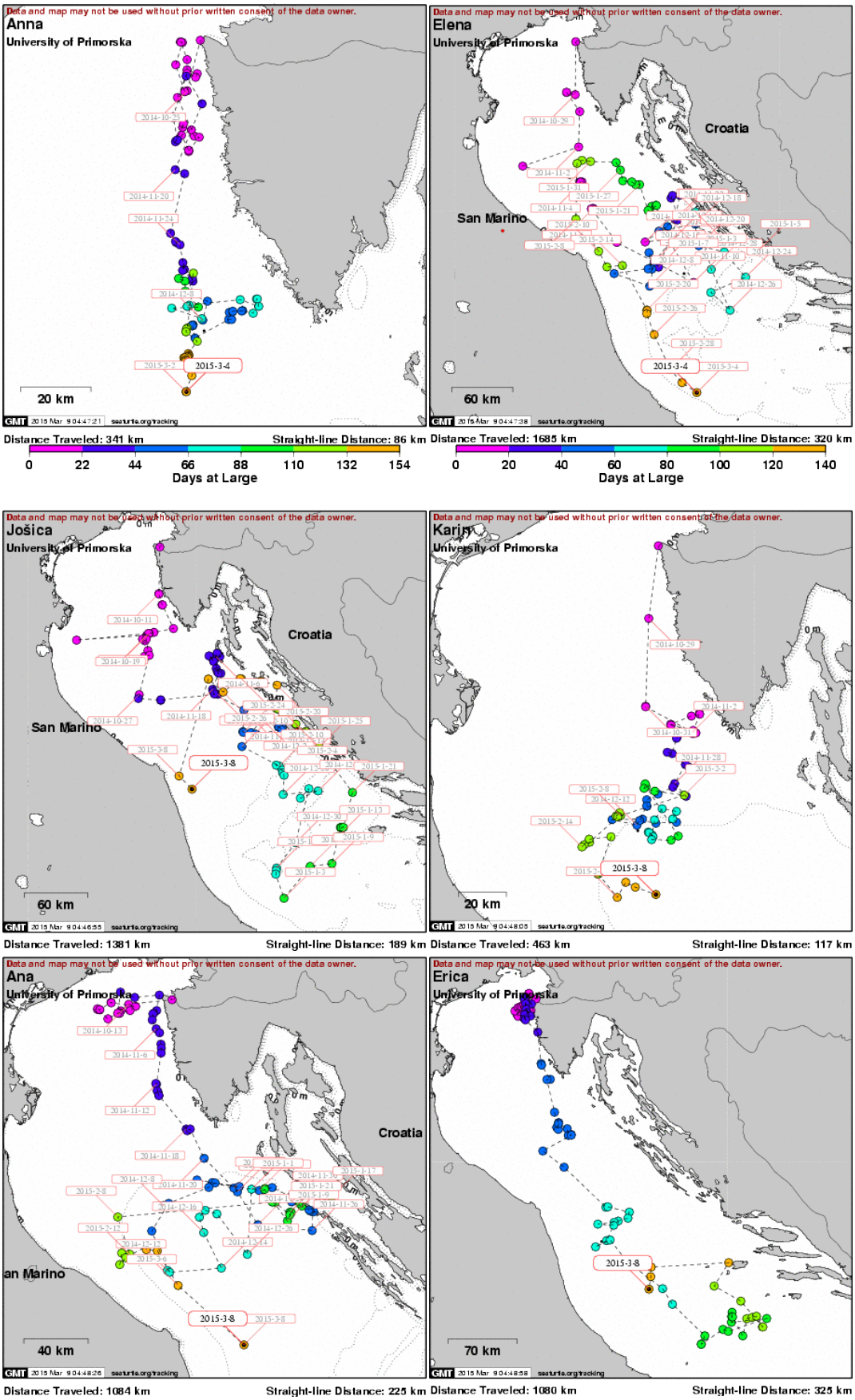

Figure 2.29. Maps of movements of six loggerhead turtles tagged by NETCET (Source: www.seaturtle.org)

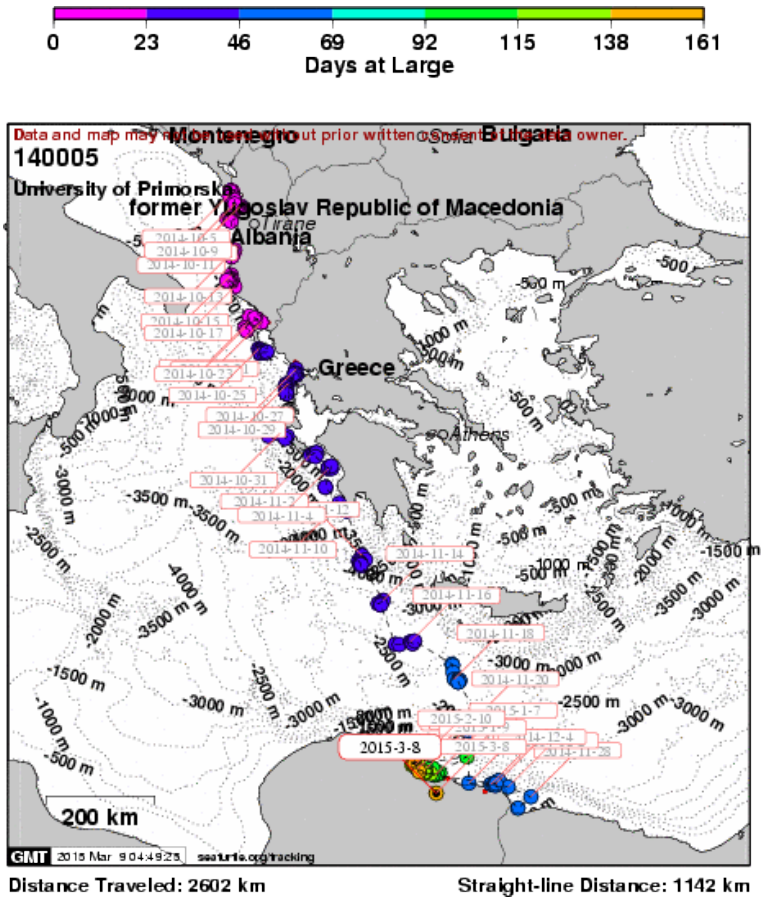

Figure 2.30. Map of movements of one green turtle tagged within NETCET

2.10.7. NETCET stranding data on turtles

Within the project framework activities aimed at increasing the knowledge on mortality in cetaceans and sea turtles through collection and autopsy of stranded animals have been carried out. The cumulative results of all project partners are presented in Table 2.13.

Table 2.13 – NETCET data on loggerhead turtles

Beneficiary		Total	Dead	Alive
LB	COV (Vento and Padova)	33	86	5
FB1	UPD	0	0	0
FB2	COP	65	57	8
FB3	CF (Emilia Romagna & Marche)	252	224	28
FB5	SINP	26	18	8
FB6	BWI	1	0	1
FB7	HAS	5	3	2
FB8	APAWA	0	0	0
FB9	IMB	3	2	1
FB10	UPR	11	11	0
FB11	WWF	75	64	10
FB12	MEC	5	1	4
	TOTAL	*476*	*466*	*67*

2.11. Conservation status

2.11.1. IUCN listing of the green turtle

The green turtle is listed as Endangered given the following rationale: "*Analysis of historic and recent published accounts indicate extensive subpopulation declines in all major ocean basins over the last three generations as a result of overexploitation of eggs and adult females at nesting beaches, juveniles and adults in foraging areas, and, to a lesser extent, incidental mortality relating to marine fisheries and degradation of marine and nesting habitats. Analyses of subpopulation changes at 32 Index Sites distributed globally [...] show a 48% to 67% decline in the number of mature females nesting annually over the last 3–generations*".

2.11.2. IUCN listing of the loggerhead turtle

The loggerhead turtle is listed globally as Endangered by the IUCN. The rationale for the listing is not available in full, but it was based on a global population decline.

Chapter 3 - Policy and legislative framework relevant to cetacean and sea turtle conservation in the Adriatic sea

Editors: Ana Maricevic, Jasna Jeremić, Caterina Fortuna, Ana Srebenac

3.1. Policy and legislative framework relevant to cetacean and sea turtle conservation in the Adriatic sea

This chapter summaries some of the main aspects of the policy and legislative framework relevant to cetacean and sea turtle conservation in the Adriatic sea. It is not meant to be an exhausting overview of all policy documents, legislations and institutional frameworks, but it focuses on the main aspects in relation to the perceived high priority threats to Adriatic species.

3.1.1. International legislation on environmental protection relevant to cetacean and sea turtle species conservation, including those targeting anthropogenic activities

International treaties generally can be defined as all types of written and oral compliant statements of least two subjects of international Act (contracting parties) that the relevant entities intend to cause effects provided by international Act (Ibler, 1987).

The International community has recognised necessity to ensure conservation of nature and biodiversity, including cetaceans and sea turtles, through the protection of species and their habitats. In this respect, eight international conventions and agreements, with associated protocols, were enforced. Their scope ranges from an overall approach (e.g. CBD) to various mechanisms for the conservation of species and habitats (e.g. the European Habitats Directive that includes strict protection of species and the establishment of protected areas) and supporting environmental protection mechanisms (e.g. Environmental Impact Assessment frameworks).

Within this framework, there are also number of conventions, agreements and associated protocols addressing a range of human activities that have potential to affect cetaceans and sea turtles. This is an obvious consequence of the fact that is usually more effective to manage human activities rather than nature and marine biodiversity. These legislative frameworks pertain fisheries, marine traffic, pollution related activities, climate change and environmental impact assessments.

The species of interest for the NETCET project are considered migratory in the broad sense, as they move between borders. Their ranging patterns can vary from a few hundred kilometres to several thousand. Hence the *Convention on Migratory Species* (CMS; Bonn, 1979) should play a strong role in the region. In addition the CMS fosters regional agreements for species that have an unfavourable conservation status or would benefit from international cooperation, which are listed under Appendix II. In this context and for the concern of

cetacean species only in the Adriatic Sea the *Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area* (ACCOBAMS; Monaco, 1996) is of utmost importance.

See Table 3.1 for full details on the variable degree of adherence to these legislative frameworks among the Adriatic countries.

Table 3.1 - International conventions, related agreements, protocols and management bodies relevant to cetacean and sea turtle species conservation in the Adriatic countries

		Signatures and Ratifications					
Convention	**Agreements/Protocols/relevant bodies**	**IT**	**SLO**	**HR**	**BiH**	**MN**	**AL**
International Convention for the Regulation of Whaling (ICRW; Washington, 1946; http://iwc.int)		12/02/1998	20/09/2006	10/01/2007	/	/	/
- Cetaceans	*International Whaling Commission (IWC)*	The main duty of the IWC is conducting of whaling throughout the world. These measures, among other things, provide for the complete protection of certain species; designate specified areas as whale sanctuaries; set limits on the numbers and size of whales which may be taken; prescribe open and closed seasons and areas for whaling; and prohibit the capture of suckling calves and female whales accompanied by calves.					
Convention on International Trade in Endangered Species of Fauna and Flora (CITES; Washington, 1973; www.cites.org)		31/12/1979	23/04/2000	12/06/2000	21/04/2009	03/06/2006	25/09/2003
Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979; http://www.coe.int)		01/06/1982	01/01/2000	01/11/2000	01/03/2009	01/02/2010	01/05/1999
Convention on the Conservation of Migratory Species of Wild Animals (CMS; Bonn, 1979; www.cms.int)		01/11/1983	01/02/1999	01/10/2000	/	01/03/2009	01/09/2001
- Cetaceans	Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS; Monaco, 1996; www.accobams.org)	01/09/2005	01/12/2006	01/06/2001	/	01/08/2009	01/10/2001
	ACCOBAMS Permanent Secretariat	*ACCOBAMS is a cooperative tool for conservation of cetaceans in the Mediterranean and Black seas and contiguous Atlantic area. The Permanent Secretariat assists countries in implementing the Agreement.*					
International Convention on Load Lines (London, 1966)		*Member*	*Member*	*Member*	/	*Member*	*Member*
Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972		*Member*	*Member*	*Member*	/	*Member*	*Member*
International Convention for the Prevention of Pollution from Ships (MARPOL) (London, 1973/1978) (http://www.imo.org)		*Member*	*Member*	*Member*	/	*Member*	*Member*
- Shipping	International Maritime Organization (IMO)	As a specialized agency of the United Nations, IMO is the global standard-setting authority for the safety, security and environmental performance of international shipping. Its main role is to create a regulatory framework for the shipping industry that is fair and effective, universally adopted and universally implemented.					
United Nations Convention on the Law of the Sea (1982; www.un.org/depts/los/convention_agreements/texts/unclos/closindx.htm)		13/01/1995	16/06/1995	05/04/1995	12/01/1994	23/10/2006	23/06/2003
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989) (http://www.basel.int)		22/03/1989	07/10/1993	09/05/1994	16/03/2001	23/10/2006	29/06/1999
Convention on Biological Diversity (CBD; Rio de Janeiro, 1992; www.cbd.int)		14/07/1994	29/12/1993	07/10/1996	26/08/2002	03/06/2006	05/04/1994
United Nations Framework Convention on Climate Change (UNFCCC) (New York, 1994) (http://unfccc.int/2860.php)		14/07/1994	29/02/1996	07/07/1996	06/12/2000	21/01/2007	01/01/1995
Kyoto Protocol (1997)		16/02/2005	16/02/2005	28/08/2007	15/07/2007	02/09/2007	30/06/2005

Table 3.1 - (continued) - International conventions, related agreements, protocols and management bodies relevant to cetacean and sea turtle species conservation in the Adriatic countries

