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5.2. Updating of the Action Plan concerning species introductions and invasive species in the Mediterranean Sea

Draft updated Action Plan concerning species introductions and invasive species in the Mediterranean Sea

Note:

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© 2023 United Nations Environment Programme / Mediterranean Action Plan (UNEP/MAP)
Specially Protected Areas Regional Activity Centre (SPA/RAC)
Boulevard du Leader Yasser Arafat
B.P. 337 - 1080 Tunis Cedex - Tunisia
E-mail: car-asp@spa-rac.org

Note by the Secretariat

With regards to the update of the Action plan, an assessment of the implementation of its previous calendar has been done at national and regional levels. This evaluation appears in the annex I of the present document.

The assessment of the implementation of the action Plan has considered the SPA/RAC Progress activities achieved during the last biennium's (since 2018) and the activities realized by Contracting Parties as requested by the adopted timetable.

Multilateral Environment Agreements, regional organizations, and institutions as well as Partners to this action Plan were also invited to report on their achievements for the conservation of these habitats. All the answers received in due time were incorporated on the evaluation. The draft updated Action plan is given in this document

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I. Introduction

1. In 1975, 16 Mediterranean countries and the European Community adopted the Mediterranean Action Plan (MAP), the first-ever Regional Seas Programme under UN Environment's umbrella. In 1976 these Parties adopted the Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention). Seven Protocols addressing specific aspects of Mediterranean environmental conservation complete the MAP legal framework.

2. Currently, MAP has been adopted by 21 countries bordering the Mediterranean Sea, and the European Union. The Contracting Parties to the Barcelona Convention give priority to the conservation of the marine environment and to the components of its biological diversity. This has been confirmed on several occasions, particularly by the adopting (Barcelona, 1995) of the new Protocol concerning specially protected areas and biological diversity in the Mediterranean (SPA/BD Protocol) and of its Annexes. The SPA/BD Protocol invites the Contracting Parties to take "all appropriate measures to regulate the intentional or non-intentional introduction of non-indigenous or genetically modified species into the wild and prohibit those that may have harmful impacts on the ecosystems, habitats or species" (Article 13.1). For established alien species, the SPA/BD Protocol stipulates that "the Parties shall endeavour to implement all possible measures to eradicate species that have already been introduced when, after scientific assessment, it appears that such species cause or are likely to cause damage to ecosystems, habitats or species" (Article 13.2).

3. To that effect, the Contracting Parties adopted in 2003 the first Regional Action Plan concerning species introductions and invasive species in the Mediterranean Sea, which was further updated in 2017. The main objective of the 2017 NIS Action Plan was to promote the development of coordinated efforts and management measures throughout the Mediterranean region in order to prevent as appropriate, minimise and limit, monitor, and control marine biological invasions and their impacts on biodiversity, human health, and ecosystem services, through a series of actions to be carried out between 2017 and 2020. Coinciding with the adoption of the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP), which aims to assess the status of the Mediterranean sea and coast as a basis for enhanced action, the focus of the 2017 Action Plan was to strengthen the capacity, and the institutional and legislative framework of Mediterranean countries so that they can deal with issues of alien species, conduct baseline studies and establish monitoring programmes, foster regional co-operation and data sharing infrastructure and produce guidelines and other necessary technical documentation; goals which have been achieved to a large extent.

4. As our baseline knowledge and understanding of marine bioinvasions has been increasing and the regulatory and institutional framework to combat NIS are continuously developing, the post-2020 international and regional policy framework is moving towards more concrete actions for the management of pathways and the drastic reduction in invasive alien species populations and their impacts.

5. The first draft of the Post-2020 Global Biodiversity Framework (GBF) addresses alien species with Target 6: Manage pathways for the introduction of invasive alien species, preventing, or reducing their rate of introduction and establishment by at least 50 per cent, and control or eradicate invasive alien species to eliminate or reduce their impacts, focusing on priority species and priority sites.

6. Similar stipulations are reflected in the Draft Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region" (Post-2020 SAPBIO), which aims to reduce the threats to biodiversity by alien species with its Target 1.2 on alien invasive species, by sharing databases and controlling introduction pathways and impacts in the most vulnerable areas. Furthermore, it stipulates that "Invasive alien species and pathways must be regularly identified in all countries, listing priority species to be controlled or eradicated".

7. The EU Biodiversity Strategy for 2030, calls for an enhanced implementation of NIS-relevant legislation aiming to minimise, and where possible eliminate, the introduction and establishment of alien species in the EU environment. One of the Strategy's key commitments is the management of established invasive alien species and a 50% reduction in the number of Red List species they threaten (EC, 2020)

8. The Mediterranean Sea, with about 1000 alien species reported in its waters up to now, is one of the most invaded ecosystems in the world. The trend of new introductions of alien species, which exhibited a steep increase after the mid-1990s, shows no sign of decline and is moreover accompanied by an accelerating rate of spread and establishment in the last decade, with almost seventy percent of the species being considered established (Zenetos & Galanidi, 2020; Zenetos et al., 2022a). Many of these species have become invasive with serious negative impacts on biodiversity, human health, and ecosystem services. The main pathways by which human actions have introduced alien invasive species into the Mediterranean Sea are shipping (by means of ballast waters and hull fouling), corridors, aquaculture, trade in live marine organisms (aquarium trade and live food trade) and others (e.g. fishing activities and aquarium exhibits).

9. Elaborating and implementing action plans to confront the threats to biological diversity is an effective way of guiding, coordinating and stepping up the efforts made by the Mediterranean countries to safeguard the region's natural heritage. In the 2022-2027 period, significant actions for the management of shipping vectors are planned within the framework of the Ballast Water Management Strategy for the Mediterranean Sea and its Action Plan. The present NIS Action Plan takes this into consideration with complementary actions addressing the remaining important pathways, as well as a focus on the impacts of priority invasive species on priority native species and habitats, in line with existing regional and international policies; it will be adapted and updated, if necessary, to reflect the latest policies on invasive species and new data available.

10. The actions advocated by the present Action Plan are to be carried out over a five-year period, starting from when the Action Plan is adopted by the Contracting Parties. At the end of this period, SPA/RAC will prepare a report on the progress so far made in implementing the advocated actions and will submit it to the National Focal Points for SPAs, who will make follow-up suggestions to the Parties.

11. Considering the world-wide scope of the issue of alien species introduction, it is important that the implementation of the present Action Plan be done in consultation and collaboration with the initiatives undertaken in this field in other regions and/or by other international organisations.

II. A. Objectives of the Action Plan

12. The main objective of the present Action Plan is to promote the development of coordinated efforts and management measures throughout the Mediterranean region in order to make progress towards Good Environmental Status in relation to non-indigenous species. These efforts can be organized along two main axes corresponding to the two main operational objectives of the Ecosystem Approach (EcAp) and IMAP with respect to Ecological Objective 2 (EO2) and Common Indicator 6 (CI6).

13. Operational objective 2.1 requires that “Introduction and spread of NIS linked to human activities are minimised, in particular for potential IAS” and addresses trends in temporal occurrence, spatial distribution, and abundance of NIS, as well as preventative measures for introduction and spread. Here, the main goals of the Action Plan for the next five years should be:

- Continuing to support the implementation of IMAP and the operationalization of its indicators
- Developing a regional early-warning system within the framework of MAMIAS
- Continuing to elaborate guidelines and technical documentation
- Strengthening the institutional and legislative framework for pathway management, allowing for synergies with the Mediterranean BWM Strategy (2022-2027)
- Supporting the implementation of the Mediterranean BWM Strategy (2022-2027), through technical cooperation and capacity building activities
- Promoting voluntary codes of conduct for pathways where a mandatory legal framework is not yet in place

Operational objective 2.2 states that “The impact of non-indigenous, particularly invasive species, on ecosystems is limited” and requires prioritization and impact quantification that can be achieved in a three-step process of:

- Risk assessment and prioritization
- Identification of invasive population levels that elicit unacceptable effects
- Elaborating and executing rapid response plans and management plans for the most invasive NIS

III. B. Priorities

1. B.1. At National level

14. Considering the lack of the data and knowledge necessary for impact and risk assessments, horizon scanning, and the implementation of management actions for prevention, control and eradication, priority at national level should be given to:

- Conducting regular NIS monitoring as specified in their monitoring programmes
- Supporting the regional Digital Data infrastructure by providing updated baselines and any other new information to MAMIAS and by submitting yearly monitoring data to the IMAP Info System
- Focusing on invasive species impacts through systematic prioritization, risk assessment and targeted species impact research
- Performing data-based assessments of the NIS introduction and spread risks associated with the aquaculture, ornamental trade and live food trade sectors
- Elaborating an early warning system and rapid response plans

- Developing training and raising awareness programmes on risks, legal issues, best practices, and management actions for prevention and mitigation of impacts.
- Ratify and implement the BMW convention and enact the BMW strategy for the Mediterranean and its Action Plan

2. B.2. At Regional level

15. Considering the existing progress in monitoring and baseline information and the activities planned under the BWM Action Plan concerning ballast water and fouling management, priority at the regional level should be given to:

- Further refinement of IMAP targets and development of impact related aspects of CI6 indicator
- Supporting cooperation at international level and ensuring harmonization with related policies
- Activating the updated version of MAMIAS and developing an early warning system
- Co-ordinating the application of risk assessment methodologies for priority species
- Training and capacity building for status assessments of the aquaculture, ornamental trade and live food trade sectors
- Training as needed and co-ordination of targeted NIS impact studies
- Support the implementation of the Ballast Water Management Strategy for the Mediterranean and its Action Plan, in cooperation with REMPEC

IV. C. Actions required to attain the objectives of the Action Plan

1. C.1. At National level

a. IMAP implementation

- Consolidate/implement IMAP compliant monitoring programmes (if not already in place) and adapt as necessary as new data emerges and IMAP refinement progresses;
- Regularly update the national baselines, informed by national monitoring, research projects and the literature.
- Endeavour to increase the level of confidence in pathways and vectors of introduction and spread and refine relevant baseline information to support the BWM Action Plan.

b. Prioritisation and planning

- Conduct Horizon Scanning for existing NIS and potential future introductions at the national level in order to compile priority lists of high-risk species and to inform an early warning system. High-risk species should be prioritized for spatial distribution and abundance monitoring.
- Perform risk assessments of priority species following well established protocols and taking into account the potential for management
- Quantify and map impacts of priority species at the national level by employing CIMPAL. Such analysis allows the identification of hotspots of highly impacted areas, and augments the prioritization of sites, pathways and species for management actions.

