

Monitoring Factsheet: Non-Indigenous Species

October 2015

1. Subject: Non-Indigenous Species

'Non-indigenous species' (NIS) or 'alien species' as defined in Olenin *et al.* (2010)¹ are species, subspecies or lower taxa introduced outside of their natural range and outside of their natural dispersal potential. This includes any part, gamete or propagule of such species that might survive and subsequently reproduce. Their presence in the given region is due to intentional or unintentional introduction resulting from human activities. Natural shifts in distribution ranges e.g. due to climate change or dispersal by ocean currents, do not qualify a species as a NIS. However, secondary introductions of NIS from the area(s) of their first arrival could occur without human involvement due to spread by natural means.

'Invasive alien species' (IAS) means an alien species whose introduction or spread has been found to threaten or adversely impact upon biodiversity and related ecosystem services.

According to the latest regional review (Zenetos *et al.* 2012)² more than half of the marine NIS in the Mediterranean Sea were probably introduced via corridors (mainly the Suez Canal). Shipping is the second most common pathway of introduction, followed by aquaculture and aquarium trade.

¹ Olenin, S.; Alemany, F.; Cardoso, A.C.; Gollasch, S.; Gouletquer P.; Lehtiniemi, M.; McCollin, T.; Minchin, D.; Miossec, L.; Occhipinti Ambrogi, A.; Ojaveer, H.; Rose Jensen, K.; Stankiewicz, M.; Wallentinus, I. & Aleksandrov, B. (2010). Marine Strategy Framework Directive Task Group 2 Report – Non-indigenous species. Publications Office of the European Union, Luxembourg. EUR 24342 EN – 2010.

² Zenetos, A. *et al.* 2012. Alien species in the Mediterranean Sea by 2012. A contribution to the application of European Union's Marine Strategy Framework Directive (MSFD). Part 2. Introduction trends and pathways *Mediterranean Marine Science*; **13**(2): 328-352.

2. Monitoring Requirements

2.1. Marine Strategy Framework Directive – MSFD (2008/56/EC)

2.1.1. Annex III characteristics/pressures/impacts

The MSFD calls for an assessment of the environmental status based on a list of characteristics listed in Table 1 of Annex III to the Directive, and pressures and impacts listed in Table 2 of the same Annex.

Implementation of this monitoring factsheet will contribute to the compilation of an inventory of the temporal occurrence of non-indigenous species as per Table 1 of Annex III and address the following pressure listed in Table 2: ‘biological disturbance – introduction of non-indigenous species and translocations’. The monitoring factsheet will also contribute to the compilation of an inventory of the occurrence, abundance and spatial distribution of non-indigenous species within specific taxonomic groups.

2.1.2. Annex I Good Environmental Status Descriptors

MSFD Annex I descriptors of Good Environmental Status and the associated criteria and indicators established by MSFD Commission Decision 2010/477/EU of relevance to the achievement of GES in terms of non-indigenous species, and which will be addressed by this monitoring factsheet, are listed hereunder:

- 2.1. Abundance and state characterisation of non-indigenous species, in particular invasive species
 - Trends in abundance, temporal occurrence and spatial distribution in the wild of non-indigenous species, particularly invasive non-indigenous species, notably in risk areas, in relation to the main vectors and pathways of spreading of such species (2.1.1)
- 2.2. Environmental impact of invasive non-indigenous species
 - Ratio between invasive non-indigenous species and native species in some well studied taxonomic groups (e.g. fish, macroalgae, molluscs) that may provide a measure of change in species composition (e.g. further to the displacement of native species) (2.2.1)

2.2. Regulation of the European Parliament and of the Council on the prevention and management of the introduction and spread of invasive alien species (IAS Regulation)

This regulation sets out rules to prevent, minimise and mitigate the adverse impact on biodiversity of the introduction and spread within the Union, both intentional and unintentional, of invasive alien species (Article 1). This regulation distinguishes between IAS of “Union Concern” (Article 4), IAS of “regional concern and species native to the Union” (Article 11) and IAS of “Member State Concern (Article 12).

‘Invasive alien species of Union concern’ means invasive alien species whose adverse impact has been deemed such as to require concerted action at Union level pursuant to Article 4(3); ‘invasive alien species of Member State concern’ means an invasive alien species other than an invasive alien species of Union concern, for which a Member State considers on the basis of scientific evidence that the adverse impact of its release and spread, even where not fully ascertained, is of significance for its territory, or part of it, and requires action at the level of that Member State.