		Signatures and Ratifications					
Convention	**Agreements/Protocols/relevant bodies**	**IT**	**SLO**	**HR**	**BiH**	**MN**	**AL**
General Fisheries Commission for the Mediterranean (GFCM; Rome 1952; www.gfcm.org/)		*Member*	*Member*	*Member*	/	*Member*	*Member*
- Fisheries	General Fisheries Commission for the Mediterranean (FAO-GFCM)	The purpose of the GFCM is to promote the development, conservation, rational management and best utilization of living marine resources, as well as the sustainable development of aquaculture in the Mediterranean, Black Sea and connecting waters.					
Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks (1995)		19/12/2003	15/06/2006	10/09/2013	/	/	/
Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona 1995; www.unepmap.org)		09/07/2004	28/11/2002	08/10/1991	22/10/1994	19/12/2007	26/10/2001
- Protected areas - Biodiversity	*United Nations Environment Programme (UNEP) / Mediterranean action plan (MAP)*	The MAP Coordinating Unit is the Secretariat of the Mediterranean Action Plan. It performs diplomatic, political and communications roles, supervising the main MAP components (six Regional Activity Centres) and organizes major meetings and programmes.					
	Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (Barcelona, 1994 and Monaco 1995) – A Barcelona Convention Protocol	17/06/1999	29/11/2002	12/05/2002	/	19/12/2007	26/10/2001
	RAC/SPA	The Regional Activity Centre for Specially Protected Areas (RAC/SPA) was established by the Contracting Parties to the Barcelona Convention and its Protocols in order to assist Mediterranean countries in implementing the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean.					
- Pollution - CZM	*Protocol for the protection of the Mediterranean Sea against Pollution Resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and its Sub-Soil (Madrid 1994)*	14/10/1994	10/10/1995	14/10/1994	/	/	24/03/2011
	Protocol for protection of the Mediterranean Sea against Pollution From Land-Based Sources and Activities (Syracuse 1996)	11/05/2008	11/05/2008	11/05/2008	22/10/1994	11/05/2008	11/05/2008
- Pollution - Shipping	*Protocol for the Prevention and Elimination of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft (Barcelona 1976)*	03/02/1979	16/09/1993	12/06/1992	22/10/1994	/	30/05/90
	Protocol Concerning Cooperation on Preventing Pollution from Ships and, in Cases of Emergency, Combating Pollution of the Mediterranean Sea (Malta 2002)	25/01/2002	17/03/2004	17/03/2004	/	19/12/2007	16/11/2000
	Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal (Izmir, 1996)	01/10/1996	/	/	/	18/01/2008	18/01/2008
- CZM	*Protocol on Integrated Coastal Zone Management in the Mediterranean (Barcelona 2008)*	21/01/2008	24/03/2011	28/02/2013	/	08/02/2012	24/03/2011
Convention on Persistent Organic Pollutants (Stockholm, 2001) (http://chm.pops.int)		23/05/2001	04/05/2004	30/01/2007	30/03/2010	31/03/2011	04/10/2004

Table 3.1 - (continued) - International conventions, related agreements, protocols and management bodies relevant to cetacean and sea turtle species conservation in the Adriatic countries

		Signatures and Ratifications					
Convention	**Agreements/Protocols/relevant bodies**	**IT**	**SLO**	**HR**	**BiH**	**MN**	**AL**
Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991; www.unece.org/env/eia/)		*19/01/1995*	*05/08/1998*	*08/07/1996*	14/12/2009	/	*04/10/1991*
	United Nations Economic Commission for Europe (UNECE)	The United Nations Economic Commission for Europe (UNECE) was set up in 1947 by United Nations Economic and Social Council. UNECE's major aim is to promote pan-European economic integration. To do so, it brings together 56 countries located in the European Union, non-EU Western and Eastern Europe, South-East Europe and Commonwealth of Independent States (CIS) and North America. All these countries dialogue and cooperate under the aegis of UNECE on economic and sectoral issues.					
- EIA, SEA	*Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context (Kiev, 2003)*	21/05/2003	23/04/2010	06/10/2009	21/05/2003	02/11/2009	02/12/2005

3.1.2. EU legislation

Three Adriatic countries - Italy, Slovenia and Croatia - are members of the European Union (EU MS). Montenegro is an EU candidate country and its accession negotiations started on 29 June 2012. Albania is also a candidate country, but negotiations have not stated yet. Accession countries, with the help of the European Commission, need to engage into all necessary processes to harmonise their national legislations with the EU legislation. Given this, at the present about 87% of Adriatic waters are under the EU jurisdiction. This fact and ongoing accession processes give a strong leverage to the existing European legislation.

There are two types of EU legislative acts: Directives and Regulations. Directives are acts that require EU MS to emit one or more national legislative acts reflecting what therein contained. In essence they need a national legislative transposition that cannot be less restrictive. Directives are usually used in areas for which the European Union has shared competence with EU MS (e.g. Environment, Research, Transport, etc.). Regulations are legislative acts equal to national laws. Once published on the Official Gazette they are mandatory for all EU MS and do not require any additional national law. Regulations are used for areas where the European Union has exclusive competence (e.g. Fishery and Commerce).

There are a number of EU Directives and Regulations relevant for conservation of cetaceans and sea turtles in the Adriatic region, including those regulating human activities that can have an impacts on these species (e.g. fisheries, maritime traffic and pollution; Tab. 3.2).

The Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) is the one of the most important. Its main aim is to ensure favourable conservation status of some 220 habitats and approximately 1000 species of European interest, listed in the directive's Annexes. In this respect, Directive stipulates setting up of a network of protected sites - NATURA 2000 - across the European Union, together with obligation to implement adequate management of the network. It also introduces appropriate assessment mechanism.

A very important regulation is Council Regulation (EC) No 812/2004 of 26 April 2004 laying down measures concerning incidental catches of cetaceans in fisheries and amending Regulation (EC) No 88/98 which pursues a double objective. This Regulation introduces for the Mediterranean Sea an on board monitoring system for mid-water/pelagic trawlers to obtain information on by-catches of cetaceans.

Table 3.2 shows some of the main EU legislation acts relevant to cetaceans and sea turtles conservation.

Table 3.2 - Main EU legislation relevant for conservation of cetaceans and sea turtles in the Adriatic region (http://eur-lex.europa.eu/advanced-search-form.html?locale=en)

CONSERVATION OF SPECIES AND THEIR HABITATS, INCLUDING TRADE
Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.
Directive 2008/56/EC of the European Parliament and of the Council establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).
Council Directive 1999/22/EC of 29 March 1999 on the keeping of wild animals in zoos.
Council Regulation (EEC) No 348/81 of 20 January 1981 on common rules for imports of whales or other cetacean products.
Council Regulation (EC) No 338/97 of 9 December 1996 on the protection of species of wild fauna and flora by regulating trade therein.
Regulation (EC) 1332/2005 on the protection of species of wild fauna and flora by regulating trade therein (CITES).
ENVIRONMENTAL ASSESSMENT
Environmental Impact Assessment (EIA) Directive (85/337/EEC).
Strategic Environmental Assessment (SEA) Directive (2001/42/EC).
FISHERIES
Council Regulation (EC) No 1967/2006 of 21 December 2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea, amending Regulation (EEC) No 2847/93 and repealing Regulation (EC) No 1626/94.
Council Regulation (EC) No 812/2004 of 26 April 2004 laying down measures concerning incidental catches of cetaceans in fisheries and amending Regulation (EC) No 88/98.
Council Regulation (EC) No 520/2007 of 7 May 2007 laying down technical measures for the conservation of certain stocks of highly migratory species and repealing Regulation (EC) No 973/2001.
Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC.
MARITIME TRAFFIC
Council Regulation (EC) 2978/94 of 21 November 1994 on the implementation of IMO Resolution A.7478189 on the application of tonnage measurement of ballast species in segregated ballast oil tankers.
Directive 2002/59/EC of the European Parliament and of the Council of 27 June 2002 establishing a community vessel traffic monitoring and information system and repealing council Directive 93/75/EEC.
Directive 2002/84/EC of the European Parliament and of the Council of 5 November 2002 amending the Directives on maritime safety and the prevention of pollution from ships.
Regulation (EC) No 782/2003 of the European Parliament and of the Council of 14 April 2003 on the prohibition of organotin compounds on ships.
POLLUTION
Council Directive 75/442/EEC of 15 July 1975 on waste.
Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources as amended by Regulations 1882/2003/EC and 1137/2008/EC (Nitrates Directive).
Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (Water Framework Directive).

3.1.3. Institutional arrangements: regional institutions and organisations

International organisations relevant to conservation of cetaceans and sea turtles in Adriatic region are intergovernmental organisation (IGOs), managing global or regional nature conservation agreements (e.g. ACCOBAMS, GFCM, IMO), international NGOs (e.g. IUCN and WWF International) and regional consortia/permanent projects (e.g. ADRIAMED, MedPAN) (Tab 3.3). See Tables 3.1 and 3.2 for more details on these institutional arrangements. In general, organisational structures of conventions and agreements include secretariats, scientific and technical committees and meetings of the Parties. The European Commission

also plays important role for environmental and other sectors policies in member states and beyond. Several non-governmental organisations are active in the Mediterranean region, including IUCN and WWF International.

Table 3.3 - Other International bodies, organisations and consortia relevant to cetaceans and sea turtle conservation

Topic	Body	Description & competence
IGOs		
- Research	Mediterranean Science Commission (CIESM)	The CIESM support a network of several thousand marine researchers, applying the latest scientific tools to better understand, monitor and protect a fast-changing, highly impacted Mediterranean Sea. Structured in six committees and various taskforces, CIESM runs expert workshops, collaborative programs and regular congresses, delivering authoritative, independent advice to national and international agencies.
- Research	Centre for Maritime Research and Experimentation (CMRE)	It is an executive body of NATO's Science and Technology Organization (STO) along with the NATO Collaboration Support Office. CMRE conducts relevant, state-of-the-art scientific research in ocean science, modelling and simulation, acoustics and other disciplines.
EU bodies		
- Environment	EU – EC/The Directorate-General for the Environment (DG Environment)	European Commission's department responsible for development and coordination of implementation of the EU environmental policies. It consists from 6 directorates: Green Economy; Natural Capital; Quality of Life, Water & Air; Implementation, Governance and Semester; Global & Regional Challenges, LIFE; Strategy. Under directorate named Natural Capital is the Biodiversity Unit that deal with protection of biodiversity which aim is halting biodiversity loss within the EU by 2020.
- Shipping - Fisheries	EU-EC/The Directorate-General for Maritime Affairs and Fisheries (DG MARE)	European Commission's department responsible for the implementation of the Common Fisheries policy and of the Integrated Maritime Policy. DG MARE is made up of six Directorates dealing with all aspects of both policies, including among others conservation, control, market measures, structural actions and international relations relating to fisheries.
NGOs		
- Nature conservation	International Union for Conservation of Nature - Centre for Mediterranean Cooperation (IUCN-Med)	The IUCN Centre for Mediterranean Cooperation goals are: a) Making knowledge, information and experience available regarding the conservation and management of Mediterranean biodiversity and natural resources for sustainable-use and rehabilitation efforts; b) Strengthening and supporting IUCN members and Commissions in the region to mainstream social, economic and environmental dimensions in policy-making, management, and the conservation of biodiversity and natural resources; c) Promoting, both globally and regionally, Mediterranean policies on conservation and sustainable development, and supporting mechanisms for their implementation.
- Nature conservation	World Wide Fund for Nature - Mediterranean Programme Office (WWF MedPO)	The WWF Mediterranean Program's goal is to conserve and restore the natural wealth of the Mediterranean and promote the sustainable use of natural resources. The Programme focuses primarily on the conservation of forest, freshwater and marine ecosystems, promoting the establishment of protected areas and resource use practices to maintain biodiversity and ecological functions that support human needs and livelihoods. Geographic focus is on the Southern and Eastern Mediterranean ecoregions.
Consortia		
- MPAs	Network of Managers of Marine Protected Areas in the Mediterranean (MedPAN)	The MedPAN network acts to build the capacity of MPA managers around the Mediterranean basin through the exchange of best practice and the development of tools for the management of MPAs. MedPAN also contributes to the establishment of a representative and coherent ecological network of MPAs, which is a step beyond the more traditional approach of designing MPAs as single independent entities.
- Nautical tourists awareness	European Boating Association (EBA)	EBA aims to ensure boat users are informed and consulted about EU legislation and to make their views known to relevant European Institutions.
- Nautical tourists awareness	European Boating Industry	European Boating Industry represents the interests of the European leisure marine industry and its members. European Boating Industry monitors and informs its members about all relevant developments at EU level which can affect positively or negatively the European boating industry.

3.1.4. Regional Biodiversity Strategies and Species Conservation Plans: background documents on biodiversity relevant policy biodiversity

This section summarises the characteristics of relevant European and Mediterranean strategies on biodiversity and species conservation plans.

The *Strategic Plan for Biodiversity 2011-2020*, adopted in the scope of Convention on Biological Diversity (CBD), provides an overarching approach to ensure biodiversity conservation at global level. It is comprised of a shared vision, a mission, strategic goals and 20 targets, collectively known as the Aichi Targets. The Strategic Plan serves as a flexible framework for the establishment of national and regional targets.

In 2011, the *Pan-European 2020 Strategy for Biodiversity* was endorsed by pan-European countries. This Strategy refocuses efforts to prevent further loss of biodiversity in the pan-European region and undertake the main actions to be taken in order to implement the previous mentioned Strategic Plan for Biodiversity 2011-2020 and to reach the Aichi Targets.

The *EU Biodiversity Strategy to 2020* was adopted in 2011 by European Commission, taking into account globally set Aichi targets. The aim is to halt the loss of biodiversity and improve the state of Europe's species, habitats, ecosystems and the services they provide over the next decade, while stepping up the EU's contribution to averting global biodiversity loss. It focuses on six major targets to address the main pressures on nature and ecosystem services in the EU and beyond, and lays down the policy foundations for EU-level action over the next ten years[3].