- Perform risk analysis and status assessments of sectors (aquaculture operations, ornamental trade and live food trade)

c. Initiate and support research on NIS impacts

- Focused impact studies (field and laboratory experiments, modelling studies) for priority species to identify acceptable abundance levels

d. Support the regional Digital Data Infrastructure

- Regularly submit monitoring data to the IMAP Info System, following the designated procedures and Data Standards
- Support MAMIAS with updated baselines, pathway information, results of impact studies and any other new information.

e. Legislation

16. Those Contracting Parties which have not yet enacted national legislation for controlling the introduction of marine species must do so as quickly as possible. All the Contracting Parties are strongly recommended to take the necessary steps to express in their national laws the provisions of the pertinent international treaties, especially the IMO Convention on the management of ballast waters, and guidelines and codes adopted on the subject within the context of international organisations.

f. Institutional framework

- Set up reporting mechanisms for NIS sightings, especially among actors and stakeholder groups most likely to first notice new species introductions (e.g. fishers, divers, aquaculture operators, border officials, etc.). Disseminate information about species anticipated to arrive in the near future. Provide links of this early warning system to the regional MAMIAS system and cooperate with the concerned authorities in neighbouring states regarding new NIS detections;
- Elaborate rapid response and management plans for invasive NIS, including eradication or population control measures as appropriate; it is important that such plans are specific with clear procedures, jurisdictions and resource allocation;
- Develop and disseminate best practice guidelines and voluntary codes of conduct for pathways not already covered by the BWM Action Plan and where a mandatory legal framework does not sufficiently protect against within border NIS spread (e.g., aquaculture operations, ornamental trade and live food trade);
- Strengthen and where necessary set up systems to control the intentional import and export of alien marine species;
- Promote citizen science programmes for data collection;
- Undertake awareness raising activities for targeted stakeholder groups and the general public.

2. C.2. At Regional level

a. IMAP implementation/refinement and operationalization of its indicators

17. Evaluation of CI6 is currently based on operational objective 2.1 (“Invasive non-indigenous species introductions are minimized”), addressing trends in abundance, temporal occurrence and spatial distribution of NIS, notably in risk areas; however due to the lack of suitable data, significant progress has only been made in assessing trends in temporal occurrence. With national monitoring programmes being increasingly implemented and making data available, further elaboration of CI6 elements will be possible, more specifically:

- Setting reference conditions and threshold values for trends in temporal occurrence, in collaboration with other Regional Seas Conventions and the EU
- Elaborating methodologies and quantitative targets for trends in spatial distribution
- Elaborate quantitative targets for trends in abundance, in conjunction with operational objective 2.2 (“The impact of non-indigenous, particularly invasive species on ecosystems is limited) and its state target “Abundance of NIS introduced by human activities reduced to levels giving no detectable impact.
- Elaborate scales of aggregation for CI6 assessment and integration with other Ecological Objectives and Common Indicators
- Furthermore, develop an early warning system within MAMIAS and link with national early warning systems.

Finally, liaise with REMPEC on monitoring and data collection in ports and baseline surveys in ports to ensure integration with IMAP monitoring programs.

b.Implementation of the BWM Strategy (2022-2027)

18. SPA/RAC is already committed in its PoW for 2024-2025 to provide assistance to Contracting Parties to implement target measures to control and manage ships' ballast water and biofouling in order to minimize the transfer of invasive aquatic species, as an active participant in the implementation of the BWM Strategy. This can be achieved through:

- Participation in the regional online BWM Working Group, established and coordinated in cooperation with REMPEC, to drive the process towards harmonization of BWM measures in the region;
- Liaising with REMPEC regarding monitoring and data collection at ports and port baseline surveys to ensure integration with IMAP monitoring programmes.
- Assisting, with data and methodological approaches, in developing and implementing port risk assessments and a comprehensive Regional Procedure for the Granting of Exemptions under the BWM Convention as stipulated in the BWM Action Plan;
- Co-ordinating, together with REMPEC, the preliminary activities to address the threat of biofouling on ships and provide assistance to Contracting Parties in implementing them, as stipulated in the BWM Action Plan (i.e., organize a regional workshop, conduct National Status Assessments and national strategies and action plans to manage biofouling)

c.Training and Capacity Building

- Produce an updated guide for risk analysis to assess NIS impacts. Organise a training session focusing on the application of risk analysis and risk assessment for priority species and for pathways and co-ordinate the systematic application of region-wide agreed methodologies. Considering that a regional risk assessment of key ports in the Mediterranean Sea as well as National Status Assessments for biofouling are planned to be undertaken within the framework of the BWM Action plan, the focus should be on species, as well as risk analyses of other contributing pathways, most notably aquaculture, the ornamental trade and live food trade. Collaborate with Contracting Parties on data requirements and availability and with REMPEC to support ballast and biofouling management with NIS related data.
- Provide guidance and training as needed for experimental field studies and modelling studies and translating results into policy targets, co-ordinate pilot studies for specific NIS in order to elucidate their density-impact relationships.

d. Public education and awareness

19. With particular focus on stakeholders and decision-makers, prepare and circulate guidelines with best practices for activities and sectors that exert strong pressure as vectors of introduction and particularly spread of NIS

V. Regional Coordination

20. Regional coordination of the implementation of the present Action Plan will be guaranteed by the Mediterranean Action Plan's (MAP) Secretariat through the Regional Activity Centre for Specially Protected Areas. The main functions of the coordinating structure shall consist in:

- taking in hand the implementation of those actions required at regional level to attain the present Action Plan's objectives (Section C.2 above);
- insofar as its means permit, assisting the Contracting Parties in implementing the actions required at national level to attain the present Action Plan's objectives (Section C.1 above);
- regularly reporting to the National Focal Points for SPAs about the implementation of the present Action Plan, and preparing a report on the progress made in reaching its objectives at the end of the 5-year implementation period;
- collaborating with the concerned organisations and endeavouring to ensure that the Mediterranean region is involved in the pertinent international and/or regional initiatives;
- promoting exchanges among Mediterranean specialists.

VI. Participation in the Implementation

21. Implementing the present Action Plan is the province of the national authorities of the Contracting Parties. The concerned international organisations and/or NGOs, laboratories and any organisation or body are invited to join in the work necessary for implementing the Action Plan. At their ordinary meetings, the Contracting Parties may, at the suggestion of the meeting of National Focal Points for SPAs, grant the status of «Action Plan Partner» to any organization or laboratory which so requests, and which carries out, or supports (financially or otherwise) the carrying out of concrete actions (conservation, research, etc.) likely to facilitate the implementation of the present Action Plan, taking into account the priorities contained therein.

22. In addition to collaborating and coordinating with the Secretariats of the relevant Conventions, SPA/RAC should invite other MAP components and RACs to join and contribute to the implementation of the present Action Plan, in particular REMPEC and INFO/RAC. It will set up a mechanism for regular dialogue between the participating organisations and, where necessary, organise meetings to this effect.

VII. IMPLEMENTATION TIMETABLE

Action (* in tandem with the BWM Action Plan)	Deadline	Responsible
1. Consolidate/implement IMAP compliant monitoring programmes	2024	Contracting Parties
2. Increase the level of confidence in pathways and vectors of introduction and spread	2024	Contracting Parties
3. Prepare and circulate guidelines with best practices for activities and sectors that exert strong pressure as vectors of introduction	2024	SPA/RAC
4. Produce an updated guide for risk analysis to assess NIS impacts	2024	SPA/RAC
5. Organise a training session for risk assessment of species and pathways	2024	SPA/RAC
6. Develop and adopt a regional protocol for sampling of ballast water for purposes of Port State Control*	2024	REMPEC & SPA/RAC
7. Develop a regional protocol for port baseline surveys *	2024	REMPEC& SPA/RAC
8. Review and adapt the IMAP Guidance Fact Sheet for CI 6 under EO 2 to ensure integration of data in the IMAP Info System*	2024	REMPEC& SPA/RAC
9. Develop and adopt a regional protocol for port risk assessment *	2024	REMPEC& SPA/RAC
10. Undertake a regional risk assessment of key ports in the Mediterranean Sea *	2025	REMPEC& SPA/RAC
11. Develop, adopt, and implement a comprehensive Regional Procedure for the Granting of Exemptions under the BWM Convention *	2025-2027	REMPEC& SPA/RAC
12. Develop an early warning system in the framework of MAMIAS	2025	SPA/RAC
13. Conduct Horizon Scanning for existing NIS and potential future introductions taking into consideration the increased risk of establishment of IAS due to climate change	2025	Contracting Parties
14. Perform risk assessments of priority species	2025	Contracting Parties
15. Map impacts of priority species with CIMPAL	2025	SPA/RAC, Contracting Parties
16. Workshop to initiate biofouling-related activities in the region *	2024	REMPEC& SPA/RAC
17. Undertake National Status Assessments of Biofouling *	2025	Contracting Parties
18. Develop national strategies and action plans to manage biofouling *	2025-2027	Contracting Parties
19. Perform risk analysis and status assessment of aquaculture, ornamental trade and live food trade sectors	2026	Contracting Parties
20. Set up a mechanism to promote and coordinate the actions listed in section C.1.6. (Institutional framework)	2025	Contracting Parties
21. Launch the procedures for enacting or strengthening national legislation governing the control of alien species introduction	2026	Contracting Parties
22. Develop national early warning and reporting systems	2026	Contracting Parties
23. Elaborate rapid response and management plans for invasive NIS	2026	Contracting Parties
24. Preparation of material for public education and awareness	2025-2027	SPA/RAC, Contracting Parties