Member States may establish a national list of invasive alien species of Member State concern. For those invasive alien species, Member States may apply the various provisions of the regulation including surveillance. Member States are required to establish a surveillance system of invasive alien species of Union concern, or include it in their existing system, within 18 months of the adoption of the Union list (Article 14). This system would collect and record data on the occurrence in the environment of invasive alien species by survey, monitoring or other procedures to prevent the spread of invasive alien species into or within the Union.

Surveillance systems should imply paying continuous attention to any new invasive alien species anywhere in the EU and aim to provide an effective and complete picture at Union level. The surveillance system shall:

- cover the territory, including marine territorial waters, of the Member States to determine the presence and distribution of new as well as already established invasive alien species of Union concern;
- be sufficiently dynamic to detect rapidly the appearance in the environment of the territory or part of the territory of a Member State of any invasive alien species of Union concern, whose presence was previously unknown;
- build upon, be compatible with, and avoid duplication of relevant provisions for assessment and monitoring laid down by Union law or under international agreements and make use of the information provided by the existing systems of surveillance and monitoring set out in Article 11 of Directive 92/43/EEC³, Article 8 of Directive 2000/60/EC⁴ and Article 11 of Directive 2008/56/EC⁵;

³ Habitats Directive

⁴ Water Framework Directive

⁵ Marine Strategy Framework Directive

- take into account the relevant transboundary impact and transboundary features, to the extent possible.

Member States shall use the surveillance system to confirm early detection of the introduction or presence of invasive alien species of Union concern (Article 16). The Commission, should be notified in writing of the early detection of the introduction or presence of invasive alien species of Union concern and inform the other Member States, in particular of:

- the appearance on their territory or part of their territory of any species included on the Union list whose presence was previously unknown in their territory or in part of their territory;
- the re-appearance on their territory or part of their territory of any species included on the Union list after it has been reported as eradicated.

Member States shall, when complying with their obligations under this Regulation, make every effort to ensure close coordination with all Member States concerned and, where practical and appropriate, use existing structures arising from regional or international agreements. In particular, Member States concerned shall endeavour to ensure coordination with other Member States that share inter alia the same marine subregions in accordance with Article 4(2) of Directive 2008/56/EC, regarding marine species (Article 22 of the EU IAS Regulation).

2.3. Barcelona Convention and the Ecosystem Approach

The principal aim of the Barcelona Convention and its protocols is to reduce pollution in the Mediterranean Sea and to protect and improve the marine environment in the area, thereby contributing to its sustainable development. The Barcelona Convention/MAP are working towards an Integrated Monitoring Programme and an Integrated Policy of Assessments to be established by 2015. The Integrated Monitoring Programme should be able to provide all the data needed to assess whether 'Good Environmental Status' defined through the EcAp process⁶ has been achieved or maintained⁷.

2.4. Convention on Biological Diversity

The Convention on Biological Diversity addresses IAS as a cross-cutting issue. Article 8(h) of the Convention text requires that each contracting Party, as far as possible and as appropriate, prevents the introduction of, controls or eradicates those alien species which threaten ecosystems, habitats or species. In addition, under the framework of the Biodiversity Strategic Plan 2011 to 2020, Aichi Target 9 states that "By 2020, invasive alien species and pathways are identified and prioritised, priority species are controlled or eradicated, and measures are in place to manage pathways

⁶ Ecosystem-based approach undertaken as part of the Barcelona Convention.

⁷ UNEP/MAP 2014. Draft Monitoring and Assessment Methodological Guidance, 4th meeting of the EcAp Coordination Group UNEP(DEPI)/MED WG.401/3

to prevent their introduction and establishment.”⁸ COP Decision VI/23 includes guiding principles for the prevention, introduction and mitigation of impacts of alien species that threaten ecosystems, habitats or species⁹. Guiding principle 5 on Research and monitoring recognizes that these are required not only to develop an adequate knowledge base to address the problem but are also key to early detection of new invasive alien species. Monitoring should include both targeted and general surveys, and benefit from the involvement of other sectors, including local communities. Research on an invasive alien species should include a thorough identification of the invasive species and should document: (a) the history and ecology of invasion (origin, pathways and time-period); (b) the biological characteristics of the invasive alien species; and (c) the associated impacts at the ecosystem, species and genetic level and also social and economic impacts, and how they change over time.

2.5. Bern Convention

Parties to the Bern Convention are required to Parties “to strictly control the introduction of non-native species” (Article 11.2.b). The European Strategy on Invasive Alien Species adopted under the framework of the Convention similarly addresses research and monitoring¹⁰. Monitoring that is systematic helps build an understanding of the ecological, distribution, patterns of spread and responses of IAS to management.