The *Strategic Action Programme for the conservation of Biological Diversity (SAP BIO)* in the Mediterranean Region is launched in 2004 by RAC/SPA. Its aim is establishing a logical base for implementation the 1995 SPA Protocol. The strategic actions objectives are: Protecting species and habitats, Improving knowledge about marine and coastal biodiversity; Reducing negative impacts on biological diversity; Promoting sector-based policies that encourage biodiversity (tourism, agriculture, etc.); Adopting institutional and legal measures; Coordinating the biodiversity activities of the MAP centres. Adopted by the Contracting Parties these actions should guide countries over the following fifteen years in planning and implementing protection activities[4].

The *ACCOBAMS Strategy 2014-2023* is developed and adopted by Parties in 2013. In the scope of Strategy overall objective and 10 supportive specific objectives were identified and linked to the Aichi targets and targets of the EU Biodiversity Strategy to 2020. The overall objective is to improve current conservation status of cetaceans and their habitats in the ACCOBAMS area, more specifically to achieve that status of at least all the regularly present species listed as endangered (EN) in the IUCN Red List downgraded to at least vulnerable (VU), with support of ACCOBAMS and ensure good environmental status (GES) as defined in the MSFD at least in the areas representing critical habitats. The specific objectives are grouped in two chapters: Management of the Agreement and Cetacean conservation efforts[5].

3.1.5. Species conservation plans

The Species conservation plans assess the conservation status of species and their habitats, and outline conservation priorities. There are several conservation plans for cetaceans and sea turtles in the Mediterranean region.

Through *ACCOBAMS the Conservation Plan for short-beaked common dolphins in the*

[3] http://www.unep.org/roe/PromotingBiodiversityConservation/tabid/54597/Default.aspx
[4] http://www.rac-spa.org/sapbio
[5] http://accobams.org/index.php?option=com_content&view=article&id=1146:accobams-strategy&catid=3:accobams-news&Itemid=68

Mediterranean Sea (2004)[6] was developed by group of scientist and adopted by Parties. This plan addresses the conservation problems of Mediterranean common dolphins by defining priority actions to stop their decline and facilitate their recovery in the region. It includes recommendations for Adriatic countries. As well as *Conservation Plan for the Mediterranean bottlenose dolphin* and *Conservation Plan for the Mediterranean fin whales* have been drafted.

RAC/SPA (Regional Activity Centre for Specially Protected Areas) developed and adopted the *Action Plan for the Conservation of cetacean in the Mediterranean Sea* (1991) within the framework of UNEP/MAP (United Nations Environment Programme/Mediterranean Action Plan). The objectives of this Plan are protection and conservation of cetacean habitats including feeding, breeding and calving grounds, without however, being restricted to these aspects, as well as protection, conservation and the recovery of cetacean populations in the Mediterranean Sea Area[7]. Currently RAC/SPA in collaboration with ACCOBAMS Agreement is working on the revision of this plan, which should be completed in April of 2015.

RAC/SPA also developed and adopted the *Action plan for the conservation of Mediterranean sea turtles* (2007) whose objectives are the recovery of the populations of *Caretta caretta* and *Chelonia mydas* in the Mediterranean (through appropriate protection, conservation and management of sea turtle habitats, including nesting, feeding and wintering areas and key migration passages, as well as, improvement of the scientific knowledge by research and monitoring.

World Wide Fund for Nature (WWF) also developed *Species Action Plan for the conservation of sea turtles in the Mediterranean Sea* (2005). Twelve priority targets were identified and ascribed to three areas corresponding to different operational approaches: a) Protection of nesting sites; b) Reduction of human induced mortality at sea; c) Collection of scientific information[8].

3.1.6. Existing guidelines on mitigation of negative impacts of anthropogenic activities on cetaceans and sea turtles

There are a number of relevant institutional guidelines for cetaceans and sea turtles. These help addressing some of the priority issues, such as mitigation measures on anthropogenic activities potentially affecting these species, including those producing noise pollution (e.g. fishery, hydrocarbon exploitation); captivity; strandings, rescue techniques and centres; marine protected areas, research and whale watching in the Mediterranean and Black Sea region. These documents were prepared by ACCOBAMS, RAC/SPA and the International Whaling Convention. See Table 3.4 for more details.

[6] http://accobams.org/index.php?option=com_content&view=article&id=1136&Itemid=166
[7] http://rac-spa.org/publications
[8] http://iucn-mtsg.org/regions/mediterranean/electronic-library/

Table 3.4 - Guidelines for cetaceans and sea turtles in the Mediterranean region

TOPIC	TITLE OF GUIDELINES	TAXA	SOURCE
Captivity	Guidelines for the release of captive cetaceans into the wild (2007).	Cetaceans	ACCOBAMS[1]
Rescue centres	Guidelines to improve the involvement of marine rescue centres for sea turtles (2004).	Sea turtles	RAC/SPA[2]
Interactions with humans	Principles and guidelines for large whale entanglement response efforts.	Cetaceans	IWC[3]
	Guidelines for technical measures to minimise cetacean-fishery conflicts in the Mediterranean and Black Seas (2004).	Cetaceans	ACCOBAMS[1]
	Guidelines for the use of acoustic deterrent devices (2004).	Cetaceans	ACCOBAMS[1]
	Guidelines to address the impact of anthropogenic noise on cetaceans in the ACCOBAMS area (2010).	Cetaceans	ACCOBAMS[1]
	Sea Turtle handling Guidebook for fishermen (2001, available in several languages).	Sea Turtles	RAC/SPA[2]
Conservation Plans	Guidelines for Cetacean Conservation Management Plans.	Cetaceans	IWC[4]
Marine Protected Areas	Guidelines for the Establishment and Management of Marine Protected Areas for Cetaceans (2007).	Cetaceans	ACCOBAMS[1]
	Guidelines for the criteria for the selection of Marine Protected Areas for cetaceans (2007).	Cetaceans	ACCOBAMS[1]
	Guidelines for the Establishment and Management of Marine Protected Areas for Cetaceans (2011).	Cetaceans	RAC/SPA[2]
Research	Guidelines on the granting of exceptions to article II, paragraph 1, for the purpose of non-lethal in situ research in the Agreement area (2010).	Cetaceans	ACCOBAMS[1]
Strandings	Guidelines for the Development of National Networks of Cetacean Strandings Monitoring (2004).	Cetaceans	ACCOBAMS[1]
	Guidelines for the establishment of Tissue Banks and Ethical Code (2007).	Cetaceans	ACCOBAMS[1]
	Guidelines for a coordinated cetacean stranding response during mortality events caused by infectious agents and harmful algal blooms (2010).	Cetaceans	ACCOBAMS[1]
	Guidelines concerning best practice and procedure for addressing cetacean mortality events related to chemical, acoustic and biological pollution (2010).	Cetaceans	ACCOBAMS[1]
	Guidelines for the Development of National Networks of Cetacean Strandings Monitoring (2004).	Cetaceans	RAC/SPA[2]
Whale watching	Guidelines for commercial cetacean-watching in the ACCOBAMS area (2010).	Cetaceans	ACCOBAMS[1]
	Guidelines for implementing a Pelagos-ACCOBAMS Label for commercial whale watching activities (2010).	Cetaceans	ACCOBAMS[1]
	Guidelines for Commercial Cetacean-Watching Activities in the Black Sea, the Mediterranean Sea and Contiguous Atlantic Area (2004).	Cetaceans	RAC/SPA[2]
	General Principles for Whale watching (Agreed general principles to minimise the risks of adverse impacts of whale watching on cetaceans).	Cetaceans	IWC[5]
	Review of Whale watching guidelines and regulations around the World (version 2012).	Cetaceans	IWC[6]
Legislation	Guidelines to design legislation and regulations relative to the conservation and management of sea turtle populations and their habitats (2003).	Sea Turtles	RAC/SPA[2]

Note: 1. http://accobams.org/index.php?option=com_content&view=article&id=1134&Itemid=165; 2. http://rac-spa.org/publications; 3. https://iwc.int/best-practice-guidelines-for-entanglement-responde ; 4. https://iwc.int/conservation-management-plans; 6. http://iwc.int/wwguidelines; 7. https://iwc.int/whalewatching.

3.1.7. Adriatic intergovernmental initiatives and projects potentially relevant to cetaceans and sea turtles conservation

Besides the already mentioned IG initiatives (Tab. 3.1, 3.3), within the Adriatic region there are

some *ad hoc* international programmes and partnerships which aim to coordinate sustainable development policies (Tab. 3.5 and 3.6). Their scopes range from nature and environmental protection and sustainable development to specific issues, such us marine pollution control, water quality, flood control, integrated coastal zone planning and management, development of ports, navigation, maritime safety, transport and infrastructure, fishery, tourism, recreation, cooperation in research projects, socio-economic trends, etc. In the following paragraphs the most relevant to the NETCET project are summarised.

In addition to the Adriatic initiatives listed in Table 3.5 it two documents are worth noting. These are the Bilateral Memorandum on Cooperation between the Government of the Republic of Croatia and Government of the Italian Republic (2009) and the "European Union Strategy for the Adriatic and Ionian Region" with its Action Plan.

The *Bilateral Memorandum on Cooperation between the Government of the Republic of Croatia and Government of the Italian Republic* was signed in 2009[9]. The scope of this Memorandum is rather wide, ranging from transport and infrastructure, civil aviation, harbours development, maritime safety, agriculture and food industries, rural development, energy, cooperation and tourism, to culture, education and science. Among other main objectives, there is a mutual interest on the environmental protection and sustainable development within the framework of Adriatic Ionian Initiative (AII). Croatia and Italy have agreed to intensify their cooperation and continue consultation with the other Adriatic Sea coastal states with the aim to designate the Adriatic Sea as Particularly Sensitive Sea (PSSA) within IMO framework. Parties agreed to also:

- strengthen the implementation of the Sub-regional contingency plan for the prevention of, preparedness for and response to larger scale pollution incidents in the Adriatic;
- strengthen the scientific cooperation on the Adriatic Sea monitoring and the harmonization of evaluation methods and indicators for the purpose of assessing the status of the marine environment of the Adriatic and
- develop strategies for the Adriatic in accordance with the EU Framework Marine Strategy Directive.
- further develop the scientific cooperation in the field of monitoring and assessing presence and abundance of cetaceans in the framework of the ACCOBAMS Agreement.

The recent approval of a EU Commission document titled "*European Union Strategy for the Adriatic and Ionian Region***"** (EU Commission Communication WD(2014) 190 final) and its *Action Plan*. This Communication "*sets outs the needs and potential for smart, sustainable*

[9] public.mzos.hr/lgs.axd?t=16&id=16939

and inclusive growth in the Adriatic and Ionian Region. It provides a framework for a coherent macroregional strategy and Action Plan, to address those challenges and opportunities, through cooperation between the participating countries'. The Strategy is accompanied by a "*rolling Action Plan*" that is structured around four pillars of strategic relevance, it presents a list of possible, indicative actions. The pillars are:

1. Blue Growth (coordinated by Greece and Montenegro);
2. Connecting the Region (transport and energy networks) (coordinated by Italy and Serbia);
3. Environmental quality (coordinated by Slovenia and Bosnia-Herzegovina);
4. Sustainable tourism (coordinated by Croatia and Albania).

Two cross-cutting aspects are also identified in the AP that entail cooperation within transnational networks. These are:

- capacity-building, including communication, for efficient implementation and for raising public awareness and support;
- research and innovation to boost high-skilled employment, growth and competitiveness.

The Adriatic Sea has also been recognised as a '*sensitive area*' by the Convention for the Protection of the Marine Environmental and Coastal Region of the Mediterranean (Barcelona, 1976, 1995). Of particular relevance is the Mediterranean Action Plan (MAP) whose priorities for the coming decade are:

- to bring about a massive reduction in pollution from land-based sources;
- to protect marine and coastal habitats and threatened species;
- to make maritime activities safer and more conscious of the Mediterranean marine environment;
- to intensify integrated planning of coastal areas;
- to monitor the spreading of invasive species;
- to limit and intervene promptly on oil pollution;
- to further promote sustainable development in the Mediterranean region.

The Adriatic Sea is also a sub-region of the European Marine Strategy Framework Directive (Council Directive 2008/56/EC), which underlines its importance as a region for conservation and management of all sea uses.

See Tables 3.5 and 3.6 for additional information on these initiatives.

Table 3.5 - Regional Intergovernmental partnerships in the Adriatic region

Joint Commission for the Protection of the Adriatic Sea and Coastal Areas from Pollution, 1992[10]	**SCOPE** The Commission considers all issues relating to pollution of the Adriatic Sea waters and coastal areas, makes proposals and recommendations to governments on research and management measures aiming to remove existing and prevent new causes of pollution of the Adriatic Sea. **PARTIES** Croatia, Italy, Montenegro and Slovenia (Albania and Bosnia and Herzegovina are involved, but they are not a part of the Commission). **OBJECTIVES** Protection of the Adriatic Sea and coastal areas against pollution. **SUMMARY**: The Joint Commission represents an adequate institutional framework for cooperation of Adriatic counties in the field of marine pollution. Moreover, the work of the Joint Commission has proved to be an efficient model, housing different aspects of marine environmental issues and providing for appropriate response to new challenges. So far the Commission has dealt with following activities: • regular assessment of the Adriatic Sea ecosystem; • cooperation and mutual direct assistance in combating pollution incidents and special protection of sensitive areas as well as adoption of a common (sub-regional) Contingency Plan for accidental pollution of the Adriatic. The *Subregional Contingency Plan* was signed in 2005 in Portorož; • establishment of a traffic separation scheme and sailing routes in the Adriatic; • identification and control of pollution caused by inadequate handling and disposal of solid and hazardous waste; • cooperation concerning revitalization and protection of environmental values (landscape, nature and construction heritage); • remediation of the most burdened areas (Po, Bay of Trieste, Bay of Koper, Rijeka Bay, Kaštela Bay) and other areas of larger cities, industrial zones and ports; • cooperation in preventive protection and further implementation of development strategies aligned with resource conservation; • tackling the issue of ballast waters in the Adriatic.
Adriatic-Ionian Initiative (AII), 2000[11]	**SCOPE** Environmental protection and sustainable development, economy, tourism and small and medium enterprises cooperation, transport and maritime cooperation, culture, education and inter-university cooperation. **PARTIES** All Adriatic countries **OBJECTIVES** Link together the coastal countries to cooperate for development and safety of the whole area **SUMMARY**: Its decision-making body is the Council of Foreign Ministers (Adriatic-Ionian Council), whose agenda is prepared by periodic meetings of the National Coordinators. The Adriatic and Ionian Initiative is part of the framework of the Stability Pact, which makes explicit reference to the Initiative. In the framework of the Table on Environmental Protection and Sustainable Development a document called the *Adriatic Action Plan* (AAP) 2020 was adopted at the environmental ministers' meeting in June 2003 in Zadar, Croatia. The Adriatic Action Plan aims to link together the All Countries in efforts to reduce the negative impacts of human activities in the Adriatic-Ionian basin. Three projects covering the environmental aspect of the AII. The projects initially link three North Adriatic AII member states that are more advanced institutionally, other states have agreed to join and follow the projects in their extended phases or to learn from them in following years.
Adriatic Euroregion (AE), 2006[12]	**SCOPE** Protection of the cultural heritage, protection of the environment, sustainable economic development, fishery, agriculture, transport and other infrastructure issues **PARTIES** Twenty-three members from Regional and local governments from Albania, Bosnia and Herzegovina, Croatia, Italy, Montenegro and Slovenia **OBJECTIVES** Forming an area of peace, stability and co-operation, Protection of the cultural heritage, Protection of the environment, Sustainable economic development in particular of tourism, fishery and agriculture, Solution of transport and other infrastructure issues. **SUMMARY**: Funded in Pula, Region of Istria, Croatia. It represents a model of co-operation that includes trans-national and inter-regional co-operation between regions of the Adriatic coastline. The AE is the institutional framework for jointly defining and solving important issues in the Adriatic area.