25. Develop programmes to raise the awareness of the general public and target groups, including decision-makers, concerning the risks associated with species introduction and disseminate best practice guidelines	2027	Contracting Parties
26. Strengthen and where necessary set up systems to control the intentional import and export of alien marine species	2027	Contracting Parties
27. Support the regional Digital Data Infrastructure as set out in section C.1.4	2024-27 (annually)	Contracting Parties
28. IMAP CI6 target refinement, setting of thresholds, further indicator development regarding impacts	2024-27	SPA/RAC
29. Organise a symposium every 3 years	From 2024	SPA/RAC

ANNEX I

Status of the implementation of the Action plan concerning species introduction and invasive species

1. Introduction

Biological invasions are globally identified as one of the main drivers of biodiversity loss, with impacts ranging from loss of genetic diversity to native population losses, species displacements, habitat modifications and even whole ecosystem shifts (IPBES, 2019). The Mediterranean Sea, one of the most invaded ecosystems in the world (Costello et al., 2021) with an accelerating rate of alien species spread and establishment (Zenetos & Galanidi, 2020; Zenetos et al., 2022a), is already experiencing as a result a homogenization of its native biota and degradation of its distinctive communities and habitats (Katsanevakis et al., 2014, Tsirintanis et al., 2022).

The Contracting Parties to the Barcelona Convention, as part of the Mediterranean Action Plan, give priority to the conservation of the marine environment and to the components of its biological diversity. This has been confirmed on several occasions, particularly by the adoption (Barcelona, 1995) of the new Protocol concerning specially protected areas and biological diversity in the Mediterranean (SPA/BD Protocol) and of its Annexes. The SPA/BD Protocol, in its Article 13, invites the Contracting Parties to take “all appropriate measures to regulate the intentional or non-intentional introduction of non-indigenous or genetically modified species into the wild and prohibit those that may have harmful impacts on the ecosystems, habitats or species”.

To that effect, the Contracting Parties adopted the first Action Plan concerning species introductions and invasive species in the Mediterranean Sea (UNEP-MAP RAC/SPA 2005), which was further updated in 2016 (the “updated NIS Action Plan”) (UNEP/MAP, 2017a). The main objective of the updated NIS Action Plan was to promote the development of coordinated efforts and management measures throughout the Mediterranean region in order to prevent as appropriate, minimise and limit, monitor, and control marine biological invasions and their impacts on biodiversity, human health, and ecosystem services, through a series of actions to be carried out between 2016 and 2020 (UNEP/MAP, 2017a). The focus of these actions was to strengthen the capacity, and the institutional and legislative framework of Mediterranean countries so that they can deal with issues of alien species, conduct baseline studies and establish monitoring programmes, foster regional co-operation and data sharing infrastructure and produce guidelines and other necessary technical documentation.

A number of key developments on the scientific as well as the regulatory and policy front during this period render the regular 5-yearly update of the NIS Action Plan even more timely, with the Contracting Parties to Barcelona Convention requesting this update during the CoP 22 (Antalya, Türkiye, 7-10 December 2021) (UNEP/MAP, 2021). The purpose of this document is to assess the status of implementation of the updated NIS action plan in the context of the most recent scientific, institutional and regulatory advances.

2. Progress in the scientific knowledge on alien and invasive species in the Mediterranean Sea

2.1 Alien species inventories & temporal trends

Following the studies of Zenetos et al. (2010; 2012) on Mediterranean NIS and cryptogenic species, two major subsequent updates were published since 2015. Zenetos et al. (2017) undertook a meticulous revision and validation of the established alien species inventory, while 5 years later Zenetos et al. (2022a; b) re-evaluated not only the established species but also the casual and failed introduction events of over 1366 taxa. Furthermore, Zenetos et al. (2022a; b) took a critical look at debatable species and questionable records and collated a comprehensive inventory, documenting all status changes since 2010. Thus, taking into account data until December 2021, the total number of validated Mediterranean NIS is 1001 -759 established taxa and 242 casual taxa – while 23 species are considered as failed introductions. The rest are tagged as cryptogenic (58 taxa) and questionable (70 taxa), while 223 taxa were excluded as misidentifications, native species erroneously reported as NIS or species not found in the wild. Mollusca have the highest diversity among established and casual NIS (230 taxa), followed by Pisces and Crustacea with 173 and 170 NIS respectively.

An important finding of that study is that since 2011 42% of the newly reported species were already established by 2021 (149 out of 352), signaling an accelerated rate of spread and establishment of NIS in the Mediterranean basin.

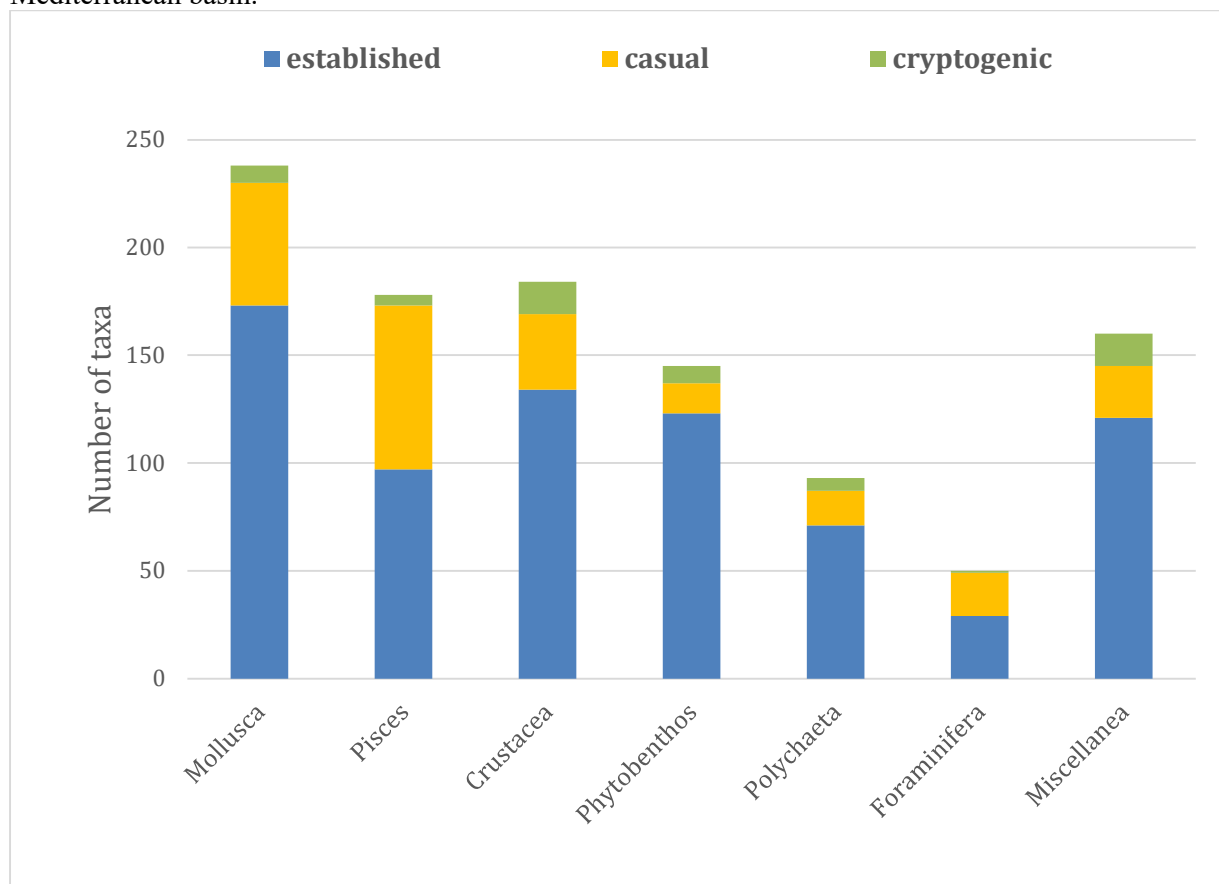


Figure 1: Status of non-indigenous species in the Mediterranean Sea according to their taxa and introduction stages (Modified from Zenetos et al., 2022a).

Since the last NIS Action Plan was published a number of countries have compiled and published updated national inventories of non-indigenous species in their waters; among these, noteworthy are national NIS checklists (Italy: Servello et al., 2019; Libya: Shakman et al., 2019; Algeria: Grimes et al. 2018; Greece: Zenetos et al., 2020; Israel: Galil et al., 2020; Türkiye: Çınar et al., 2021). National inventories have also been submitted by EU member states for the fulfilment of their obligations for the assessment of their territorial waters as provisioned by the Marine Strategy Framework Directive (Tsiamis et al., 2019; 2021).

Table 1: Updated national inventories of marine alien species in the Mediterranean Sea since 2016.

Country	Reference
Algeria	Grimes et al. 2018
Greece	Zenetos et al. 2020
Israel	Galil et al. 2020
Italy	Servello et al., 2019
Libya	Shakman et al., 2019
Montenegro	Petović et al. 2019

Syria	Ammar, 2019 (only zoobenthos)
Tunisia	Ounifi-Ben Amor et al. 2016
Türkiye	Çinar et al. 2021
Regional	
EU Mediterranean waters	Tsiamis et al., 2019, 2021
Pan-Mediterranean	Zenetos et al. 2017; Zenetos & Galanidi, 2020; Zenetos et al. 2022
National & Regional Baselines	UNEP/MED WG.520/5, 2022

At the national level, the highest number of species is observed in Israel and Türkiye, followed by Italy, Lebanon and Egypt, with values generally decreasing as we move towards the Adriatic and west Mediterranean countries (Figure 2).