⁸ <http://www.cbd.int/doc/strategic-plan/targets/T9-quick-guide-en.pdf>

⁹ <http://www.cbd.int/decision/cop/default.shtml?id=7197>

¹⁰ http://www.coe.int/t/dg4/cultureheritage/nature/bern/ias/Documents/Publication_Strategy_en.pdf

3. Targets

This section includes targets set by policies in relation to non-indigenous species.

Implementation of this monitoring factsheet will facilitate achievement of the targets adopted by Malta as part of the EU Marine Strategy Framework Directive. Such monitoring may also apply in assessing progress towards targets articulated through other processes.

| Policy | Status to be achieved | Targets |
|-------------------------------------|--|--|
| Marine Strategy Framework Directive | <p>Good Environmental Status: The introduction and establishment of new invasive non-indigenous species as a result of human activities is, in so far as practicable prevented.</p> | <p>Efforts are undertaken to detect the occurrence of new NIS in defined assessment areas and to address gaps in knowledge on non-indigenous species, particularly invasive NIS.</p> |
| Barcelona Convention: ECAP Process | <p>Operational Objective: Invasive non-indigenous species introductions are minimized</p> <p>Indicator: Spatial distribution, origin and population status (established vs. vagrant) of non-indigenous species</p> <p>Good Environmental Status defined as: Introduction and spread of NIS linked to human activities are minimised, in particular for potential IAS</p> | <p>State The number of species and abundance of IAS introduced as a result of human activities is reduced.</p> <p>Pressure/Response - Improved management of the main human related pathways and vectors of NIS introduction (Mediterranean Strategy for the management of ballast waters, Aquaculture early warning systems, etc.)</p> <p>- Action plans developed to address high risk NIS, should they appear in the Mediterranean.</p> |

| | | |
|--|--|---|
| | <p>Operational Objective: Invasive non-indigenous species introductions are minimized</p> <p><i>Common Indicator¹¹:</i> <i>Trends in abundance, temporal occurrence and spatial distribution of non-indigenous species, particularly invasive, non-indigenous species, notably in risk areas (in relation to the main vectors and pathways of spreading of such species).</i></p> <p>Good Environmental Status defined as: Decreasing abundance of introduced NIS in risk areas</p> | <p>State Abundance of NIS introduced by human activities reduced to levels giving no detectable impact</p> |
| | <p>Operational Objective: The impact of non-indigenous particularly invasive species on ecosystems is limited</p> <p>Indicator: Ecosystem impacts of particularly invasive species</p> <p>Good Environmental Status defined as: No decrease in native species abundance, no decline of habitats and no change in community structure that have been generated by IAS via competition, predation or any other direct or indirect effect.</p> | <p>Pressure/Response Impacts of NIS reduced to the feasible minimum</p> |
| | <p>Operational Objective: The impact of non-indigenous particularly invasive species on ecosystems is limited</p> <p>Indicator: Ratio between non-indigenous invasive species and native species in some well-studied taxonomic groups¹²</p> <p>Good Environmental Status defined as: Stable or decreasing proportion of NIS in the different habitats</p> | <p>State To be set upon species choice and their related impact degree of the invasive upon the indigenous ones, taking into account the role of Climate Change in accelerating the establishment of NIS populations.</p> |

¹¹ UNEP/MAP 2014. Working document on Common Indicators for the Mediterranean. Integrated Correspondence Groups of GES and Targets Meeting, Athens (Greece), 17-19 February 2014, UNEP(DEPI)/MED WG.390/3

¹² Feasibility of this indicator to be addressed by COP19.

4. Competent Authorities

| Policy | Competent Authority |
|----------------------|---|
| MSFD | Office of the Prime Minister (delegation of technical implementation to the Malta Environment and Planning Authority) |
| Barcelona Convention | Malta Environment and Planning Authority |

5. Spatial Extent of monitoring requirements

| Policy | Extent of marine waters |
|----------------------|--|
| MSFD | Extent of waters to be monitored depends on relevance and established GES and targets. |
| Barcelona Convention | Regional |

6. Monitoring Approach

This monitoring factsheet includes four monitoring subprogrammes listed hereunder:

| Monitoring sub-programme | Title | Monitoring Purpose |
|--------------------------|---|--------------------|
| 1 | Non-indigenous species – occurrence in MPAs | Pressure |
| 2 | Non-indigenous species – occurrence in hotspots | Pressure |
| 3 | Non-indigenous species – abundance within specific taxonomic groups | Pressure |
| 4 | Information on relevant anthropogenic activities | Activities |

Non-indigenous species should be subject to both surveillance¹³ and monitoring processes - this monitoring factsheet encompasses both processes.

Monitoring is focused on recording the occurrence of non-indigenous species (NIS) in hotspots and sensitive areas in Malta. This will enable assessment of trends in temporal occurrence of NIS as well as ratio between invasive alien species and native species.