[10] http://ec.europa.eu/maritimeaffairs/documentation/studies/documents/case_study_adriatic_sea_en.pdf
[11] http://www.aii-ps.org/
[12] http://www.adriaticionianeuroregion.eu/index.php?lang=en

Table 3.5 (continued) - Regional Intergovernmental partnerships in the Adriatic region

The Adriatic Sea Partnership (ASP), 2006[13]	**SCOPE** Navigation, flood control, commerce, recreation and other uses, water quality, transboundary cooperation, public participation, biodiversity. **PARTIES** Albania, Bosnia and Herzegovina, Croatia, Italy, Montenegro and Slovenia **OBJECTIVES** Facilitate project preparation and implementation aimed at protection and sustainable development of the Adriatic region **SUMMARY**: Originally a Slovenian initiative in cooperation with the Regional Environmental Centre (REC), the Adriatic Sea Partnership was launched at the Mediterranean Action Plan (MAP) sub-regional conference on the Sustainable Development Strategy for the Adriatic in Portorož, Slovenia. It helps to prepare and implement projects through a comprehensive umbrella partnership and platform for joint action based on commitments by coastal states under appropriate institutional arrangements. The ASP is open to all and is based on full cooperation with existing Adriatic initiatives and coordination with implementation of MAP and EU programmes.
FAO AdriaMed Project[14]	**SCOPE** Scientific support to Governments to Responsible Fisheries **STATE PARTIES** Albania, Croatia, Montenegro, Italy and Slovenia **OBJECTIVES** Some of the main objectives of AdriaMed are: • to develop a common cognitive basis to support international processes aimed at fishery management; • to reinforce the scientific coordination among the different institutions interested in fishing activity; • to establish a permanent network among the main institutions present in the Adriatic that are involved in fishery management activities. **SUMMARY**: The FAO-AdriaMed Project *AdriaMed project* is a "scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea" is an FAO Regional Project. It is funded by the Italian Ministry of Agriculture, Food and Forestry Policies and since 2007 by the European Commission. This project aims to promote scientific cooperation among the Albania, Croatia, Italy, Montenegro and Slovenia, in line with the Code of Conduct for Responsible Fisheries (UN-FAO 1995). AdriaMed aims to contribute decisively to enlarging the scope of information on the Adriatic Sea, related to shared fishery resources, knowledge that is often fragmented and localised to different territories. Scientific knowledge of resources within a single nation is not adequate for the responsible management of shared resources.

Finally another relevant initiative is *AdriaPAN*, a consortium/network of Protected Areas in the Adriatic sub-region, which currently gathers over 40 members. The main objective of this network is to improve planning and management activities protected areas through cooperation. AdriaPAN is also recognised in the Maritime Strategy for the Adriatic and the Ionian Sea.

Table 3.6 - Planned institutional projects relevant to the Adriatic region

Programme title	**ACCOBAMS survey initiative**
Period	not yet defined
Funding source	ACCOBAMS and state parties
Implementing bodies	ACCOBAMS state parties
Scope	Cetaceans, sea turtles and seabirds
Summary	The overall objective of this project is obtaining the first baseline information on abundance for cetaceans, sea turtles and seabirds at a regional level, as well as maps of relative density and the identification of high density/biodiversity areas for individual species and for communities. This information will enable to put actual and potential threats into context, will constitute the scientific foundation for the management actions and will establish the reference level(s) to allow for the monitoring and analysis of trends and hence to provide a feedback mechanism to determine the effectiveness of the management actions and determine whether adjustments are necessary.

[13] http://asp.rec.org/
[14] http://www.faoadriamed.org/

Table 3.6 (continued) - Planned institutional projects relevant to the Adriatic region

Programme title	**Mapping anthropogenic noise hot spots in the ACCOBAMS area**
Period	not yet defined
Funding source	In the phase of seeking potential voluntary financial contributors
Implementing bodies	ACCOBAMS state parties
Scope	Cetaceans
Summary	The project will identify anthropogenic noise/cetaceans interactions hot spots in the ACCOBAMS area and map and develop a monitoring of sea ambient noise, particularly in critical habitats. Anthropogenic activities to be map are marine traffic (including intense recreative vessel zone), offshore construction (harbour extension, renewable energy, oil platform, etc.), seismic survey area, naval exercise area.
Programme title	**Regional programme for assessing and reducing the impact of ghost fishing on marine biodiversity**
Period	under development
Funding source	ACCOBAMS and state parties
Implementing bodies	ACCOBAMS state parties
Scope	Ghost fishing and marine debris
Summary	The programme strengthens collaboration between global and regional intergovernmental organizations interested in the issue of ghost fishing or marine debris in general. The objectives are improving data collection for assessing the quantity of derelict fishing gears in the Mediterranean and Black Seas and their impact on marine biodiversity in particular fishes, cetaceans, and sea turtles; promoting the retrieval of lost fishing gears; preventing abandonment, loss and the discarding of fishing gears at sea

3.1.8. Regional research and management projects on relevant aspects of governance and science

There are a considerable number of research and management projects in progress in the Mediterranean region that deal with conservation of marine biodiversity, marine protected areas, fishery and pollution related issues. Albania, Croatia, Montenegro and Italy are the most represented countries in the Regional projects in progress (Table 3.7).

Table 3.7 - Regional projects in progress relevant to some aspects of the governance and science on cetaceans and marine turtles conservation

Project title	**MEDITS**[15]
Period	Ongoing since 1994.
Funding source	European Commission (DG MARE) and EU Member States.
Implementing bodies	Mediterranean research institutes and Fishery departments.
Scope	Benthic and demersal species.
Summary	The MEDITS survey programme (International bottom trawl survey in the Mediterranean) intends to produce basic information on benthic and demersal species in term of population distribution as well as demographic structure, on the continental shelves and along the upper slopes at a global scale in the Mediterranean Sea, through systematic bottom trawl surveys. The MEDITS programme is conducted within the Data Collection Framework (DCF) in compliance with the Regulations of the European Council n. 199/2008, the European Commission Regulation n. 665/2008 the Commission Decisions n. 949/2008 and n. 93/2010.

[15] http://www.sibm.it/SITO%20MEDITS/principaleprogramme.htm

Table 3.7 (continued) - Regional projects in progress relevant to some aspects of the governance and science on cetaceans and marine turtles conservation

Project title	**CoCoNET (Towards COast to COast NETworks of Marine Protected Areas Coupled With Sea-based Wind Energy Potential)[16]**
Period	27/02/2012 - 27/02/2016
Funding source	FP7
Implementing bodies	39 research institutes from 22 countries, including Albania, Croatia, Montenegro and Italy.
Scope	MPA and offshore wind farms.
Summary	The project will produce the guidelines to design, manage and monitor a network of MPAs, and a detailed wind atlas for the Mediterranean and the Black Sea. It 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. These activities will also individuate areas where Offshore Wind Farms might become established, avoiding too sensitive habitats but acting as stepping stones through MPAs.
Project title	**BALlast Water MAnagement System for Adriatic Sea Protection – BALMAS[17]**
Period	11/01/2013 - 31/03/2016
Funding source	IPA Adriatic Programme.
Implementing bodies	Seventeen institutional and scientific partners from Albania, Bosnia and Herzegovina, Croatia, Italy, Montenegro and Slovenia.
Scope	Ballast waters.
Summary	Project addresses the protection from ballast water pollution in the Adriatic area, and risk prevention and protection and enhancement of the marine and coastal environment. The general BALMAS objective is a common cross-border System linking all Adriatic research, experts and national responsible authorities to avoid the unwanted risk to the environment and humans from the transfer of Harmful Aquatic Organisms and Pathogens (HAOP), through the control and management of ships' ballast water and sediments.
Project title	**Project DeFishGear[18]**
Period	01/11/2013 - 31/03/2016
Funding source	IPA Adriatic Programme.
Implementing bodies	Universities, research institutes, national and local authorities and NGOs from all countries of the Adriatic Sea.
Scope	Litter in the sea.
Summary	Derelict Fishing Gear Management System in the Adriatic Region aims to facilitate efforts for integrated planning to reduce the environmental impacts of litter-generating activities and ensure the sustainable management of the marine and coastal environment of the Adriatic Sea. Ultimately, the DeFishGear project will provide a strategic input to regional efforts in successfully achieving good environmental status in the Mediterranean Sea.
Project title	**Coastal Cities Pollution Control Project 2[19]**
Period	11/12/2008 - 31/12/2015
Funding source	International Bank for Reconstruction and Development
Implementing bodies	HRVATSKE VODE, Legal entity for water management, Croatia
Scope	Pollution issues of coastal waters
Summary	This project aims to build on the activities of the first phase, which aimed at safeguarding the quality of coastal waters and the environment, both of strategic importance to Croatia's tourism industry, the livelihoods of local communities and marine life. The objectives of the Second Coastal Cities Pollution Control Project are: to improve the provision of efficient and sustainable wastewater services in participating coastal municipalities; and to reduce the nutrient load entering Croatia's coastal waters from, and pilot innovative 'wastewater treatment solutions in, selected municipalities.

3.1.9. National legislation

In the Adriatic region, besides the international framework there are rather complex national policy and legislative frameworks relevant to cetaceans and sea turtles conservation. The following sections summaries their main tracts.

[16] http://www.coconet-fp7.eu/
[17] http://www.balmas.eu/
[18] http://www.defishgear.net/
[19] http://www.worldbank.org/projects/P102732/coastal-cities-pollution-control-project-2?lang=en

3.1.9.1. National Biodiversity Strategies and Species Action Plans

National Biodiversity Strategies and Action Plans (NBSAPs) are the principal instruments for implementing the Convention on Biological Diversity at the national level. The Convention requires countries to prepare a national biodiversity strategy (or equivalent instrument) and to ensure that this strategy is mainstreamed into the planning and activities of all those sectors whose activities can have an impact (positive and negative) on biodiversity. All Adriatic countries have their National Biodiversity Strategies and Action Plans that are related to all aspects of nature conservation[20].

Regarding ***National Action Plans for Cetaceans and Sea Turtles***, Albania is the only Adriatic country with adopted NAPs both for CT an ST. Although Action Plan for the conservation of cetaceans in Albanian waters (2006) and Action plan for the conservation of sea turtles and their habitats in Albania (2012) were adopted, very few actions and incentives for their implementation have been carried out in national scale.

In Italy the former Central Institute for Marine Applied Research (ICRAM) prepared a draft document of a National Action Plan for the Conservation of Cetaceans in the Italian Seas (2001)[21], which was never officially adopted by the relevant national and regional Authorities.

In Slovenia background document for preparation of Action plan for Cetaceans is being in preparation process while background document for preparation of Action plan for Sea Turtles was finished in 2014 and sent to the competent Ministry for adoption.

3.1.9.2. National legislation on relevant to cetacean and sea turtles conservation in the Adriatic region

All Adriatic countries have established to certain level nature conservation legislative framework, regulating overall nature conservation as well as addressing specifically conservation of cetaceans and sea turtles. In addition, frameworks are set for the implementation of environmental protection mechanisms which are relevant for ensuring nature conservation, such as the Strategic Environmental Assessment and the Environmental Impact Assessment regulated through Environmental Protection Act. Nature protection or biodiversity conservation acts are main nature conservation regulations in all countries. They stipulate establishment of different conservation mechanisms, such as (strictly) protected species and protected areas. Majority of countries have at least one nature conservation regulation, in force both at national and regional levels. Only in Italy each region enacts its specific regional nature conservation acts (Table 3.8).

[20] https://www.cbd.int/nbsap/search/default.shtml

[21] Notarbartolo di Sciara G., Bearzi G., Mo G., Cozzi B. (2001): National Action Plan for the Conservation of Cetaceans in the Italian Seas: 2001-2003. Prepared for the Italian Ministry for the Environment. ICRAM, Rome. 161 pp.