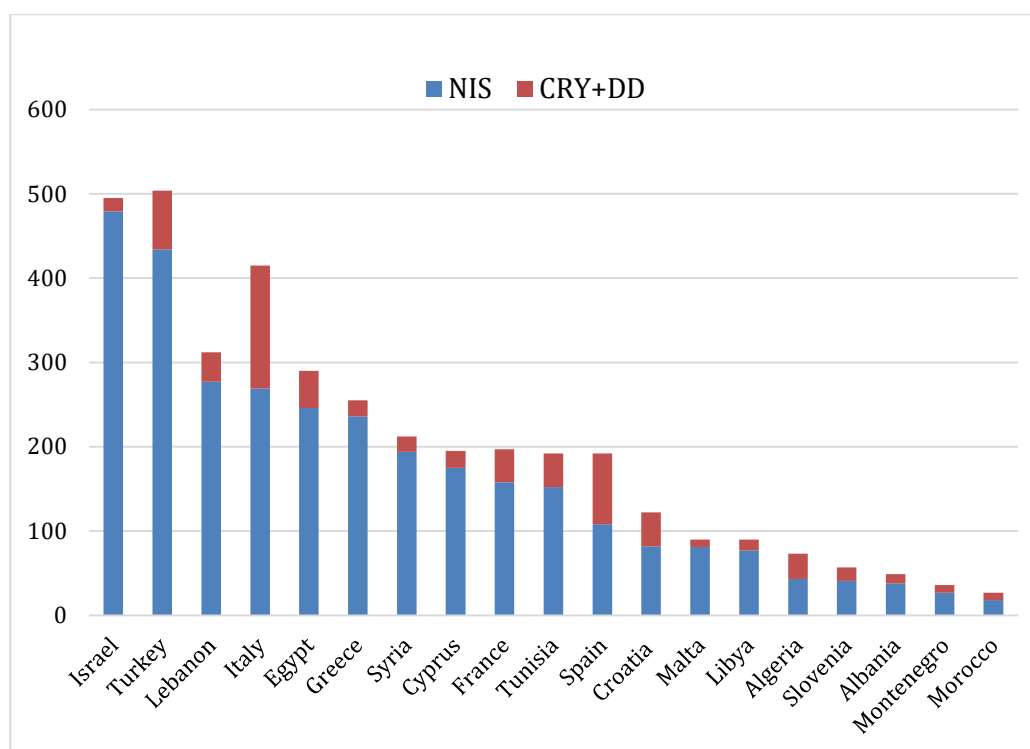


Figure 2. Total number of validated NIS per Mediterranean country (blue) with cryptogenic (CRY) and data deficient (DD) species displayed in orange. (Source: UNEP/MED WG.520/5, 2022)

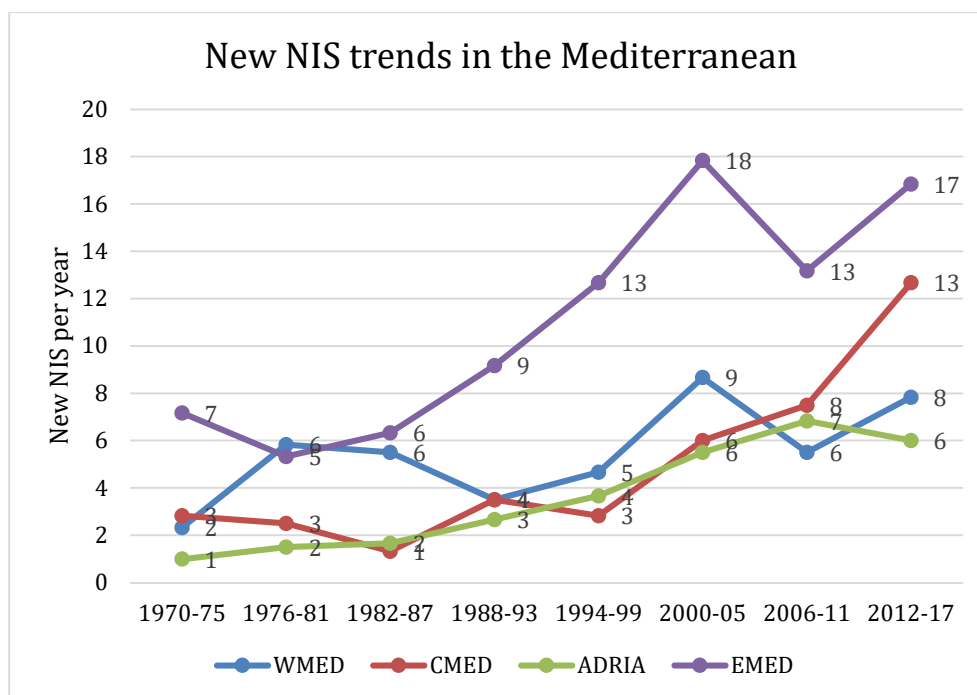


Figure 3. Trends in new introduction of validated NIS per 6-year period in the Mediterranean subregions. (Modified after UNEP/MED WG.520/5, 2022)

Regarding temporal trends, the rate of new NIS introductions displays a generally upwards trend with a noticeable increase in the slope after the 1990's in most Mediterranean subregions with the exception of WMED.

2.2 Assessment of pathways

For harmonization and standardization purposes, a concerted effort has been made in recent Mediterranean NIS works to follow the pathway classification of the Convention on Biological Diversity, first proposed in 2014 (CBD, 2014), based on the Hulme et al. (2008) classification framework. Two further works that help improve understanding and interpretation of pathway categories are those of Harrower et al. (2017) and Pergl et al. (2020) and these should be consulted for a consistent application of terminology. Accordingly, the main pathways of NIS introductions in the Mediterranean are Release in Nature (including intentional release of pet/aquarium species), Escape from Confinement, Transport-Contaminant (representing primarily species transported via aquaculture), Transport-Stowaway, which encompasses a variety of ship/boat related vectors, and Corridor which in the case of the Mediterranean is essentially the Suez Canal.

Tsiamis et al. (2018) analysed and presented the origins and pathways of primary introduction of the established European marine NIS until 2017, including the whole of the Mediterranean region. Note that this study was conducted before the Pergl et al. (2020) article, which transferred private aquarium releases to the "Release" pathway, hence aquarium species are classified under the "Escape" pathway (Figure 4).

The report on the national and regional NIS Baselines on the other hand (UNEP/MED WG.520/5, 2022) presented pathway analysis for all validated Mediterranean NIS (i.e., established, casual and of unknown establishment success) with data until December 2021 (Figure 5). The two studies display a generally good agreement, depicting the clear dominance of Lessepsian species of Indo-Pacific origin in the eastern Mediterranean and the relatively higher contribution of aquaculture related species primarily from the north Pacific (i.e., Stowaway-Contaminant) in the western Mediterranean and the Adriatic.

Additionally, significant work on specific pathways includes a series of studies of biofouling in harbours and marinas (e.g., Ferrario et al., 2017; Ulman et al., 2017; 2019; Chebaane et al., 2019), port baselines surveys and studies in a number of locations (Algeria – Bensari et al., 2020, Adriatic ports – Kraus et al., 2019; Trivizi

et al., 2019; Vidjak et al., 2019, Gulf of Gabes – Mosbahi et al., 2021, Mediterranean bibliographic review – Tempesti et al., 2020).

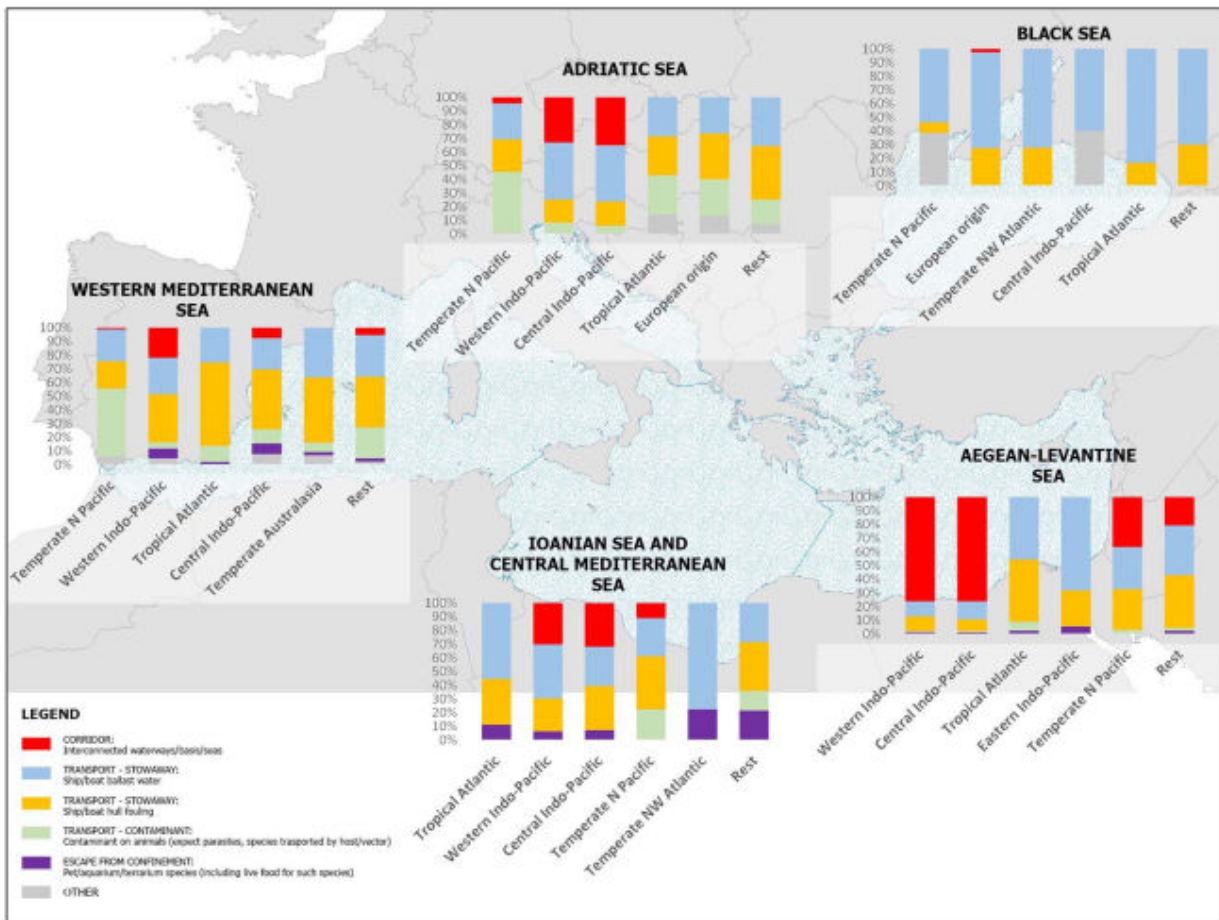


Figure 4. Proportion (%) of each primary pathway contribution to established NIS primary introductions in Europe, depicted per European marine subregion of the Mediterranean and Black Sea, associated with each major native distribution of the related NIS (Source: Tsiamis et al., 2018).