¹³ refers to the process of deliberately searching for the occurrence (presence/absence) of alien or invasive species.

The factsheet also builds on other monitoring regimes with a view to assess abundance of NIS in specific taxonomic groups. Detailed assessment of abundance of invasive alien species (IAS) will only be considered once further knowledge on the occurrence, distribution and impact of selected IAS is adequate enough to enable elaboration of monitoring processes in this regard.

Monitoring of non-indigenous species is concentrated in sensitive areas, namely Marine Protected Areas which are deemed sensitive to the introduction of NIS, and hotspots, namely harbours which are considered to be the main points of entry in view of shipping activities¹⁴.

Selection of monitoring areas was based on an assessment of records of non-indigenous species as reported by the MSFD Initial Assessment and other records by the MedPAN North project¹⁵. Sites with records of NIS >6¹⁶ as per MSFD IA and sites with relatively higher records of invasive alien species as per MedPAN North project are listed in Table 1. Selection of monitoring areas for the purpose of this monitoring factsheet was based on both NIS and IAS records.

6.1. Building on other initiatives

- The implementation of this monitoring factsheet should ensure links with related and ongoing initiatives such as the CIESM Tropical Signals programme in which the Marine Ecology Research Group (University of Malta) is currently participating¹⁷. This programme focuses on the detection and monitoring of a number of indicator species likely to be affected by the ongoing warming trend of Mediterranean waters; such indicators include a number of non-indigenous species in Maltese waters."
- Mechanisms may also be explored as to how volunteers can be involved in monitoring non-indigenous species. Such process can build on the methodologies established by the MedPAN North project¹⁸, run under the European Union Programme Med. This project studied the presence of invasive alien species in local marine protected areas also by inviting stakeholders, mainly divers to participate on a voluntary basis.

¹⁴ Noting however that in accordance with the MSFD Initial Assessment, NIS in Malta are in the majority of cases, Lessepsian migrants from the Suez Canal

¹⁵ Programme MED – MEDPAN North - Cohesion Policy 2007 – 2013 - Europe in the Mediterranean (2013). Monitoring of Invasive alien species in the Maltese Marine Protected Areas. Report of Survey.

¹⁶ An arbitrary cut-off point used by the MSFD Initial Assessment to distinguish localities with higher NIS records.

¹⁷ http://www.um.edu.mt/science/biology/staff/profpatrickschembri/non-indigenous_marine_species_as_indicators_of_change_in_the_marine_environment

¹⁸ Programme MED – MEDPAN North - Cohesion Policy 2007 – 2013 - Europe in the Mediterranean (2013). Monitoring of Invasive alien species in the Maltese Marine Protected Areas. Report of Survey.

Table 1: Records of non-indigenous species, and specific invasive non-indigenous species, in Maltese localities

| | Records of established invasive NIS as per MSFD Initial Assessment within localities where NIS record is >6 | | | | | | Records of NIS in MPAs surveyed as part of MEDPAN ¹⁹ . Shaded fields refer to additional records in same locality as per MSFD Initial Assessment. | | | | | |
|--|---|-----------------|----------|--------------------|--------|----------------------|--|-------|----------|--------------------------|------------|---------------------------------|
| Agglomeration of localities where records of invasive NIS are available into areas → | M'Xlokk harbour area | | | Grand Harbour Area | | | Northeastern MPA ²⁰ | | | Filfla MPA ²¹ | | Rdum Majjiesa MPA ²² |
| Established invasive species with a high/moderate abundance as per MSFD Initial Assessment ↓ | Marsaxlokk Bay | Birżebbugia Bay | Delimara | Grand Harbour | Sliema | I-Ahrax tal-Mellieħa | Pembroke | Qawra | Ċirkewwa | Żurrieq | Għar Lapsi | Gnejna |
| <i>Caulerpa racemosa</i> | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| <i>Lophocladia lallemandii</i> | | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| <i>Womersleyella setacea</i> | | | ✓ | | | ✓ | | | | | | |
| <i>Percnon gibbesi</i> | | ✓ | | | ✓ | ✓ | ✓ | | ✓ | | ✓ | |
| <i>Brachidontes pharaonis</i> | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | |
| <i>Siganus luridus</i> | | | ✓ | ✓ | | | ✓ | ✓ | | ✓ | ✓ | |
| <i>Sphoeroides pachygaster</i> | | | | | | | | | | | | |
| <i>Fistularia commersonii</i> | ✓ | ✓ | | | | | ✓ | ✓ | ✓ | ✓ | | |
| Records of NIS, (including invasive NIS) as listed in MSFD Initial Assessment | 9 | 9 | 7 | 9 | 7 | 6 | 2 | 3 | 4 | 3 | 5 | 2 |
| Total number of invasive NIS recorded within the area (MSFD Initial Assessment & MEDPAN) | 3 | 4 | 5 | 2 | 3 | 3 | 6 | 5 | 5 | 4 | 5 | 1 |

¹⁹ Programme MED – MEDPAN North - Cohesion Policy 2007 – 2013 - Europe in the Mediterranean (2013). Monitoring of Invasive alien species in the Maltese Marine Protected Areas. Report of Survey.