Table 3.8 - National legislation relevant to cetaceans and sea turtles conservation in the Adriatic region

PROTECTED SPECIES AND THEIR HABITATS	
Albania	Act no. 9587, Dated 20/7/2006, On the conservation of biodiversity, amended by Act no. 68/2014 of 3/7/2014 "On some changes and additions to the Act 9587, 0f 20/7/2006 "On biodiversity protection"". Act no.10 006, Dated 23/10/2008 "On the protection of wild fauna'. Act no. 8906, of 6/6/2002 "On protected areas" amended by Act no. 9868, of 4/2/2006 . Order no. 1280, of 20/11/2013 "On the approval of Red List of wild flora and fauna species in Albania".
Bosnia and Herzegovina	Nature Protection Act (OG 66/13). Red List of endangered wild species and subspecies of plants, animals and fungi (OG 7/14).
Croatia	Nature Protection Act (OG 80/2013). Ordinance on strictly protected species (OG 144/2013). Ordinance on list of habitat types, habitats map, threatened and rare habitat types (OG 88/14)
Italy	Ministerial Decree 08-01-2002 (IT003) and Ministerial Decree 05-10-2010[22]. Legislative Decree 152/2006 on Legislation on Environmental Issues[23]. Friuli-Venezia Giulia Regional Law 43/90; Veneto Regional Law 11/99 (IT034), Regional decree 245/Pres/ 96. Emilia-Romagna Regional Law 3/2012, Reform of Regional Law 9/99; Marche Regional Law 7/2004 (IT031), 3/2012 (IT029a), its Guidelines for EIA according to Law 7/2004 and the Giudelines' update; Abruzzo Regional Law; Puglia Regional Laws 17/2007, 11/2001, 13/2010.
Montenegro	Nature Protection Act (OG 51/08, 21/09, 40/11). Resolution on protection on certain plant and animal species (OG 76/06).
Slovenia	Nature Protection Act 801-01/98-7/16 (96/2004, 61/2006, 8/2010, 46/2014) . Decree on Protected Wild Animal Species (Ur.l. RS, št. 46/2004). Rules on the Inclusion of Endangered Plant and Animal Species in the Red List (Ur.l. RS, št. 82/2002, 42/2010).
DAMAGE FROM STRICTLY PROTECTED SPECIES	
Albania	Act no. 9587, of 20/7/2006 "On biodiversity protected", as amended by Act 68/2014 of 3/7/2014 and Act no. 100006, of 23/10/2008 "On wild fauna protection".
Croatia	Ordinance of Procedure of prevention and compensation of damage caused by animals of strictly protected wild species (OG 158/2009). Ordinance on the amount of damages caused by illegal actions against protected animal species (OG 84/96, 79/2002).
Italy	Law 157/92[24]. Puglia Regional Law 27/98.
TRADE OF PROTECTED SPECIES	
Albania	Act no. 9867, of 31/1/2008 "On the determination of rules and procedures of international trade of endangered species of wild flora and fauna"
Croatia	Cross-border movement and trade in protected species Act (OG 94/2013)
Italy	See EU regulations on this matter. Law 150/92, Law 59/93, Legislative Decree 275/01.
Slovenia	Decree on the Course of Conduct and Protection Measures in the Trade in Animal and Plant Species (Ur.l. RS, št. 78/2012)
DELIBERATE CAPTURE AND KILLING	
Albania	Act no. 10253, of 11/3/2010 "On hunting" and Act no. 10006, of 23/10/2008 "On the protection of wild fauna"
Bosnia and Herzegovina	Ordinance on establishing a system of monitoring of deliberate capture and killing of protected animals (OG 46/05). Ordinance on new measures for research or conservation to prevent significant adverse impact on the species deliberate capture or killing (OG 65/06)
Croatia	Nature Protection Act (OG 80/2013) Ordinance on the amount of damages caused by illegal action on the protected animal species (OG 84/1996, 79/2002) Criminal Act (OG 125/2011, 144/2012)
Italy	Law 157/92. Law 189/2004. Puglia Regional Law 27/98.
Montenegro	Criminal Act (OG 3/03, 32/03, 37/03, 54/04, 61/04, 30/05, 53/06, 55/06, 32/07, 8/10)
Slovenia	Criminal Act (CC-1-OCT2) 713-01/12-8/2 (2012)

[22] These decrees establish a compulsory CITES register and its terms.

[23] Legislative decree 152/2006 is the transposition of Directives 2001/42/CE, 2011/92/EU (including Directive 85/337/EEC and it's amendments) for what concerns EIA and SEA. Article 300 defines the "environmental damage" that includes any direct or indirect measurable and significant deterioration of a natural resources or any utility deriving from it. According to Directive 2004/35/CE it is also an environmental offence any damage to species and habitats protected under a number of environmental protection legislations, including Directive 92/43/CEE, Act 157/92, Presidential Decree 357/97, etc. The national legislation is assisted by Regional legislation.

[24] Act 157/92 transposes a number of EU Directives on birds and the Bern Convention (1979). It protects all cetaceans from deliberate killing (art. 2). Art. 26 allows compensation of damages caused by protected species. Regions are in charge of regulating this compensation mechanism. ISPRA (ex-INFS) is in charge of assessing the status of protected species.

Table 3.8. (continued) - National legislation relevant to cetaceans and sea turtles conservation in the Adriatic region

ANIMAL WELFARE	
Croatia	Animal Protection Act (OG 135/2006, 37/2013).
Italy	Legislative Decree 26/2011 on the implementation of Directive 2010/63/EU on the protection of animals used for scientific purposes (GU Serie Generale n.61 del 14-3-2014).
Montenegro	Act on Animal Welfare (OG 14/08).
KEEPING OF PROTECTED SPECIES	
Albania	Act no. 10006, of 23/10/2008 "On wild fauna protection".
Croatia	Nature Protection Act (OG 80/2013). Ordinance on the conditions for holding, methods of marking and keeping records on protected animals in captivity (OG 70/2009).
Italy	Ministerial Decree 21-05-1980 (IT007) and Ministerial Decree 03-05-1989[25].
Montenegro	Rulebook on Conditions for Keeping and Raising of Protected Animal Species (OG 67/10).
Slovenia	Rules on the Marking of Animals of Wild Species Kept in Captivity (Ur.l. RS št. 58). Order on the Living Conditions for and care of Wild Animals in Captivity (Ur.l. RS, št. 90/2001) Decree on Zoos and Similar Facilities (Ur.l. RS, št. 37/2003)
SPECIES MONITORING, STRANDING NETWORKS, RESCUE CENTRES AND INFORMATION SYSTEM	
Albania	Decree no. 84 Dated 27/01/2009 determining the criteria to raise the network for inventory and monitoring of the biodiversity. In reliance on article 100 of the constitution and paragraph 2 of article 9 of the Act nr.9587, dated 20/07/2006 "On protection of biodiversity" DCM no. 1189, of 18/11/2009 "On the monitoring of the environment in the Republic of Albania"
Croatia	Nature Protection Act (OG 80/2013) Ordinance on strictly protected species (OG 144/2013)
Italy	Law 157/92[26]. Decree no. 112/98 on functions and administrative duties of local administration (art. 69). Presidential Decree 854/55. Agreement between State and Region 26/11/2003 defining veterinary structures included rescue centers. Presidential Decree 357/97 (IT005) and Presidential Decree 120/03[27]. Ministerial Circular 07-06-1986, n. 6227716; Ministerial Circular 29-04-1988, n. 6223259; Ministerial Circular 09-03-1993, n. 6220563[28]. Emilia Romagna Regional Law (GPG 646/2012); Marche Regional Law Prot. 14229 on 10/05/2010.
Slovenia	Decree on the Rescue Centre for Animals of Wild Species Ur.l. RS, št. 98/2002.
PROTECTED AREAS (INCLUDING ECOLOGICAL NETWORKS) AND RELATED MECHANISMS SUCH AS APPROPRIATE ASSESSMENT	
Albania	Act no. 8906, Dated 6/6/2002 On protected areas, In reliance on articles 78, 81 and 83 paragraph 1 of the constitution, amended by Act no. 9868, of 4/2/2008 "On some changes and additions to the Act no. 8906, of 6/6/2002" DCM no. 897, of 21/12/2011 "On the approval of rules for SCAs designation"
Bosnia and Herzegovina	Regulation NATURA 2000 - protected areas in Europe (OG 43/11)
Croatia	Regulation on Ecological Network (OG 124/2013) Ordinance on the appropriate assessment of the impact of plans, programmes and projects on the ecological network (OG 118/2009) A number of proclamation acts for marine protected areas (see Table 1.4).
Italy	Law 394/91, Framework Law on Protected Areas. Law 179/2002[29]. Ministerial Decree 27-12-2007, Designation of the Marine Protected Area named "Regno di Nettuno" (Campania)[30]. Presidential Decree 357/97 (IT005) and Presidential Decree 120/2003[31]. Ministerial Decree 05-10-2010. Ministerial Decree 21-10-2013. Four designation decrees for the Adriatic Marine Protected Areas (Tab. 1.4). Friuli-Venezia Giulia Regional Act 17/2006, 7/2008; Veneto Regional Law 24/2012; Emilia-Romagna Regional Law 7/2004; Marche Regional Law 6/2007; Abruzzo Regional Law 61/80; Puglia Regional Regulation 14/2008 (IT047), 28/2008.
Montenegro	Act on Animal Welfare (OG 14/08)

[25] These Decrees forbid to fish, hold and transport cetaceans and sea turtles. Derogations take place where possible for scientific purpose. The Ministerial Decree 21-05-1980 was a transposition of CITES into National Fishery regulations.
[26] This Act do not specify sea turtles in article 2, as protected species. Nevertheless art. 2, c indicates that this Act concerns all species that are declared endangered by a separate Decree of the Prime Minister. The Act (Art. 4.6) establishes that Regions are in charge of regulating the rehabilitation of individuals.
[27] These Decrees establish that the Minister of environment is in charge for preparing guidelines for monitoring and the Regions are in charge of monitoring the conservation status of the species listed in the annex IV of the Habitat Directive. Art 11 states the rules.
[28] These circulars provide local authorities with information on how to report a stranding event.
[29] Article 18, Marine Protected Areas (MPAs) designation Article 19, Management of the MPAs.
[30] First MPA having as primary objective the conservation of cetaceans.
[31] This P.D. 357/97 (and its amendment 120/03) adopts and implements the EU Habitat Directive in Italy. (Council Directive 92/43/EEC). It establishes how to designate special areas of conservation and the Natura 2000 network (Designated for species listed in Annex 2)

Table 3.8. (continued) - National legislation relevant to cetaceans and sea turtles conservation in the Adriatic region

PROTECTED AREAS (INCLUDING ECOLOGICAL NETWORKS) AND RELATED MECHANISMS SUCH AS APPROPRIATE ASSESSMENT	
Slovenia	Decree of the Municipality of Piran on natural monuments (Cape Madona), UO Primorskih novic 5/1990 Decree of the Municipality of Koper on the natural monument of Debeli rtič, OU Primorskih novice 33/1991 Governmental decree on Strunjan Landscape Park (Ur. L. RS 107/2004, 114/2004, 83/2006, 71/2008, 77/2010, 46/2014) Governmental decree on ecologically important areas (Ur. L. RS 48/2004, 33/2013, 99/2013) Decree on special protection areas (NATURA 2000) (Ur.l. RS, št. 49/2004, 49/04, 110/04, 59/07, 43/08, 8/12, 33/13, 35/13 – popr., 39/13 – odl. US in 3/14)

3.1.9.3. National legislation on anthropogenic activities potentially impacting cetaceans and marine turtles

The majority of Adriatic countries have legislative frameworks to regulate anthropogenic activities with potential impact on cetaceans and marine turtles. As with nature conservation regulation, most countries have single legislation per each topic in force at both national and regional levels, except Italy where each region has its own regulation. These regulations cover issues of fishery and mariculture, shipping and navigation, tourism and recreation, domestic, municipal, industry, agriculture sewage and solid waste, military activity, coastal engineering & development of the coastal zone, offshore oil and gas and (offshore) and wind power generation (Table 3.9).

Bosnia and Herzegovina has not yet adopted regulations in the field of fisheries and mariculture. Italy and Albania do not have legislation in the field of shipping & navigation, while Slovenia lack regulation in the field of offshore oil & gas and in the field of domestic, municipal, industry, agriculture sewage and solid waste. Only Croatia has regulated issue of (Offshore) wind power generation.