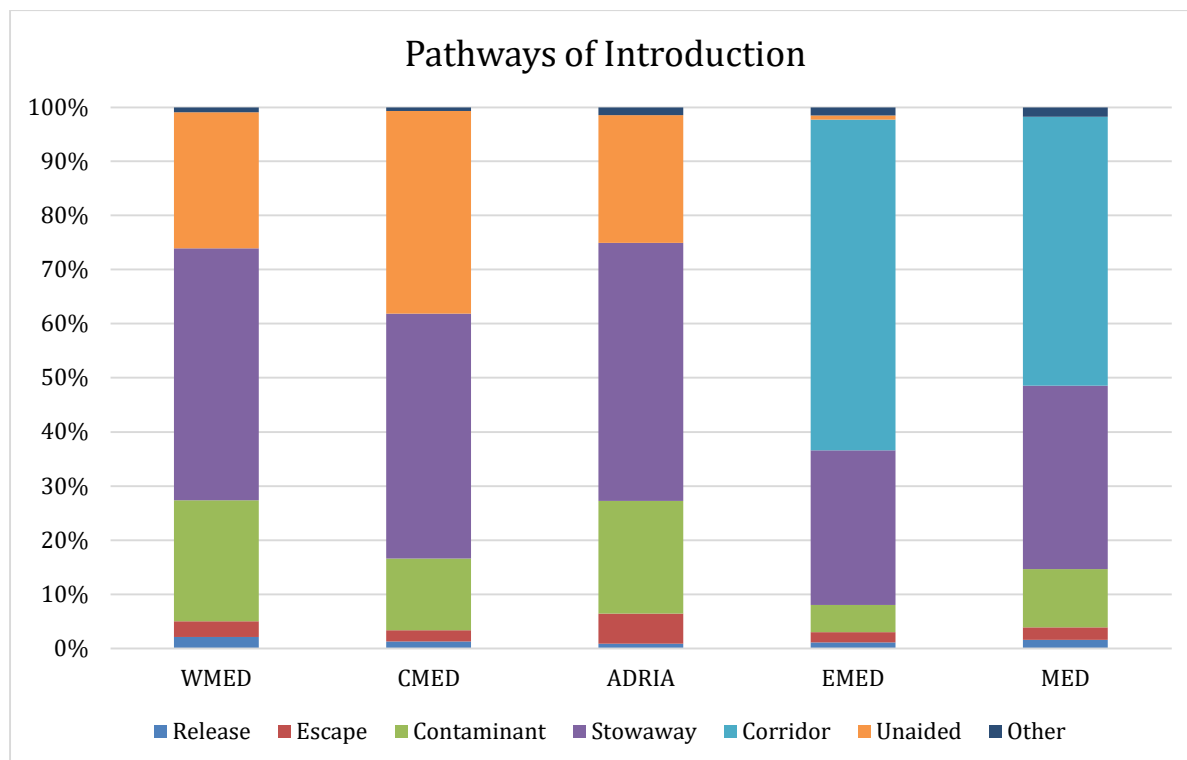


Figure 5. Primary pathways of introduction of marine NIS per Mediterranean subregion and regionally (Modified from UNEP/MED WG.520/5, 2022).

2.3 Spatial distribution & abundance

Since its development and launching in 2012, EASIN (European Alien Species Information Network) with its Catalogue and Geodatabase has been responsible for the collection, quality control, harmonization, integration, storage, visualization, and dissemination of large datasets on alien species in Europe (Katsanevakis et al., 2015; Deriu et al., 2017). The EASIN database is continuously updated and enriched with nomenclature, taxonomy, origin, pathway and impact information on alien species, as well as georeferenced new records from the literature and an expanding network of data partners, including quality-controlled Citizen Science observations (Kousteni et al., 2022).

Regarding fish species in particular, Azzurro et al. (2022) recently published the ORMEF database, a comprehensive compilation of 4015 geo-referenced occurrences of 188 alien and neonative species from 20 Mediterranean Countries (Figure 6). This is publicly accessible for download in a SEANOE repository (<https://www.seanoe.org/data/00730/84182/>) and can be used for various aspects of invasion research, such as Species Distribution Modelling, invasion dynamics, speed rate calculations, etc.

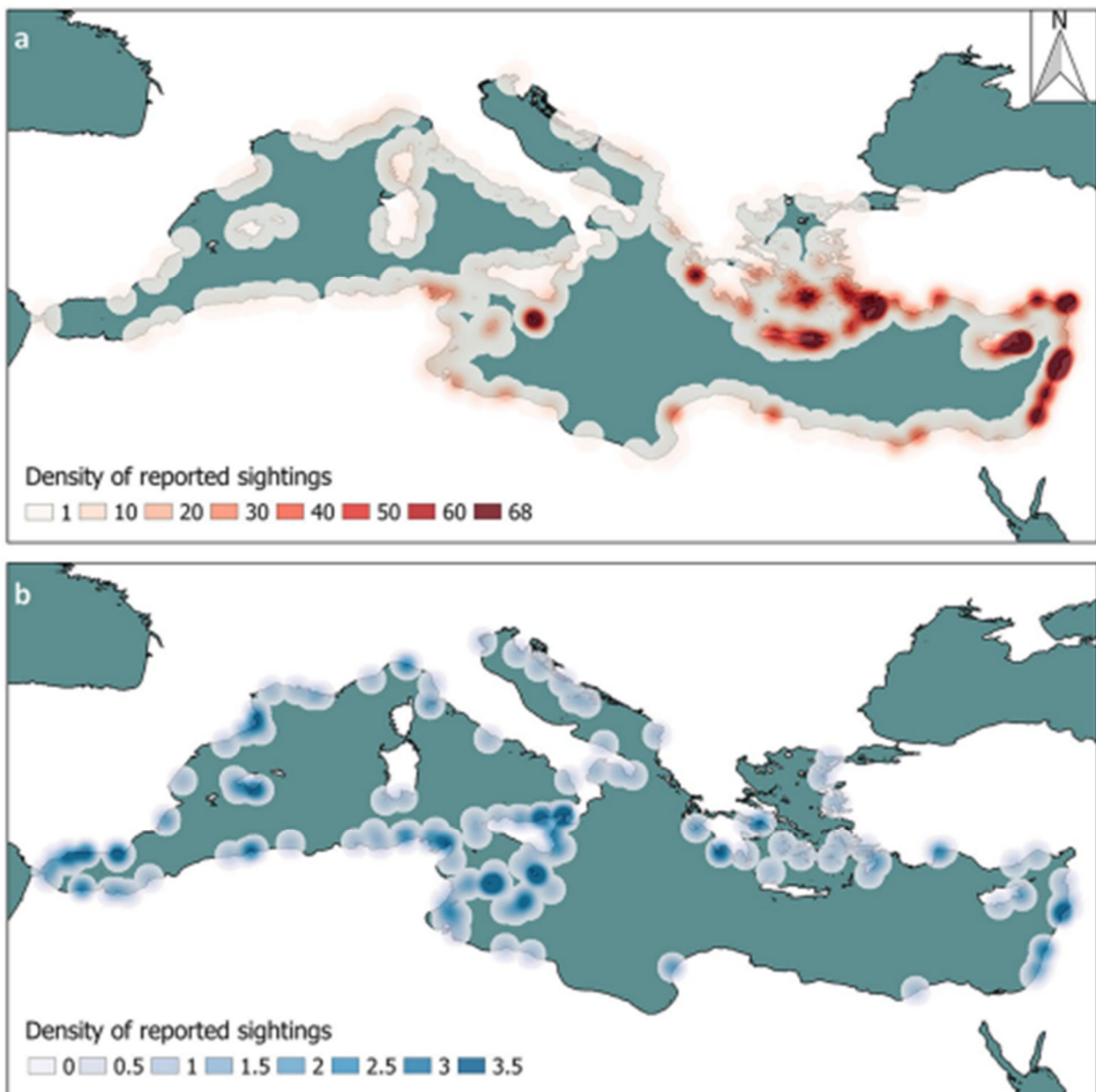


Figure 6. Heat maps of the occurrences of non-indigenous fish species in the ORMEF database. Cumulative density of reported sightings (radius=70 km) for Lessepsian species (top) and species introduced through other anthropogenic pathways (bottom) in the Mediterranean Sea. (Source: Azzurro et al., 2022)

2.4 Risk and Impact Assessment

Risk Screening

Efficient allocation of effort and resources for the management of alien species requires a systematic evaluation of their invasiveness and the risks they pose for native species and ecosystems. The need to develop and implement methods and protocols of risk and impact assessment as well as horizon scanning regarding new introductions of alien species has already been identified in the previous Action Plan (UNEP/MAP, 2017a). In recent years, a plethora of publications has addressed this gap aiming to identify and prioritise the most potentially invasive alien species, ranging from the evaluation of risk assessment protocols for alien species (Roy et al., 2018), Horizon Scanning at for marine NIS the EU (Tsiamis et al., 2020) and at the national level (Cyprus – Peyton et al., 2019; 2020) and risk screening of particular taxonomic groups (e.g.