²⁰ MT0000105 Marine area in the Northeast of Malta as per GN 851 of 2010

²¹ MT0000102 Marine area in the limits of Għar Lapsi & Filfla as per GN 851 of 2010

²² INT025 Rdum Majjiesa to Ras-ir-Raħeb MPA as per GN 112 of 2007

7. Assessment of status

Assessment of status with respect to non-indigenous species is based on the following parameters as per guidance provided by UNEP/MAP (2014)²³:

- Number of new non-indigenous species recorded in comparison with those recorded in the previous year:
 - a positive trend would indicate that new species are introduced into the area and call for management on the basis of the pathway with which the species were introduced;
 - stable or negative trends are desirable;
- Trends²⁴ in the total number of non-indigenous species over time:
 - stable or negative trends are desirable;

²³ UNEP/MAP 2014. Draft Monitoring and Assessment Methodological Guidance, 4th meeting of the EcAp Coordination Group UNEP(DEPI)/MED WG.401/3

²⁴ at least three years of data per location should be available in order to calculate the trend indicator;

8. Monitoring sub-programme 1: *Non-indigenous species – occurrence in MPAs*

8.1. Monitoring Parameters

Table 2: List of parameters to be monitored in selected Marine Protected Areas

| Parameter | MSFD | EcAp |
|--|------|------|
| Number of non-indigenous species recorded | ✓ | ✓ |
| Number of newly arrived non-indigenous species | ✓ | ✓ |

8.2. Monitoring methodologies

- Underwater surveys are undertaken to monitor the occurrence and distribution of invasive species in selected localities in line with the methodologies outlined in Otero *et al.* (2013)²⁵;
- Linear transects²⁶ perpendicular to the shoreline and representative of the habitats, depth ranges and substrates within the MPAs are identified. The location of each transect is identified by GPS coordinates.
- Non-indigenous species encountered up to five meters on either side of transect are recorded, counted and geo-referenced
- Although no specific assessment of abundance will be undertaken at this stage, an indication of abundance of non-indigenous algae and other sessile organisms may be estimated using the Braun-Blanquet scale. For non-indigenous fish species, the number of individuals as well as the size may be recorded to enable estimation of fish biomass from size data.
- Observations are made on potential impacts of Invasive Alien Species²⁷ on natural communities.
- Assessment of pathways of identified NIS is also undertaken with reference to the work that is being done on the assessment of pathways by the IUCN-Species Survival Commission-Invasive Species Specialist Group on pathway terminology, classification and analysis of pathway data²⁸.

8.3. Monitoring area

Marine areas off L-Aħrax tal-Mellieħa, Ċirkewwa, Qawra, Pembroke, Żurrieq and Għar Lapsi constitute the main areas within Marine Protected Areas harbouring a relatively high number of invasive NIS as per observations recorded through the

²⁵ Otero M., Cebrian E., Francour P., Galil B., Savini D. (2013). Monitoring Marine Invasive Species in Mediterranean Marine Protected Areas (MPAs): A strategy and practical guide for managers. Malaga, Spain: IUCN. 136 pp

²⁶ Minimum one transect at each locality

²⁷ List of invasive alien species compiled in the MSFD Initial Assessment on non-indigenous species.

²⁸ <http://www.cbd.int/doc/meetings/cop/cop-12/information/cop-12-inf-10-en.pdf>

MedPAN North project²⁹ (Table 1). L-Aħrax tal-Mellieħa is also associated with a relatively high number of non-indigenous species as per records reviewed by the MSFD Initial Assessment on NIS.

Locations of transects within these localities are tentatively indicated in Table 3 and Figure 1. It should be noted that while records of NIS at Ġnejna are relatively low, this locality was included as representative of the Rdum Majjiesa – Ras ir-Raħeb MPA.

Such transects shall be verified following the first monitoring episode and the monitoring factsheet updated accordingly. Transects should be representative of all the habitats, depth ranges and substrates found in each individual MPA. Should the first monitoring episode imply that transects as indicated in Table 3 are not representative of the habitats, depths and substrate types within the MPA, alternative transects should be identified.