Table 3.9. - National legislation on anthropogenic activities potentially affecting cetaceans and sea turtles conservation in the Adriatic region

BORDERS (E.G. NATIONAL WATERS, ECOLOGIC ZONES)	
Croatia	Decision of the Croatian Parliament to extend the jurisdiction of the Republic of Croatia in the Adriatic Sea (OG 157/2003, 77/2004, 138/2006, 31/2008) Ordinance on Protection of the marine environment in a protected ecological and fishing zone of Republic of Croatia (OG 47/2008) Ordinance on borders of fishing sea of Republic of Croatia (OG 5/2011)
Italy	Law 61/2006 – Ecological Protection Zone and external boundaries.
Montenegro	Act on Sea (OG 17/07, 06/08) Act on Maritime Demesne (OG 14/92)
Slovenia	Act Declaring the Ecological Protection Zone and Continental Shelf Republic of Slovenia (ZRZECEP) 001-22-104/05 (2005)
FISHERY AND MARICULTURE	
Albania	Act no. 64/2012 of 31.5.2012 "On fishing"
Croatia	Marine Fisheries Act (OG 81/2013) Ordinance on commercial fisheries (OG 63/2010, 141/2010, 148/2010, 52/2011, 144/2011, 55/2013) Ordinance on small-scale coastal fisheries (OG 59/2011) Ordinance on sport and recreational fisheries (OG 152/2011) Ordinance on the form, content and manner of keeping the register, landing declaration and report on the catch in commercial fisheries (OG 144/2010, 145/2011) Order on the protection of fish and other marine organisms (OG 63/2010, 68/2010, 145/2010, 18/2012, 29/2012) Regulation on environmental impact assessment (OG 64/2008, 67/2009) Physical Planning and Building Act (OG 76/2007, 38/2009, 55/2011, 90/2011, 50/2012) Islands Act (OG 34/1999, 149/1999, 32/2002, 33/2006)

Table 3.9. (continued) - National legislation on anthropogenic activities potentially affecting cetaceans and sea turtles conservation in the Adriatic region

FISHERY AND MARICULTURE	
Italy[32],[33]	Law 963/65. Law 381/88. Legislative Decree 153/04 Presidential Decree 1639/68. Ministerial Decree 21-05-1980. Ministerial Decree 03-05-1989. Ministerial Decree 22-01-2009, New determinations on Biological Protection Zones. Misterial Decree 16-03-2004, Designation of the BPZ of "Miramare" (Friuli-Venezia Giulia). Misterial Decree 16-12-2004, Designation of the BPZ of "Tegnue di Porto Falconera" (Friuli-Venezia Giulia. Ministerial Decree 16-03-2004, Designation of the BPZ of "Tenue Chioggia" (Veneto). Misterial Decree 14-10-2009, Designation of the BPZ of "off Ravenna" (Emilia-Romagna). Misterial Decree 16-03-2004, Designation of the BPZ of "Barbare" (Marche). Misterial Decree 18-02-2004, Designation of the BPZ of "Tremiti" (Puglia). Misterial Decree 16-06-1998. Designation of the BPZ of "off Apulian coasts"(Puglia) and "Jabuka Pit".
Montenegro	Act on Marine Fishery and Mariculture (OG 56/09) Order on Prohibition of Catch and Trade in Fish Juveniles, Undersized Fish and Other Marine Organisms (OG 08/11) Ordinance on construction–technical basis, mesh size, method of use and purpose of certain net types and other means for commercial fishing (OG 08/11)
Slovenia	Marine Fisheries Act 001-22-158/06 (2006) Decree on designation of the sea fishing area of the Republic of Slovenia, Uradni list RS, št. 2/06 Rules concerning marine sports fishing and submarine sports and recreational fishing, Uradni list RS, št. 69/03 in 64/08 Rules on the carrying-out of the assessment of risk to nature and on the obtaining of authorization, Ur.l. RS, št. 43/2002 Spatial Planning Act 001-22-45/07 (2007)
SHIPPING AND NAVIGATION	
Albania	Act no. 64/2012 of 31.5.2012 "On fishing"
Bosnia and Herzegovina	Internal and Maritime Navigation Act (OG 73/05) Decision on approval to protocol on the status of Port Authority Neum (OG 21/06)
Croatia	Maritime Code (OG 181/2004,76/2007, 146/2008, 61/2011, 56/2013) Maritime Domain and Seaports Act (OG 158/2003, 141/2006, 38/2009) Ordinance on the safety of maritime navigation in internal waters and territorial sea of the Republic of Croatia and the manner and conditions of supervision and management of maritime transport (GO 79/2013)
Italy	Navigation code (King Decree 327/1942, updated Law Decree 133/2014) Recreational Craft Code (Legislative Decree 171/2005 (implementation of Directive 2003/44/EC)
Montenegro	Act on Sea (OG 17/07, 06/08) Act on Maritime Demesne (OG 14/92) Act on Yachts (OG 46/07) Act on Ports (OG 51/08) Act on Marine Traffic Safety (OG 62/13)
Slovenia	Maritime code 001-22-31/01 (2001)
TOURISM AND RECREATION	
Albania	Decision No. 395, dated 21/6/2006 For the approval of strategy and action plan for the development of tourism, culture and environmental. Act no. 9734, of 14/5/2007 "On tourism".
Bosnia and Herzegovina	
Croatia	Ordinance on underwater activities (OG 47/1999, 23/2003, 28/2003, 52/2003 i 58/2003, 96/2010). Regulation on conditions for the arrival and stay of foreign yachts and boats intended for sports and leisure in internal waters and territorial sea of the Republic of Croatia (OG 97/2013).
Italy	Veneto Regional Laws 33/2002, 28/2012, 11/2013[34]
Montenegro	Act on Tourism (OG 61/10)
Slovenia	

[32] Act 963/65 and its amendments set up fishing regulations (Art. 15.1.c and Art. 24). The first protection for cetaceans and turtles in fishing activities is provided by Ministerial Decree 21-05-1980. Art. 98 of Presidential Decree 1639/68 allows the designation of Biological Protection Zones (BPZ, Zone di Tutela Biologica) that are fishery protection zones.

[33] There are several fishery protected/regulated areas within the Adriatic. Some are permanent, some temporary. All geographic boundaries are defined, as well as the type of activity that is forbidden inside them.

[34] They all include articles on 'pescaturismo' that could be used for launching and regulating eco-tourism trip.

Table 3.9. (continued) - National legislation on anthropogenic activities potentially affecting cetaceans and sea turtles conservation in the Adriatic region

DOMESTIC, MUNICIPAL, INDUSTRY, AGRICULTURE SEWAGE AND SOLID WASTE	
Albania	Act no. 9115, Date 27/4/2003 On the treatment of waste water Act no. 8905, Date 6/6/2002 On the protection of marine environment from pollution and habitat destroy Act no.9774, Date 12/7/2007 On the evaluation and administration of noise in the environment In reliance on article 78 and 83 paragraph 1 of the constitution Act no.10463, of 22/9/2011 "On integrated waste management", amended Decision of Council of Ministers No 246 of 30/04/2014 "On environmental quality norms for surface waters", which fully approximates Directive 2013/39/EU of the European Parliament and of the Council of 12 August 2013 amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy Decision of Council of Ministers No 267 of 7/05/2014 "On the list of priority substances", which fully approximates Directive 2013/39/EU
Bosnia and Herzegovina	Act on waste management (OG 33/03)
Croatia	Regulation on the manner of establishing environmental damage (OG 139/2008 Regulation on establishing a framework for action of the Republic of Croatia in the field of marine environment protection (OG 136/2011) Sustainable Waste Management Act (OG 94/2013) Contingency plan for accidental marine pollution (OG 92/2008) Ordinance on the handling of dangerous substances, conditions and ways of transport in maritime transport, loading and unloading of dangerous substances, loose and other load in the ports, and ways of prevention of spreading of leaked oils in ports (OG 51/2005, 34/2013, 88/2013) Ordinance on the management and control of ballast water (OG 128/2012) Maritime Domain and Seaports Act (OG 158/2003, 141/2006, 38/2009)
Italy	Waters Legislative Decree 152/99 Regional Laws
Montenegro	Act on Protection of the Sea from Pollution from Seafaring Vessels (OG 20/11) Act on Transport of Dangerous Materials (OG 05/08) Act on Ports (OG 51/08) Act on Protection of the Sea from Pollution from Seafaring Vessels (OG 20/11)
Slovenia	
MILITARY ACTIVITY	
Albania	Act no. 8875, Dated amended 04/04/2002 On the Albanian coast guard
Bosnia and Herzegovina	
Croatia	Coast guard of the Republic of Croatia Act (OG 109/2007) Regulations on access, passage and stay of foreign warships and scientific research ships in internal waters and territorial sea of the Republic of Croatia (OG 19/1995, 21/2003)
Italy	Decree of the President of the Republic 90/10 "Consolidated text of the regulations on military organization, in accordance with Article 14 of the Law of 28 November 2005, no. 246"
Montenegro	
Slovenia	Defence act 012-01/94-167 (1994)
COASTAL ENGINEERING & DEVELOPMENT OF THE COASTAL ZONE	
Albania	Decision For approval of priority areas for the development of tourism Pursuant to Act no. 7665, dated 21/01/1993 "on the development of the tourism priority areas" Decision No 420, date 17/8/1993 for the adaption of "Agreement on integrated management program for coastal areas in Albania" Act no. 9734, of 14/5/2007 "On tourism"
Bosnia and Herzegovina	
Croatia	Regulation on environmental impact assessment (OG 64/2008, 67/2009) Physical Planning and Building Act (OG 76/2007, 38/2009, 55/2011, 90/2011, 50/2012)
Italy	Law 431/85 (IT065) Legislative Decree 42/2004 (IT066)[35] Legislative Decree 112/98 Presidential Decree 616/77[36]
Montenegro	Act on Maritime Demesne (OG 14/92) Act on Ports (OG 51/08)
Slovenia	

[35] Article 1 of Act 481/85 and Art. 142 of the Legislative Decree 42/2004: The coastal area 300 m to the seashore is subject to planning restrictions and its development is under State control.
[36] The administration of the beach is transferred to the Regions (which in turn should transfer it to municipalities).

Table 3.9. (continued) - National legislation on anthropogenic activities potentially affecting cetaceans and sea turtles conservation in the Adriatic region

OFFSHORE OIL AND GAS	
Albania	Act no. 9946, Date 30/6/2008 On the natural gas In reliance on articles 78 and 83 of the constitution Act no.7746, Date 28/7/1993 On petroleum (exploration and production)
Bosnia and Herzegovina	Mining Act (OG 26/2010)
Croatia	Regulation on environmental impact assessment (OG 64/2008, 67/2009) Mining Act (OG 56/2013) Ordinance on the essential technical requirements, safety and security in research and exploitation of hydrocarbons from the seabed of the Republic of Croatia (OG 52/2010)
Italy	There are forty primary Laws regulating gas and oil exploitation (http://unmig.sviluppoeconomico.gov.it/unmig/norme/primarie.htm) and 105 secondary Laws (http://unmig.sviluppoeconomico.gov.it/unmig/norme/secondarie.htm)
Montenegro	Act on Hydrocarbon Research and Production (OG 41/10)
Slovenia	
(OFFSHORE) WIND POWER GENERATION	
Bosnia and Herzegovina	
Croatia	Physical Planning and Building Act (OG 76/2007, 38/2009, 55/2011, 90/2011, 50/2012) Islands Act (OG 34/1999, 149/1999, 32/2002, 33/2006)
Italy	Legislative Decree 387/03 "Implementation of Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market" Legislative Decree 28/11 "Implementation of Directive 2009/28/ EC on the promotion of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30 / EC"
Montenegro	
Slovenia	

Chapter 4 – Priority threats to Cetacean and sea turtle species in the Adriatic Sea and possible mitigation measures

4.1. Potential and measured threats for Cetaceans and Sea turtles in the Adriatic Sea

This chapter is not meant to be a thorough review on the existing potential and real threats to cetacean and sea turtle species. This chapter summarises some of the priority existing threats that were identified within the NETCET project. Other threats exists, but our focus has been on the main and measurable ones that can be adequately addressed in a reasonable time frame and with a reasonable financial implications. Addressing these NETCET chosen priorities should be considered only as the first step toward conservation of these protected species and not the ultimate objective. These priorities were selected after the analysis of the overall situation presented in previous chapters.

Cetaceans and sea turtles are potentially affected by all human activities. For this reason the Environmental Impact Assessment (EIA) is a fundamental tool for their conservation. Regardless of the legal or conservation designation of location where particular activities would be carried out the approach that EIA should always be carried should be adopted as large marine vertebrates use large areas as part of their homerange. Such evaluation should ensure inclusion of evaluation of the effects of any new proposed activity on regularly present cetacean species and populations. This approach is particularly important in the Adriatic region, an area characterised by a high level of anthropogenic activities, some of which are known to have a direct impact on cetacean and sea turtle species elsewhere, either at individual or population level.

This chapter summaries the main potentially harmful activities that need to be evaluated and managed in order implement and enhance the conservation of Adriatic cetacean and sea turtle species and populations. At least in all these fields, thorough EIAs should be carried out considering Adriatic cetacean and sea turtle species and populations.

Table 4.1 summaries the most important threats identified within the Adriatic Sea and tries to establish an "order of significance of threats to cetacean and sea turtle species".

Table 4.1 – Summary of main threats for cetacean and sea turtle species in the Adriatic Sea

Pressure	Type of threat	Extent	Threat category	Species affected	Source of information for the region
Fishery - bycatch	Direct mortality	Individual level Potential for population level	High ☹	All cetacean species All sea turtles	Casale et al. 2004; Lazar et al. 2004; Lazar et al. 2006; Casale et al. 2010; Fortuna et al. 2010; Fortuna & Filidei 2013
Marine debris	Direct mortality	Individual level (potential for population level)	Medium/High 😐/☹	All cetacean species All sea turtles	Pribanic et al. 1999; Casale et al. 2010; Lazar & Gracan 2011, Mazzariol et al. 2011
Seasonal tourism	Behavioural changes	Individual level and sub-population level	Medium 😐	Bottlenose dolphins Low impact on sea turtles	Fortuna 2006; Rako et al 2003; Casale et al. 2010;
Oil & gas exploitation	Behavioural changes, direct and indirect mortality	Individual level and sub-population level	Medium 😐	All cetaceans Possibly sea turtles	
Chemical pollution	Indirect and direct mortality	Individual level (direct mortality) Population level (indirect mortality)	Medium 😐	All cetacean species All sea turtles	
Fishery - depredation	Behavioural changes, direct mortality	Individual level and sub-population level	Low	Bottlenose dolphin	Casale & Giovanardi 2001
Biological pollution	Direct mortality	Individual level	Low	Bottlenose and striped dolphins, sperm whales	

In the following sections all details are given to explain the content of Table 3.1 which

The order of significance of threats to cetacean and sea turtle species was established by looking at the following factors:

- type of threat (direct and indirect mortality *vs.* behavioural changes);
- extent of the threat (individual *vs.* population level);
- number of species affected.

4.1.1 Assessed threats

4.1.1.1 Interactions with fisheries

Interactions with fisheries are considered one of the main issue for both cetacean and sea turtle species within the Adriatic region. Actual monitoring data are scarce and sparse and the only existing systematic monitoring programme is carried out as implementation of Regulation (EC) n. 812/2004. However this Regulation affects only one fishing gear within the Mediterranean: the mid-water/pelagic trawl. All other gears (bottom trawlers, gillnets, longlines) are not monitored. Therefore there is an urgent need for the development and implementation of coherent monitoring programme for both the GSA 17 and 18 and covering the most impacting fishing gears. Beside a coherent monitoring programme, based on the new information on the ecology of cetaceans and sea turtles, mitigation measures should be evaluated and applied as soon as possible (e.g. TEDs, time-space closures, alternative gears or gear use modification, etc.).