Crustacea – Stasolla et al., 2020, jellyfish – Killi et al., 2020, fish-Yapici et al., 2021). Among these, the work of Tsiamis et al. (2020) employing a Horizon Scanning methodology to assess the likelihood of arrival, establishment, spread and the potential impacts of 267 marine alien species, concluded that the Mediterranean Sea is the most threatened European sea, as it is likely to be affected by the arrival or further spread of 232 of the taxa considered. This exercise arrived at a list of 26 species to be prioritized for full risk/impact assessment, and narrowed this down to 18, furthermore considering their feasibility of management (Table 2). All priority species listed in this table are relevant for the Mediterranean Sea. Cryptogenic species and species already risk assessed for the purposes of the EU IAS Regulation were not considered in this study.

Table 2: Top-priority marine invasive alien species listed through horizon scanning for EU marine waters with their final ranking score. Species denoted with asterisk* have meanwhile been risk assessed for the purposes of the EU IAS Regulation. Feasibility of management indicated by cell colour: light red=no; light yellow=partially; light green=yes. (Table after Tsiamis et al., 2020 – full risk assessments can be accessed at [CIRCABC – Biblioteka \(europa.eu\)](http://CIRCABC – Biblioteka (europa.eu)))

<i>Species</i>	<i>Horizon Scanning Score</i>	<i>Species</i>	<i>Horizon Scanning Score</i>
<i>Codium parvulum</i>	48	<i>Microcosmus exasperatus</i>	45
<i>Halimeda incrassata</i>	48	<i>Charybdis longicollis</i>	45
<i>Erugosquilla massavensis</i>	48	<i>Herdmania momus</i>	45
<i>Hemigrapsus sanguineus*</i>	48	<i>Matuta victor</i>	45
<i>Penaeus pulchricaudatus</i>	48	<i>Pseudodiaptomus marinus</i>	45
<i>Portunus segnis</i>	48	<i>Siganus luridus</i>	45
<i>Pterois miles*</i>	48	<i>Siganus rivulatus</i>	45
<i>Amphistegina lobifera</i>	48	<i>Didemnum perlucidum</i>	44
<i>Xenostrobus securis</i>	48	<i>Hydroides sanctaecrucis</i>	42
<i>Rhopilema nomadica</i>	47	<i>Zostera japonica*</i>	42
<i>Lagocephalus sceleratus*</i>	47	<i>Caulerpa serrulata</i>	41
<i>Chama pacifica</i>	47	<i>Perna viridis*</i>	39
<i>Spirobranchus kraussii</i>	47	<i>Kappaphycus alvarezii</i>	38

Impact assessment

Following the first major systematic review of the impacts of marine invasive species on biodiversity and ecosystem services in the European Seas (Katsanevakis et al. 2014), Tsirintanis et al. (2022) employed the same methodology to assess both negative and positive impacts of 103 alien and cryptogenic species in the Mediterranean Sea. They arrived at an inventory of 88 alien and cryptogenic species with reported moderate to high impacts, among which the alga *Caulerpa cylindracea* was the highest ranking one (Table 3).

Table 3: The ten worst invasive species, based on their negative impact score, accounting only for impacts on biodiversity. This ranking is based on a sum of all reported impacts in the literature, weighted by their magnitudes.

Species	Impact score
<i>Caulerpa cylindracea</i>	134
<i>Womersleyella setacea</i>	80
<i>Lophocladia lallemandii</i>	65
<i>Brachidontes pharaonis</i>	47
<i>Siganus luridus</i>	44
<i>Rugulopteryx okamurae</i>	43
<i>Caulerpa taxifolia</i>	38
<i>Siganus rivulatus</i>	38
<i>Acrothamnion preissii</i>	36
<i>Spondylus spinosus</i>	33

In the western Mediterranean, the most reported negative impacts were caused by invasive Rhodophyta and Chlorophyta, whereas in the Levantine and the Aegean Sea by Osteichthyes, and in the Adriatic Sea by Mollusca. Competition for resources, the creation of novel habitat through ecosystem engineering, and predation were the primary reported mechanisms of negative effects, while most positive impacts on biodiversity were associated with the creation of novel habitat. More negative than positive impacts on biodiversity were reported, with 468 impact records (78%) against 129 (22%).

In contrast, and this constitutes an important finding of the Tsirintanis et al. (2022) review, more positive impact records were found to affect provisioning, regulating/maintenance, and cultural ecosystem services, with 312 negative and 373 positive records in total (Figure 7). Food provisioning services in particular can and have benefited from the introduction of several edible and commercially exploited alien fishes, crustaceans and molluscs (e.g., *Nemipterus randalli*, *Upeneus spp.*, *Siganus spp.*, *P. pulchricaudatus*, *Magallana/Crassostrea*, *Ruditapes philippinarum*). On the other hand, impacts on regulating and life cycle maintenance services have been overwhelmingly negative, with invasive macrophytes such as *W. setacea*, *A. preissii*, and *L. lallemandii* being responsible for the degradation of *Posidonia oceanica* meadows and coralligenous communities, habitats with a fundamental role in the functioning of Mediterranean ecosystems. Compared to the 2014 review, in the Tsirintanis et al. (2022) study there was a slight improvement in the overall strength of evidence for the reported impacts (increase in experimental studies from 13% to 16% and decrease in inference based on expert judgement from 51% to 32%), it is evident though that there is plenty of scope to increase the strength of evidence through the implementation of more experimental studies.

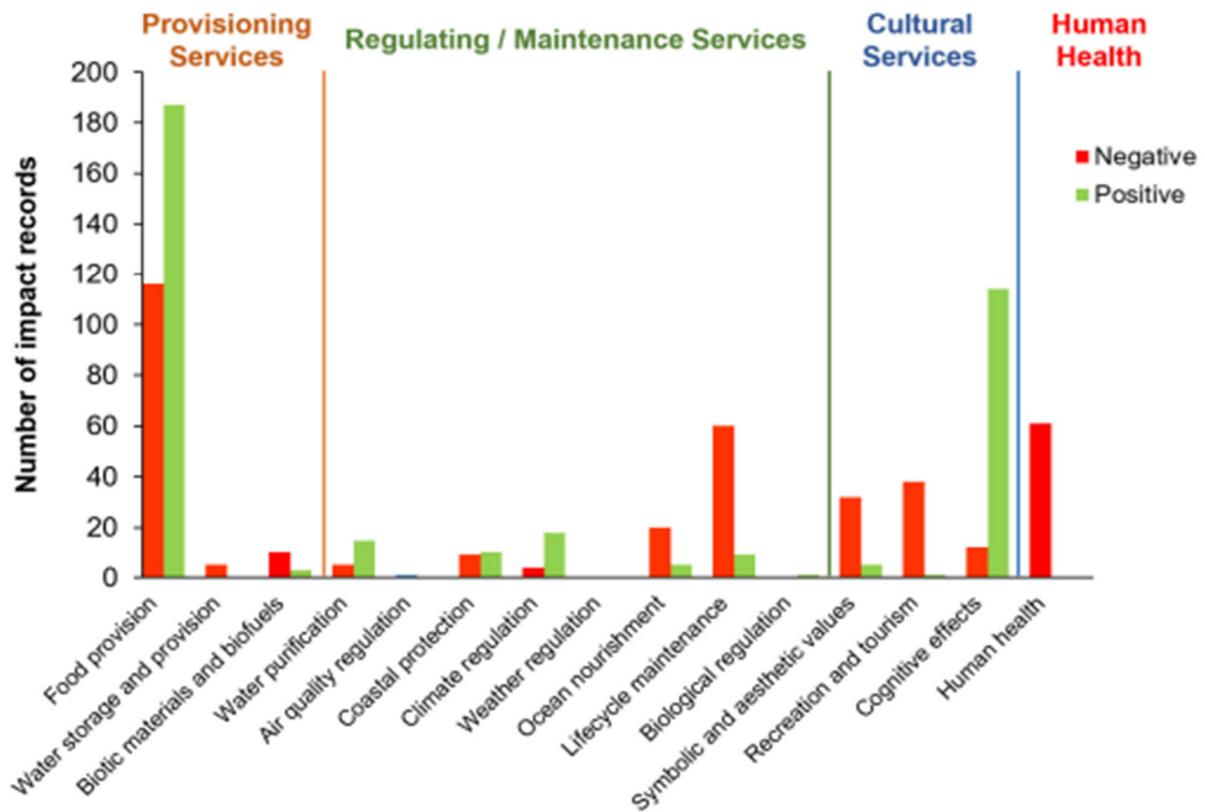


Figure 7. Overview of negative and positive impacts of 88 alien and cryptogenic species on ecosystem services and human health in the Mediterranean Sea. (Source: Tsirintanis et al., 2022)

Another important tool developed by Katsanevakis et al. (2016) is CIMPAL (Cumulative IMPact of Alien species), a standardized, quantitative method for mapping cumulative impacts of invasive alien species on the basis of the distributions of invasive species and ecosystems, and both the reported magnitude of ecological impacts and the strength of such evidence. Katsanevakis et al. (2016) estimated the impacts of 60 invasive species on 13 habitats, on a 10 x 10 km grid of the Mediterranean basin (Figure 8).

The identity and ranking of the most impacting species varied depending on the aspect of invasiveness taken into account, i.e., total occupancy, sum of impact scores across the whole basin, maximum impact score, etc. (Table 4), and showcases the versatility of this methodology to: (1) identify hotspots of highly impacted areas; (2) assess the relative importance of pathways of initial introduction to the cumulative impact and its spatial variation; (3) rank invasive alien species according to the large-scale or local importance of their impacts; and (4) prioritize areas/pathways/species/habitats for management actions and mitigation measures.