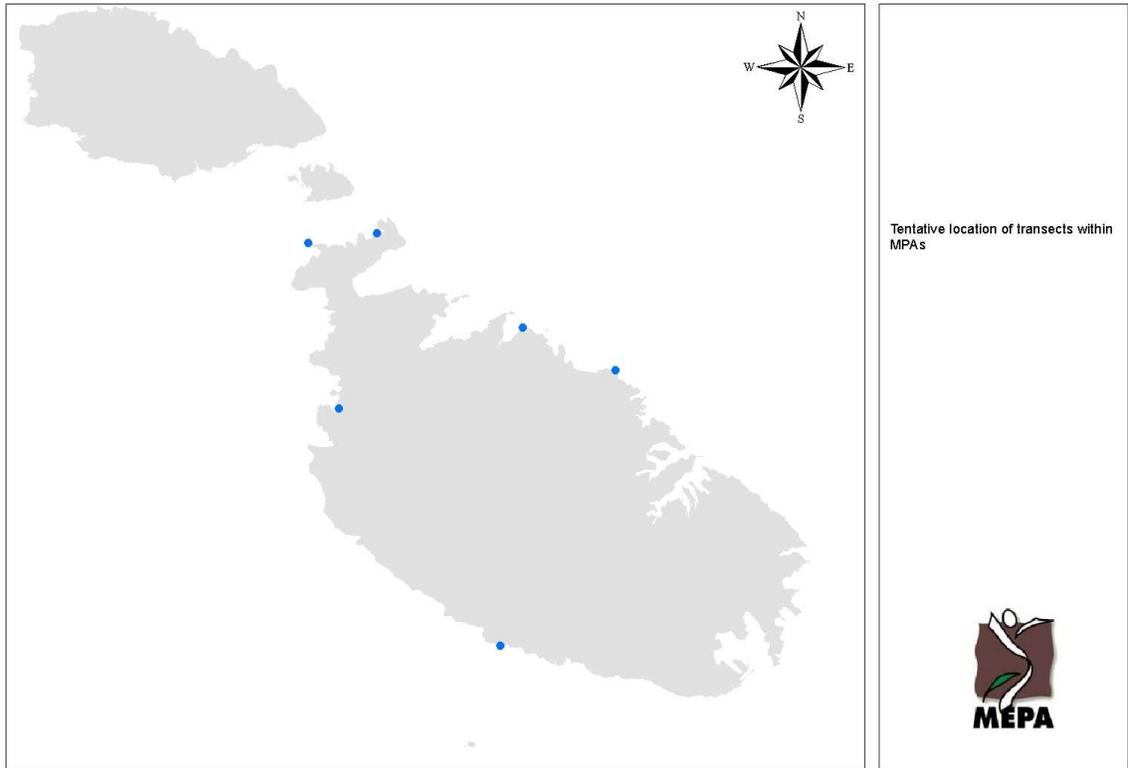
Table 3: Tentative location of transects within MPAs selected from the transects surveyed through the MedPAN North project³⁰ on the basis of number of NIS recorded.

| Locality | MPA | Transects | |
|----------------------|----------------------------------|-------------|-------------|
| | | N | E |
| L-Aħrax tal-Mellieħa | Northeastern MPA | 35 59 31 26 | 14 21 42 87 |
| Ċirkewwa | Northeastern MPA | 35 59 16 18 | 14 19 40 06 |
| Qawra | Northeastern MPA | 35 57 16 28 | 14 26 03 85 |
| Pembroke | Northeastern MPA | 35 56 15 51 | 14 28 48 49 |
| Ġħar Lapsi | Ġħar Lapsi & Filfla MPA | 35 49 37 39 | 14 25 26 18 |
| Ġnejna | Rdum Majjiesa – Ras ir-Raħeb MPA | 33 55 17 52 | 14 20 37 35 |

²⁹ Programme MED – MEDPAN North - Cohesion Policy 2007 – 2013 - Europe in the Mediterranean (2013). Monitoring of Invasive alien species in the Maltese Marine Protected Areas. Report of Survey.

³⁰ Programme MED – MEDPAN North - Cohesion Policy 2007 – 2013 - Europe in the Mediterranean (2013). Monitoring of Invasive alien species in the Maltese Marine Protected Areas. Report of Survey.