4.1.1.1.1. Fishery depredation by dolphins and culling campaigns

Historically, the interaction between dolphins and fishery in the Adriatic was acute, with fisheries reporting substantial losses in catch due to depredation by dolphins. During the 19th and 20th centuries a number of culling campaigns were organised by Austria, Italy, and ex-Yugoslavia. Bounties were paid for landed animals and in some case total numbers can be roughly inferred for some of these campaigns (Table 4.2).

Table 4.2 - Existing numbers on historical killings of dolphins in the Adriatic Sea

Period	Number of killed dolphins	Area	Source
1929	Unknown (rewards sufficient for 250-500 specimens)	Italian coasts (not only Adriatic Sea)	Italian Ministerial Decree (28 december 1928)
1933-35	at least 335 dolphins (167 specimens/yr)	Croatian coast	Crnkovic 1958
1955-60	788 dolphins (131 specimens/yr)	Croatian coast	Crnkovic 1958; Marelic 1961
1956-57	239 dolphins (120 specimens/yr)	Croatian coast	Crnkovic 1958

Although exact total numbers of killed dolphins are unknown, experts considered these to be substantial. Despite the lack of correct information on species, it is suggested that the short-beaked common dolphin and the bottlenose dolphins were the main targets.

An unknown number of dolphins were also caught in the northern Adriatic between 1964 and 1978 for live display in captive facilities.

Direct killings still occur in Croatia, Italy and Albania. According to the numbers of recovered animals such events seem rare (BWI, *unpublished data*; Italian stranding network data, Tab. 4.3), but anecdotal reports from open sea fisheries in Croatia and Albania indicate that some fishing boats use guns and explosive charges to kill and/or deter dolphins from the nets. These illegal cases are usually interpreted as fishermen's retaliation due to depredation. Net depredation on gillnets has been historically reported as serious issue along the north-western Italian coast, the Istrian peninsula and in the northern Dalmatian archipelagos. Depredation is also perceived as a severe problem in many shelf areas where bottlenose dolphins regularly follow mid-water and bottom trawlers. Dolphin monitoring project in central Adriatic Vis island area identified depredation on bottom trawls as acute in recent years and occasional check-up of the catch indicated potential substantial loss. Despite all these claims, within the Adriatic Sea there is only quantitative study on depredation, which includes the estimate of the economic loss ("*Opportunistic feeding of the bottlenose dolphin on trawl nets and gillnets in the northern Adriatic Sea*" by M. Casale & O. Giovanardi). This study estimate the impact of depredation on Catch Per Unit Effort (CPUE) on bottom trawlers - mostly targeting red mullet (*Mullus barbatus*), musky octopus (*Eledone spp.*), spiny dogfish (*Squalus acanthias*) and hake

(*Merluccius merluccius*) - and on gillnets targeting sole (*Solea vulgaris*). For the latter fishery the annual economic loss was estimated in range of about 9,000 Euro.

4.1.1.1.2. Cetacean bycatch in fishing gears (accidental mortality)

Little quantitative data exist on past or current cetacean bycatch rates in the Adriatic Sea. The only existing quantitative data on total bycatch and bycatch rates concern bottlenose dolphins accidentally caught in mid-water trawlers. The total estimate is 31 animals/year (CV=0.41) in the GSA 17 and 30 animals/year (CV=0.35) in the northern Adriatic (fishing grounds of boats harbouring in Emilia Romagna, Veneto and Friuli Venezia Giulia).

Additional indication of potential interactions between cetaceans and fisheries can be inferred from data collected along the Italian Adriatic coasts (1986-2014) by the national stranding network (http://mammiferimarini.unipv.it). Details on stranding accounts with some evidence of interaction are presented in Table 4.3.

Table 4.3. Report from the Italian national stranding network: data on fishery-related signs of interaction (1986-2014; source: http://mammiferimarini.unipv.it). Note that this table does not include 1991 data (*Morbillivirus* outbreak)

Area	*Evidence*	*Tursiops truncatus*	*Stenella coeruleoalba*	*Grampus griseus*	Unidentified small cetacean	Total events
North	Firearm	3	0	0	0	3
	Bycatch	13	0	1	0	14
	Presence of hooks	0	0	1	0	1
	Presence of nets	7	0	0	0	7
	Fishing gear marks	1	0	0	0	1
Central	Bycatch	12	3	0	2	17
	Presence of nets	10	0	0	1	11
	Fishing gear marks	2	0	0	1	3
South	Bycatch	11	21	2	6	40
	Presence of hooks	2	1	1	0	4
	Presence of nets	4	6	1	1	12
	Fishing gear marks	0	3	0	0	3
Specimens with signs of fishery-related interactions over total strandings		***65/575***	***34/133***	***6/20***	***11/206***	***116/959***

Please note that this table excludes 1991 data because of the unusual mortality caused by the Morbvillivirus outbreak. Strandings in 1991 (n=187) were as follow: 107 *Stenella coeruleoalba*, 40 *Tursiops truncatus*, 36 unidentified small odontocetes, two *Delphinus delphis*, one *Grampus griseus*, one *Balaenoptera physalus*).

Considering only the bottlenose dolphin data in Table 4.3, 10% of events suggesting interaction with fisheries were recorded in the north Adriatic, 11% in the central Adriatic and 14.5% in the southern Adriatic (about 10% when considering GSA 17 only). However, this description cannot be considered as an accurate picture of the real extent of these interactions, because full post-mortem examinations have been rarely carried out. It is

important to stress that only provided that full post-mortem examinations are carried out on most carcasses, strandings could be used as a useful tool to detect potential areas of concern for mortality induced by human activities. This is still not the case of data summarised in Table 4.3. It will also be important to elaborate and take into account Adriatic water currents and winds to analyse stranding patterns. This would be important to help discriminate potential hot spots of human-induced mortalities. This models would also help in the interpretation of genetic population structure of species inhabiting the Adriatic Sea.

4.1.1.1.2.1. NETCET data on cetacean bycatch in fishing gears (accidental mortality)

In the Adriatic Sea, causes of death related to fishing activities are among the most frequently reported for cetaceans. Here is a summary of evidence collected within the NETCET project:

- by-catch: in two years five bottlenose dolphins out of 22 examined died because of direct interactions with fishing gears (four in Italy and one in Slovenia).; Furthermore, four animals were observed alive entangled in fishing gear in Croatian waters. All events were reported in the northern Adriatic Sea, more frequently in late summer, after the stop of fishing activity (September/October).

  Conclusions were based on the direct findings (evidence of nets) and related pathological evidences as haemorrhages, pulmonary edema or amputation by fishermen (both anteand post-mortem). Furthermore, the absence of ongoing debilitating diseases and the evidences of a recent feeding were also very important for by-catch diagnosis. In previous years, interaction with fisheries were also reported, even if sporadically and in specific areas. In the first months of 2015, other three animals died entangled in fishing nets (one in Italy and two in Slovenia) confirming these observations.

  Furthermore, one bottlenose dolphin died for gastric impaction caused by ingestion of a large amount of nets (seven kgs): even if it could not be reported as by-catch it should be considered within accidental fisheries related causes of death.

  Considering strandings data in the Adriatic Sea, by-catch other fisheries related mortality appear the main threats for cetaceans, being the likely cause of death in the 27% of examined animals, mainly in the northern basin. Considering preservation of examined carcasses (generally stranded alive and in code 1-2 in eastern coastlines while along western shores mainly code 3 and 4 have been found) and marine currents, these animals could have died in the central and eastern part of the Adriatic.

- Direct takes (deadly or otherwise): since 2012 there has been several reports of individual cetaceans killed and/or injured. In particular, bottlenose dolphins were

observed killed and injured with a spearfishing harpoon and killed or injured with firearms. Although the number of killed and injured animals is not high and no increasing trend can be deduced from the data, such interaction indicate the need for additional monitoring and awareness activities.

4.1.1.1.3. Sea turtle bycatch in fishing gears (accidental mortality)

Bycatch is also one of the main threats for sea turtles world-wide, including in the Adriatic region. The highest number of bycatch events has been recorded in bottom trawlers followed by mid-water/pelagic trawlers. While there is no reliable data for gill-net or longlines, experts believe that mortality in these fishing gear is also high. Existing estimates of total bycatch of loggerhead turtles in the Adriatic Sea are provided in Tables 4.4 and 4.5.

Table 4.4. Annual estimates of bycatch of loggerhead turtles in the northern Adriatic Sea

Fishing gear	GFCM Fishing area	Species	Period	Total number (N, CV)	Source
Mid-water pair trawlers	Northern Adriatic (GSA 17 substratum)	*Caretta caretta*	1999-2000	161 (-)	Casale *et al.* (2004)
Bottom trawlers			1995	2,500 (ND)	Lazar & Tvrtković (1995)
			1999-2000	4,273 (ND)	Casale *et al.* (2004)

Table 4.5. Annual by-catch rates and estimates of loggerhead turtles in mid-water trawlers within GSA 17 (source: Fortuna *et al*. 2015)

Year	All bycaught animals			Comatose & dead only			Comatose&dead against total bycaught animals
	n events	Rate	Bycatch estimate	n events	Rate	Bycatch estimate	
2007	35	0.042	1939 (1730-2067); CV=0.22	2	0.002	111 (43-195); CV=0.69	6%
2008	23	0.014	474 (402-523); CV=0.27	2	0.001	41 (402-523); CV=0.67	9%
2009	19	0.029	1276 (1030-1450); CV=0.30	1	0.002	67 (13-179); CV=0.99	5%
2010	29	0.014	595 (538-631); CV=0.21	2	0.001	41 (18-69); CV=0.67	7%
2011	18	0.011	395 (312-448); CV=0.31	1	0.001	22 (5-55); CV=0.95	6%
2012	34	0.017	671 (628-699); CV=0.17	1	0.001	20 (5-49); CV=0.95	3%
2013	49	0.031	1274 (1194-1323); CV=0.17	10	0.007	260 (195-309); CV=0.36	20%

Note: Estimates with CV >> 0.3 are considered not reliable for management advice.

4.1.1.2. Gas & Oil exploration and exploitation

The Adriatic Sea is a region well known for intensive exploration and exploitation of hydrocarbon resources (see section 1.3.3). Beside the fact that this type of exploitation is considered extremely controversial by environmental groups, several aspects of these

activities are known to represents a threat to cetaceans, particularly to beaked whales.

The most notable direct pressure comes from seismic surveys, which are research activities aimed at understanding the hydrocarbon distribution under the sea bed. In addition, testing, drilling, and rig construction are considered sources of significant acoustic pollution. Although chemical pollution is known to have an indirect effect on cetacean species health, in this report are not considered all aspects of chemical pollution during normal operations of the platforms.

During seismic surveys and other activities related to hydrocarbon exploitation, the range of impacts of the high-intensity and persistent types of noise can vary from physical/physiological effects to direct and indirect behavioural changes potentially leading to direct and indirect mortality.

Physical/physiological effects can include hearing threshold shifts and auditory damage as well as disruption to non-auditory tissues. These effect can be directly caused by sound exposure or be the result of sudden behavioural changes in response to sounds (for example, recent observations suggesting that exposure to loud noise may result in decompression sickness in beaked whales). Behavioural responses, including startle, avoidance, changes in behaviour and vocalisation patterns, have been observed in both mysticetes and odontocetes, and in some case these have occurred at relatively long ranges. Finally, potential biological effects of air gun noise also include indirect effects associated with altered prey availability.

So far the biological and behavioural significance of these observed effects has not been measured nor direct physical and physiological injuries proven for air guns. However, if operations are not properly managed, the cumulative effects at the population level may lead to serious long-term consequences due to chronic exposure. A precautionary approach is necessary with the aim of minimising the impact. Environmental Impact Assessments, mitigation measures and systematic monitoring (pre-, during and post-exposure) should be established as components of a coherent management strategy for the Adriatic region.

The long term impact of operating gas and oil rigs on marine communities are relatively unknown. Studies show that after initial damage (during construction and drilling) to benthic communities they recover with impact visible in a limited zone. Waste produced during drilling with high levels of hydrocarbons has largely negative impact on the surrounding environment including acute and chronic toxicity.

In terms of international policy on this issue, the “Guidelines to address the impact of anthropogenic noise on cetaceans in the ACCOBAMS area” are the guiding document. Moreover, the ACCOBAMS Scientific Committee has recently called for the deployment of visual and acoustic marine mammal observers empowered to shut-down airguns when

cetaceans are detected within the prescribed zone. It also urged that duplicate surveys be avoided across same areas; that efforts should be made to avoid ensonifying adjacent areas simultaneously and that full and transparent Environmental Impact Assessments be carried out.

Concerning Adriatic cetaceans, a study carried out in the gas field off Ravenna between 2001 and 2005 provided the first information on the common bottlenose dolphin behaviour near these gas platforms. The results showed that dolphin density was higher within 750 m of gas platforms than further away. Dolphins were also spending more time feeding and milling closer to the gas platforms. As one of the reason for such behaviour authors indicated possibility that due to fishing exclusion in the surrounding gas platforms aggregate larger number of prey.

4.1.1.2.1. NETCET data on evidence of mortalitiy caused by military sonars, seismic surveys and other related sound sources

There is no clear evidence of stranding events caused or related to naval exercises involving sonars within the Adriatic Sea. These military activities involving submarines are usually not performed in the Adriatic given its bathymetry. Instead they are regularly carried out in the Ionian Sea, as the one that in 2011 was related to the mass stranding of nine beaked whales along Corfù and Calabrian coasts, with evidences of gas and fat embolic syndrome, which are likely linked to mid-frequency sonar emissions.

Concerning potential effects of seismic surveys on cetaceans populations, despite the fact that airguns have been suggested to be associated to several stranding events, no pathological evidence has been found by post-mortem examinations that could be related to the use of this technique. This also applies to the recent two mass strandings of sperm whales occurred in 2009 and 2014 along the central and southern Adriatic Italian coastline. In addition, no acoustic traumas were detected during necropsies carried out on small odontocetes found dead along Adriatic coastlines.