Table 4. Top 10 ranked high-impact scoring species according to different parameters in the CIMPAL scoring system (after Katsanevakis et al., 2016).

Rank	Species ranked by sum of impacts scores	Species ranked by number of cells with impact > 0
1	<i>Caulerpa cylindracea</i>	<i>Caulerpa cylindracea</i>
2	<i>Lophocladia lallemandii</i>	<i>Codium fragile</i>
3	<i>Womersleyella setacea</i>	<i>Siganus luridus</i>
4	<i>Caulerpa taxifolia</i>	<i>Fistularia commersonii</i>
5	<i>Acrothamnion preissii</i>	<i>Lophocladia lallemandii</i>
6	<i>Codium fragile</i>	<i>Saurida undosquamis</i>
7	<i>Magallana gigas</i>	<i>Siganus rivulatus</i>
8	<i>Brachidontes pharaonis</i>	<i>Asparagopsis taxiformis</i>
9	<i>Siganus luridus</i>	<i>Phaeocystis pouchetii</i>
10	<i>Siganus rivulatus</i>	<i>Womersleyella setacea</i>

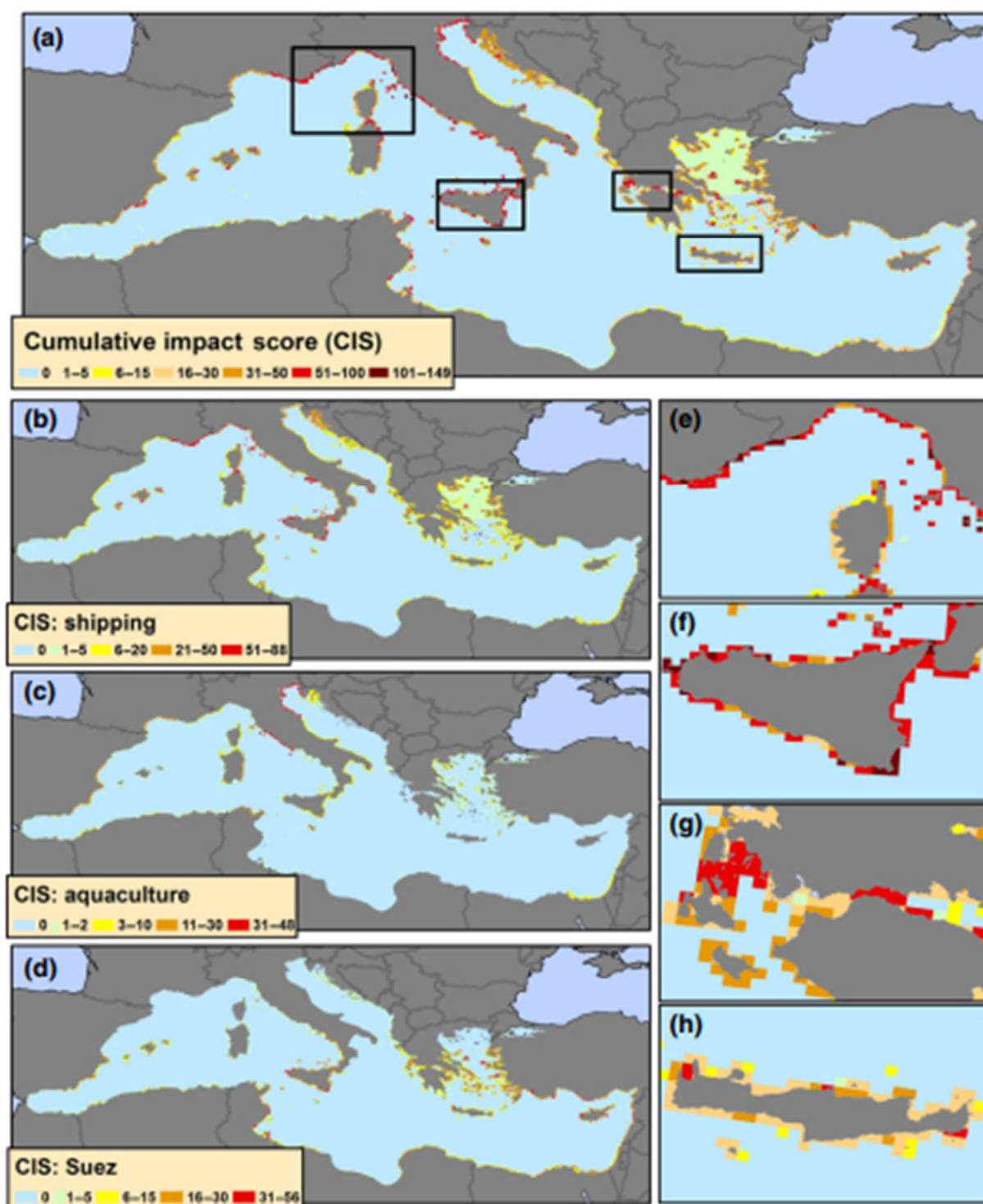


Figure 8. Mediterranean Sea map (a) of the cumulative impact (CIMPAL) score of 60 invasive alien species to 13 marine habitats, based on the uncertainty-averse strategy. Maps of cumulative impact scores to the same marine habitats by species likely introduced by shipping (b), aquaculture (c), and through the Suez Canal (d). Magnifications of the Ligurian Sea and Corsica (e), Sicily (f), the Greek Ionian Archipelagos and adjacent gulfs (g), and Crete (h). (Source: Katsanevakis et al., 2016)

3. Updated policy context

3.1. At the EU level, Council Regulation 1143/2014 on invasive alien species entered into force on 1 January 2015. The regulation introduces a dynamic priority list of species of EU concern (the so-called “Union list”), compiled on the basis of several criteria, most importantly the magnitude of IAS impacts on the environment and human well-being, their biogeographic representation in the EU and the feasibility of cost-effective prevention and management (Tollington et al., 2017). Since its first implementation, the Union List has been updated 3 times, in 2017, 2019 and 2022, and currently includes 3 marine species, namely the fish *Plotosus lineatus*, the brown alga *Rugulopteryx okamurae* and the crab *Eriocheir sinensis*, all present in the Mediterranean. *Plotosus lineatus* first appeared in Israel in 2002 (Golani, 2002), by 2016 it had spread to South Türkiye over Lebanon and Syria (Galanidi et al., 2019) and 6 years later was recorded in Cyprus (Tiralongo et al., 2022). It is thus spreading, albeit relatively slowly and requires monitoring and management, as it is a venomous, demersal species prone to population booms and causes injuries to fishers (Galanidi et al., 2017). *Rugulopteryx okamurae*, established in France and Spain, displays a highly invasive character, carpeting rocky reefs, displacing native species & communities and severely altering vegetated and coralligenous habitats. Management is partially feasible as its long-range spread is attributed to distinct secondary introduction events with aquaculture, the sea food trade and shipping vectors (Ruitton et al., 2021). *Eriocheir sinensis*, highly invasive in northern European waters, is a catadromous species already present in lagoons of the northern Mediterranean and suspected to undergo establishment there (Crocetta et al., 2020). Union list species require intervention in the form of prevention, early detection and rapid eradication, and management as deemed appropriate and this affects all EU Mediterranean States.

3.2. The first draft of the Post-2020 Global Biodiversity Framework (GBF) addresses alien species with Target 6: Manage pathways for the introduction of invasive alien species, preventing, or reducing their rate of introduction and establishment by at least 50 per cent, and control or eradicate invasive alien species to eliminate or reduce their impacts, focusing on priority species and priority sites (CBD, 2021)

3.3. The EU Biodiversity Strategy for 2030 calls for an enhanced implementation of NIS-relevant legislation aiming to minimise, and where possible eliminate, the introduction and establishment of alien species in the EU environment. One of the Strategy’s key commitments is the management of established invasive alien species and a 50% reduction in the number of Red List species they threaten (EC, 2020).

3.4. The Draft Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region” (Post-2020 SAPBIO), which aims to reduce the threats to biodiversity by alien species with its Target 1.2 on alien invasive species, by sharing databases and controlling introduction pathways and impacts in the most vulnerable areas. Furthermore, it stipulates that “Invasive alien species and pathways must be regularly identified in all countries, listing priority species to be controlled or eradicated”.

4. Regional Activities carried out in compliance with the 2016-2021 timetable, supporting the objectives of the previous Action Plan

4.1 Outputs of the EcAp/IMAP process directly contributed to meeting the main objectives of the NIS Action Plan as follows.

Objective: “Strengthening the capacity of the Mediterranean countries to deal with the issue of alien species, within the framework of the EcAp”

Objective: “Elaborating guidelines and any other technical documentation”

Action: **The adoption of the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP)** (UNEP/MAP, 2016), followed by Decision IG.21/3, outlining Good Environmental Status (GES) definitions and targets has been a pivotal point for the implementation of the EcAp process by harmonizing and streamlining the efforts of Mediterranean countries to assess and aim towards GES in line with global and regional policies, and most importantly with the Marine Strategy Framework Directive (MSFD) for the EU. IMAP, with the main objective to assess Good Environmental Status (GES), is structured along 11 Ecological Objectives and 27 Common Indicators (UNEP/MAP, 2016). Specifically for Non-Indigenous Species (NIS), these are Ecological Objective 2 (EO2) “Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem” and Common Indicator 6 (CI6) “Trends in abundance, temporal occurrence, and spatial distribution of nonindigenous species, particularly invasive, non-indigenous species, notably in risk areas, in relation to the main vectors and pathways of spreading of such species”.

Action: Establishment of three thematic **Correspondence Groups on Monitoring (CORMON)**, composed of national experts designated by the Contracting Parties, to ensure efficient coverage and in-depth discussions and analysis regarding integrated monitoring and assessment. The CORMON group for Biodiversity and Fisheries is responsible for CI6 on NIS, whereby all produced technical documentation relating to the IMAP is discussed, reviewed and revised in a collaborative and iterative process.