Figure 1: Tentative location of transects within MPAs



8.4. Monitoring frequency

Monitoring frequency for the first monitoring year is indicated hereunder. This is subject to revision following the initial monitoring episodes.

| Monitoring process | Monitoring Frequency |
|---|---|
| Dedicated Surveys in Marine Protected Areas | 6-monthly (summer and winter), every 3 years |

9. Monitoring sub-programme 2: *Non-indigenous species – occurrence in hotspots*

9.1. Monitoring Parameters

| Parameter | MSFD | EcAp |
|--|------|------|
| Number of non-indigenous species recorded | ✓ | ✓ |
| Number of newly arrived non-indigenous species | ✓ | ✓ |

9.2. Monitoring methodologies

- Rapid Assessment Surveys are undertaken in selected harbour areas, including marinas, in line with the methodologies outlined in Minchin (2007)³¹ and UNEP (2014)³².
- These surveys are conducted by a team of marine species experts spending a specified time period at the survey site and identifying species by observation of artificial substrates, pontoons and other structures. This technique may also include snorkelling and/or SCUBA diving.
- A site master records the scientists, findings and abundance of species at each site. Samples of specimens may also be taken back to the lab, where species identification is confirmed.
- Assessment of pathways of identified NIS is also undertaken with reference to the work that is being done on the assessment of pathways by the IUCN-Species Survival Commission-Invasive Species Specialist Group on pathway terminology, classification and analysis of pathway data³³.

9.3. Monitoring area

Rapid Assessment Surveys will be undertaken within selected berthing areas in Marsaxlokk Bay³⁴ and Birżebbuġia Bay³⁵ (as representative of the Marsaxlokk harbour area) and within selected marinas in Marsamxett harbour and the Grand Harbour.

³¹ Minchin, D. 2007. Rapid Coastal Survey for targeted alien species associated with floating pontoons in Ireland. *Aquatic Invasions*. 2(1): 63-70

³² UNEP/MAP 2014. Draft Monitoring and Assessment Methodological Guidance, 4th meeting of the EcAp Coordination Group UNEP(DEPI)/MED WG.401/3

³³ <http://www.cbd.int/doc/meetings/cop/cop-12/information/cop-12-inf-10-en.pdf>

³⁴ Marsaxlokk Bay harbours the main fishing community in Malta and also aquaculture activity

³⁵ Birżebbuġia Bay houses the Freeport container transit station and is also the main fuel unloading station for Maltese Islands

9.4. Monitoring frequency

| Monitoring process | Monitoring Frequency |
|--|--|
| 'Rapid Assessment Surveys' (RAS) in hotspots (harbour areas) | Yearly – monitoring frequency to be determined following the first monitoring year |

10. Monitoring sub-programme 3:
Non-indigenous species – abundance within specific taxonomic groups

10.1. Monitoring Parameters

| Parameter | MSFD | EcAp |
|---|------|------|
| Abundance of NIS in specific taxonomic groups | ✓ | |

10.2. Monitoring methodologies

10.2.1. Benthic invertebrates (refer to ‘benthic habitats’ monitoring factsheet)

- For the purpose of monitoring the habitat condition of shallow sublittoral sediment, macroinvertebrates will be sampled by means of a Van Veen grab (0.025m²) or metal corers. Samples will be washed through a 0.5mm mesh sieve and sorted.
- Throughout this process, the identification and abundance (number of individuals/m²) of any non-indigenous species is recorded.

10.2.2. Phytoplankton/Zooplankton (refer to ‘water column habitats’ monitoring factsheet)

- Species composition and abundance of phytoplankton and zooplankton is assessed for the purpose of monitoring water column habitat types. The percentage abundance of non-indigenous species will also be calculated.
- This process is used for the purpose of establishing the occurrence and abundance (cells per litre or number of individuals per litre) of non-indigenous phytoplankton and zooplankton.

10.2.3. Fisheries surveys

Fisheries independent surveys (MEDITS)

- Samples collected by the Mediterranean International Bottom Trawl Surveys (MEDITS)³⁶ will be used.
- Sampling using the MEDITS standard gear is performed at selected stations within Geographical sub-area 15.
- Throughout this process, the identification and abundance (number of individuals/m²) of any non-indigenous species is recorded.

³⁶ MEDITS is a bottom trawl survey carried out on a regional basis which aims to collect data on benthic and demersal species, targeting species which have an existing or potential commercial value.

Fisheries dependent surveys

- Non-indigenous species identified through on-board observations of by-catch and discards data of fishing gears are recorded.

10.3. Monitoring area

Monitoring stations are equivalent to those stipulated for the purposes of monitoring shallow sublittoral sediment (refer to monitoring factsheet on 'benthic habitats') and phytoplankton and zooplankton (refer to monitoring factsheet on 'water column habitats').

The stations used for the Mediterranean International Bottom Trawl Surveys (MEDITS) will also be used for the purposes of recording non-indigenous biota in hauls (refer to monitoring factsheet on 'Fish & Commercial Species').