Besides, the responding to the need for more investigations on this issue in Adriatic waters, This endeavor is made even more complicated by the fact that no clear or official information on timing and spatial coordinates of ongoing seismic surveys is available to assess potential spatial and temporal association between the use of airguns and cetacean strandings.

4.1.1.3. Seasonal tourism

Tourism is one of the most important economic activity in the region. The seasonal nature of nautical tourism makes its impact really important especially in coastal areas. While collisions between boats and cetaceans are believed to be rare in this region, both physical and acoustic disturbance is known to play a significant role in displacing populations in the summer season. Work undertaken in the eastern archipelago of Cres-Lošinj suggests that the

increase in sea ambient noise, related to the exponential increase in leisure boating in the summer months, acts as a trigger to displace the local population of common bottlenose dolphins in the region (Fig. 4.1).

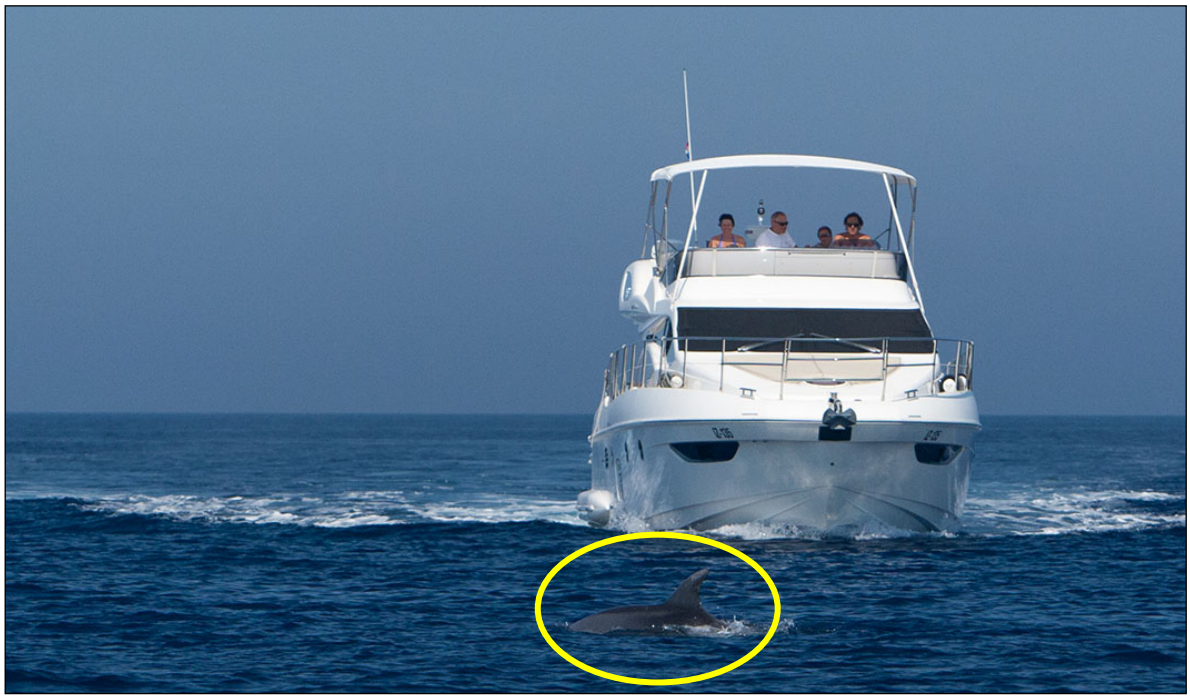

Figure 4.1. A typical wrong behaviour by boaters: a yacht approaching group of common bottlenose dolphins in Croatian Adriatic (Photo: D.Holcer, BWI).

Boat collision with cetaceans in the Adriatic are seldom reported. The source of potential concern could be dramatic increase of leisure boat traffic during summer months particularly in the coastal areas. In over 20 years of regular surveys of coastal communities of common bottlenose dolphins only on a single occasion was an animal observed with healed wounds potentially inflicted by propeller has been encountered (*BWI unpublished data*). On one occasion a body of Cuvier's beaked whale with the caudal part of the body cut-off was washed on the beach in near Giancole in 2003 indicating potential collision with larger vessel. However, it was impossible to conclude whether animal was alive or dead at the time of collision. Collision with larger vessels is highly unlikely as bottlenose dolphins and striped dolphins are usually taking advantage of the large ships for bow-riding (Fig. 4.2).

4.1.1.3.1. NETCET data on cetacean collisions

Cases of cetaceans dead for collisions with vessels has not been reported in the Adriatic Sea during the period 2013-2014 nor in previous years. Occasional reports has been insert in the Italian Stranding Database, but no post-mortem examinations were performed to confirm it or otherwise with specific forensic techniques.

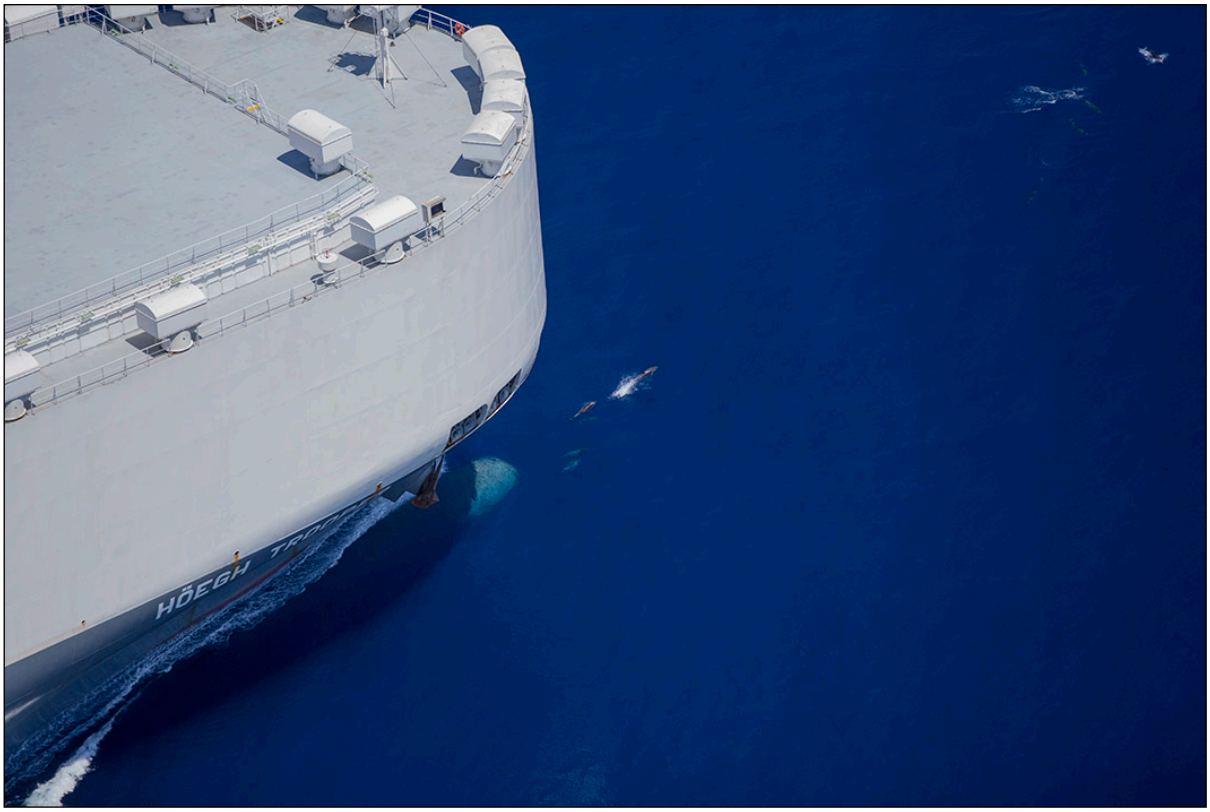

Figure 4.2. Striped dolphins bowriding in front of the cargo ship, southern Adriatic Sea. (Photo: D.Holcer, BWI)

Collision with fast moving vessels is an issue of some concern for sea turtles too. There have been reports of collisions between leisure boats (particularly speedboats) and sea turtles resting near the surface in the region. While numbers are not considered to be high this is an aspect that should be considered in the future given the increasing numbers of fast moving leisure boats in the Adriatic region.

In conclusion, unmanaged seasonal tourism have potential impacts at different levels: i) it increases the likelihood of collision; ii) it increases the acoustic pollution in the water and iii) it triggers behavioural changes (including avoidance of given areas).

4.1.2 Indirect threats

There are a number of indirect threats to cetacean and sea turtle species in the Adriatic region. Most of them are related to some sort of pollution.

4.1.2.1. Chemical pollutants

Chemical pollutants are introduced at sea thought a number of means: maritime traffic of all sorts, rivers inflow, coastal sewage systems, accidental coastal dispersion of plastic debris, gas and oil platforms (including LNG terminals), underwater pipelines, etc. This chapter has not considered this issue as this threat in terms of management it is ranked as a medium priority.

However, it is worth considering that the full extent of impact of, for example, LNG terminals on the local marine environment are yet not known. Currently there is an ongoing investigation on the Rovigo LNG terminal as it is constantly producing a foam of unknown origin which invades the sea surface for few hundred meters radius around this terminal.

4.1.2.2 Marine debris

Marine debris is proven to have a widespread negative impact on marine wildlife, including cetaceans and sea turtles inhabiting the Adriatic Sea. Pribanić and collegues (1999) found in a stomach of a striped dolphin stranded in the northern Adriatic different kinds of plastic material (approximately 1.5 litre), including plastic and garbage bags, a rubber glove and cellophane wrapping. Lazar and colleagues (2011a) examined the occurrence of marine debris in the gastrointestinal tract of 54 loggerhead sea turtles (*Caretta caretta*) found stranded or incidentally captured by fisheries in the Adriatic Sea. Marine debris was present in 35.2% of turtles and included soft plastic (68.4% of cases), ropes (42.1%), Styrofoam (15.8%) and monofilament lines (5.3%). Considering the relatively high occurrence of debris intake and possible sub-lethal effects of even small quantities of marine debris, the Authors concluded that this seems an additional factor of concern for loggerheads in the Adriatic Sea.

4.1.2.3 Biological pollution

Along the heavily anthropic Adriatic coastline, in some cases, there have been evidence of high levels of faecal contamination, likely caused by river flows. Faecal bacteria and protozoa (namely *Toxoplasma gondii*) can be transported to the marine environment by run-off waters, after prolonged rainy periods or directly by inappropriate sewage systems lacking of proper depuration systems. Evidence of cetacean strandings related to endotoxic/septicaemic shock caused by faecal pathogens are increasing, as well as reports of *T. gondii* infections and toxoplasmosis. For instance, in the last ten years the prevalence of this protozoa - a parasite living in feline intestine - have been reported several times in bottlenose and striped dolphins (about 10%) and sperm whales stranded along the Adriatic coastline.

4.1.3. Fundamental aspects of an Adriatic Conservation Plan for Cetaceans

Table 4.6 summarises some of the fundamental aspects of an Adriatic Conservation Plan for Cetaceans for what concerns: i) the mitigation and management of mortality caused by fisheries (bycatch issue); and ii) the prevention of habitat degradation with the purpose of maintaining populations at a viable level and preventing fragmentation. These letter issue that should be considered in relation to the mitigation of all anthropogenic activities in the region affecting cetaceans welfare. These activities include: fishery overexploitation, physical

impact of fisheries on habitats, oil and gas exploitation, heavy maritime traffic, recreational traffic and coastal development.

A thorough Conservation Plan will need to assess the real impact of these potential pressures at the population level, at least for those species that are regular in the Adriatic Sea.

Table 4.6 – Fundamental elements for an Adriatic Conservation Plans for cetacean and sea turtle species

Long-term conservation objectives	Management objectives	Actions to be taken (Prioritised: High, Medium, Low)
• Maintenance of the species in the Adriatic region (distribution, abundance & genetic flow)	• To take all necessary measures to eliminate deliberate killings	H: Control of the compliance with the existing laws
	• Estimation of population size and trends	H: International coordination of Adriatic stranding networks and tissue banks H: Development of international coordinated systematic research & monitoring programmes H: Implementation of a periodical Adriatic snapshots on abundance M: Use of a pilot marine park (for example Natura 2000 network) for monitoring programmes on population dynamics and implement coherent management in existing protected areas M: Networking of existing Adriatic projects
• Maintenance or restore of habitat quality (food resources availability & pollution)	• To minimize adverse effect of fishing activities on the conservation status of cetaceans and sea turtles	H: Systematic monitoring programmes on by-catch and depredation H: Implementation of mitigation measures M: Systematic analysis of stomach contents, stable isotopes, fatty acids M: Overview on existing data on fish abundance L: Identification of case studies for modelling competition for resources
	• To establish an Adriatic framework for Environmental Impact Assessments (EIA) on any new activity that may affect cetaceans and sea turtles, establishing conditions under which such activities may be conducted	H: Approval of a cetacean and sea turtles risk assessment module to be included in the standard EIA procedure
• Maintenance of the species in the region (distribution, abundance & genetic flow)	• Establishment and management of protected areas for cetacean and sea turtle species	H: Designation of new MPAs of ecologically meaningful size (including fisheries reserves) H: Planning of coordinated research activities on sensitive topics (for example, depredation or unsustainable nautical traffic) in MPAs M: Definition, implementation or update of Management Schemes including cetaceans and sea turtles issues
• Maintenance or restore of habitat quality (food resources availability & pollution)	• Fight against pollution (chemical, physical and acoustic)	H: Control of the compliance with the existing laws against pollution H: Improvement of existing sewage systems M: Monitoring of acoustic pollution in highly used areas
	• International co-ordinated measures to achieve and maintain a favourable conservation status for cetacean and sea turtle species in the Adriatic sea	H: Multilateral agreement for research and monitoring on cetaceans and sea turtles in the Adriatic sea H: Approval of Adriatic Conservation Plans for on cetaceans and sea turtles

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