Output: **The first Mediterranean Quality Status Report (2017 MED QSR)**, elaborated within the Ecosystem Approach process (EcAp), was delivered to the public in 2017 (UNEP/MAP, 2017b). It was built upon existing data from numerous diverse sources and identified a number of needs and gaps to be filled in preparation for the next assessment exercise, scheduled for 2023 (UNEP/MAP, 2017c). The 2017 MED QSR further identified important knowledge gaps that need to be rectified for a more quantitative assessment, which in relation to EO2/CI6 are primarily: i) the weak evidence base for species impacts, ii) the paucity of information on the trends of abundance and spatial distribution and iii) the lack of standardized and synchronized monitoring data and time series, which compromises comparability between assessment cycles.

Output: **Monitoring protocols for the IMAP Common Indicators**, including CI6, were discussed and reviewed by the Meetings of the Ecosystem Approach Correspondence Group on Monitoring (CORMON), Biodiversity and Fisheries (Marseille, France, 12- 13 February 2019 and Rome, Italy, 21 May 2019) and the 14th meeting of the SPA/BD thematic Focal points (Portoroz, Slovenia, 18-21 June 2019) and endorsed during the 7th Meeting of the Ecosystem Approach Coordination Group, Athens, Greece (UNEP/MED WG.467/16, 2019). The monitoring protocol for CI6 makes recommendations for the selection of monitoring sites (e.g., MPAs and introduction hotspots), spatial and temporal aspects of monitoring, parameters to be measured as well as indicated field methodologies.

Output: the revised **Guidance Factsheet for Common Indicator 6 (CI6)** related to non-indigenous species developed by SPA/RAC and REMPEC was finally endorsed during the 8th Meeting of the Ecosystem Approach Coordination Group (UNEP/MED WG.514/12, 2021). This document clarifies the definitions for the different aspects of CI6, makes recommendations for data analyses and proposes a number of expected assessments outputs.

Output: The document on **Monitoring and Assessment Scales, Assessment Criteria and Thresholds Values for the IMAP Common Indicator 6** related to non-indigenous species (UNEP/MED WG.500/7) recommended spatial and temporal scales of assessment in harmony with the MSFD and 2017 as the reference year to set national NIS baselines. It furthermore proposed that partly native species, NIS introduced through natural dispersal, unicellular marine algae, parasites, extinct and freshwater species should be reported in NIS lists but considered in CI6 assessments on a case-by-case basis, in line with Tsiamis et al. (2021). Finally, based on preliminary analysis, it concluded that threshold values should be established separately for each of the Mediterranean subregions and should be sought by examining the data of the last two decades, if not an even more recent time period.

Output: The elaboration of **NIS Baselines at the national and regional/sub-regional level** (UNEP/MED WG.520/5, 2022), co-ordinated by SPA/RAC, was the result of a collaborative process between nationally appointed, invited taxonomic and regional experts, involving detailed exchange of information and the building of consensus on the final lists to be used as the baselines for the implementation of IMAP. The datasets include NIS records until December 2020 and will be used in the 2023 Mediterranean Quality Status Report for the assessment of CI6.

Output: Guidance on developing invasive alien species national and sub-regional lists (UNEP(DEPI)/MED WG.431/Inf.14, 2017), endorsed during the Thirteenth Meeting of Focal Points for SPAs (Alexandria, Egypt, 9-12 May 2017), outlined principles and methods for species prioritization in order to inform an early warning system for invasive species of Mediterranean concern to be incorporated in MAMIAS and presented species designated as invasive in Mediterranean countries.

Action: Further development of the Marine Mediterranean Invasive Alien Species (MAMIAS) database

Objective: “Supporting a regional information network for the efficient exploitation of alien species data and to support the regional policies on biological invasions”

According to the 2016 NIS Action Plan, the MAMIAS platform should be enriched with online tools to produce statistics and indicators, online mapping tools for the distribution of alien species, an early warning system for high-risk species and information on their biology and invasive character. Furthermore, it should be regularly updated with the latest presence information, changes in status and establishment success of all Mediterranean NIS at the national level and should be ideally linked to other international information systems and organizations, such as e.g., EASIN (European Alien Species Information Network) which is the official platform of the European Commission and IUCN-ISSG (Invasive Species Specialist Group of the International Union for Conservation of Nature) among others. Some of these objectives have been achieved, with the current implementation of MAMIAS containing coarse scale mapping functionalities, online tools for statistics at the national and regional level and being linked with EASIN. The database is soon to be updated with the latest national baseline inventories but detailed geo-referenced abundance data is still lacking.

Action: Development of an Integrated Data and Information System (IMAP Info System)

INFO/RAC in close consultations with UN Environment/MAP Components developed the Pilot IMAP Compatible Data and Information System (IMAP (Pilot) Info System), supported by the EU funded EcAp-MED II Project. This platform, later to become the fully operational IMAP Info System, enables the Contracting Parties to start reporting data for selected 11 IMAP Common Indicators, including CI6 for NIS. Data Standards (i.e., Excel spreadsheets with specific data entry requirements) and Data Dictionaries (the respective guidelines) for CI6 (UNEP(DEPI)/MED WG.461/22) we developed based on the Common Indicator 6 guidance Factsheet (UNEP(DEPI)/MED WG.430/3) and were presented during the Fourteenth Meeting of SPA/BD Thematic Focal Points in Portorož, Slovenia, 18-21 June 2019 (UNEP(DEPI)/MED WG.461/28).

Action: The 1st Mediterranean Symposium on the Non-Indigenous species was held in Antalya, Türkiye in

Objective: Organize a symposium every 3 years

January 2019, in collaboration with TUDAV (UNEP/MAP – SPA/RAC, 2019). The Symposium contributions addressed primarily issues of monitoring and impacts of non-indigenous species, with an emphasis on Marine Protected Areas. The main recommendations were:

- i) Active monitoring networks should be established at national and regional levels, in line with the Barcelona Convention Integrated Monitoring and Assessment Programme (IMAP) principles and common indicators. Furthermore, enhanced co-ordination should be encouraged in order to support appropriate responses at the sub-regional level.
- ii) Experiences and best practices on the management of invasive non-native species should be transferred to all Mediterranean countries and MPAs. Adaptive management is particularly important in relation to the fishery and tourism sectors.
- iii) Risk assessment should be further promoted as an instrument to support policy makers in their decisions regarding the need for managing NIS.

Objective: Conducting baseline studies and establishing monitoring programmes, within the framework of the EcAp Integrated Monitoring and Assessment Programme, to collect reliable and pertinent scientific data that can be used for decision-making where necessary

The GEF ADRIATIC Project

Progress towards the GEF Adriatic Project “Implementation of Ecosystem Approach in the Adriatic Sea through Marine Spatial Planning” was presented during the Fifteenth Meeting of SPA/BD Focal Points in June 2021. The project, carried out by SPA/RAC with PAP/RAC and national institutes/experts succeeded in developing the first integrated monitoring programmes, fully in line with IMAP requirements, for **Albania** and **Montenegro** and carrying out marine field surveys aligned with IMAP for a number of Common Indicators, including CI6 for NIS (UNEP/MAP-PAP/RAC-SPA/RAC, MET and NAPA, 2021; UNEP/MAP-PAP/RAC-SPA/RAC and MESPU, 2021). Moreover, it attempted to apply the IMAP integrated approach for the assessment of GES in these two countries.

The EcAp-MED II Project (2015-2019) “Mediterranean Implementation of the Ecosystem Approach, in coherence with the European Union (EU) Marine Strategy Framework Directive (MSFD)”.

The project aimed to support Southern Mediterranean Contracting Parties to the Barcelona Convention to implement the ecosystem approach in synergy and coherence with the implementation of the European Union (EU) Marine Strategy Framework Directive (MSFD). Its main outcomes include the elaboration of IMAP-aligned national monitoring programmes (NMP) for 7 countries, as well as a series of national and sub-regional training sessions on monitoring techniques of the common indicators related to biodiversity and NIS.

NMP related to biodiversity and NIS in **Algeria** <https://www.rac-spa.org/node/1642>

NMP related to biodiversity and NIS in **Egypt** <https://www.rac-spa.org/node/1557>

NMP related to biodiversity and NIS in **Israel** https://www.rac-spa.org/sites/default/files/ecap/israel/national_imap_israel.pdf

NMP related to biodiversity and NIS in **Lebanon** <https://www.rac-spa.org/node/1581>

NMP related to biodiversity and NIS in **Libya** <https://www.rac-spa.org/node/1560>

NMP related to biodiversity and NIS in **Morocco** <https://www.rac-spa.org/node/1559>

NMP related to biodiversity and NIS in **Tunisia** <https://www.rac-spa.org/node/1561>

4.2 Regional activities which promote the objectives of the NIS Action Plan

- **The Ballast Water Management Strategy for the Mediterranean Sea 2022-2027** (REMPEC, 2021a) was prepared by REMPEC in collaboration with SPA/RAC and has strong synergies with the NIS Action Plan as far as GES achievement in relation to ballast water is concerned. Its main focus is the ratification and harmonized implementation of the Ballast Water Management Convention in Mediterranean countries, but it also aims to initiate preliminary activities to address the threat of biofouling on ships. As there is significant potential for overlap between this Strategy and the NIS Action Plan, it should be taken into consideration that the BWM Strategy 2022-2027 includes actions for the development of regional procedures and protocols for Port State Controls and Port Baseline Surveys, biological monitoring in Mediterranean ports, risk assessment to identify high-risk ships and aid decision-making for the granting of exemptions at the regional level under the BWM Convention, as well as the elaboration of national strategies and action plans to manage biofouling.

- The Mediterranean Strategy for the Prevention, Preparedness, and Response to Marine Pollution from Ships (2022-2031) and its Action Plan (REMPEC, 2021b), includes a Common Strategic Objective (CSO) related to NIS, namely CSO 5 (Eliminate the introduction of non-indigenous species by shipping activities).

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