10.4. Monitoring frequency

Monitoring frequency for the first monitoring year is indicated hereunder. This monitoring frequency is subject to revisions in line with the revision of related monitoring factsheets.

| Monitoring process | Monitoring Frequency |
|-------------------------------|----------------------|
| Benthic invertebrates | 6-monthly |
| Phytoplankton/Zooplankton | 3-monthly |
| Fisheries Independent Surveys | Yearly |
| Fisheries Dependent Surveys | As needed |

11. Monitoring sub-programme 4:
Information on relevant anthropogenic activities

Monitoring of anthropogenic activities will focus on the intensity of the major pathways of NIS introduction, which in Malta are considered to be related to shipping activity, following the Suez Canal as the primary source of NIS. In this regard the following data will be collected:

- Number of vessels calling at Maltese ports/waters and an indication of the last port of call with a view to determine the number of connections with different ports and the number of voyages.

General Binding Rules issued for the purpose of underwater cleaning of maritime vessels refer to the need for the operator to take samples of the marine growth on the vessel before and after cleaning. This data would provide information on hull cleaning as a potential vector of spreading invasive NIS.

12. Links to monitoring processes

Assessment of the occurrence of non-indigenous species has a direct link with the assessment of status of seabed habitats, water column habitats and food web structures. Implementation of this monitoring factsheet will thus provide the data on existing pressures from NIS on seabed habitats, water column habitats and species groups (in particular fish).

13. Quality Assurance & Quality Control

Sampling methodologies and analysis of samples shall be carried out in line with standards and guidance documents listed in this section:

General:

- Malta Standards Authority EN ISO 16665:2005: Water Quality. Guidelines for quantitative sampling and sample processing of marine soft-bottom macrofauna. 30pp.
- Malta Standards Authority EN ISO 19493:2007: Water Quality – Guidance on marine biological surveys of hard substrate communities. 21pp

Monitoring of benthic invertebrates:

- HELCOM (2013). Manual for marine monitoring in the COMBINE programme of HELCOM. Helsinki Commission, Baltic Marine Environment Protection Commission, 406 pp.

Monitoring for phytoplankton:

- EN 15204:2006: Water Quality – Guidance standard on the enumeration of phytoplankton using inverted microscopy (Utermöhl Technique)
- EN 15972:2011: Water Quality – Guidance on quantitative and qualitative investigations of marine phytoplankton

Fisheries:

- MEDITS-Handbook. Version n. 7, 2013, MEDITS Working Group: 120 pp.

14. Data collection, storage and dissemination

All data should be collected and stored in accordance with the INSPIRE Technical Specifications listed in this section and/or any other relevant INSPIRE standard as identified through the Marine Pilot Project³⁷. Processed data to be uploaded in a geoportal.

- D2.8.III.19 Data Specification on Species Distribution – Technical Guidelines³⁸

³⁷ <https://circabc.europa.eu/w/browse/bc33dff1-0f8c-467a-8382-7724c5f79d45>

³⁸ <http://inspire.ec.europa.eu/index.cfm/pageid/2>

15. Responsible organisations

| Monitoring processes | | Responsible Authorities |
|--|---------------|-------------------------|
| Dedicated Surveys in Marine Protected Areas | | MEPA |
| 'Rapid Assessment Surveys' (RAS) in hotspots | | MEPA |
| Monitoring for benthic invertebrates | | MEPA |
| Monitoring for phytoplankton/zooplankton | | MEPA |
| Fisheries surveys | | Fisheries |
| Activities | Shipping Data | Transport Malta |
| | Hull Cleaning | MEPA |

16. Gaps and Research Needs

| Gaps | Plans to address gaps |
|--|---|
| This monitoring factsheet does not adequately cover the need for data on abundance of NIS. | Following the first monitoring episodes, the monitoring factsheet will be updated with a view to focus monitoring on abundance and impacts of NIS on selected alien species considered to be of significant concern on the basis of the data generated through this monitoring factsheet. |
| This monitoring factsheet does not adequately cover assessment of impacts associated with NIS. | |

17. Main Sources

- AAE Consortium (ADI Associates Ltd, Ecoserv Ltd and E Cubed Consultants). 2014. Long Term Monitoring Strategy for the Marine Environment of the Maltese Islands under the Marine Strategy Framework Directive. Service Contract for the development of a long-term monitoring strategy for the marine environment, a social and economic analysis of the use of marine waters and costs of degradation, and baseline sediment survey in inland waters (MEPA tender ref: CT3048/2012). ERDF156 - Developing national environmental monitoring infrastructure and capacity. Malta, unpublished report, 252 pp.
- UNEP/MAP 2014. Draft Monitoring and Assessment Methodological Guidance, 4th meeting of the EcAp Coordination Group UNEP(DEPI)/MED WG.401/3