SUMMARY REPORT

SAFEGUARDING MEDITERRANEAN SEAGRASS BLUE FORESTS FROM ANCHORING DAMAGE

DEVELOPED IN COLLABORATION WITH:

Global Fishing Watch

ithaca

links

POSIDONIA NETWORK

SAFEGUARDING MEDITERRANEAN SEAGRASS MEADOWS FROM ANCHORING DAMAGE

In this study, we conducted a comprehensive assessment of anchoring-related impacts on *Posidonia oceanica* meadows throughout the Mediterranean region. Our findings highlight the widespread nature of the threats to seagrass meadows and their significant implications for coastal biodiversity, habitat stability, and carbon sequestration. Based on this assessment, we propose a set of priority recommendations aimed at mitigating anchoring pressure and enhancing the protection and resilience of these vital marine ecosystems.

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WHAT ARE SEAGRASS MEADOWS?

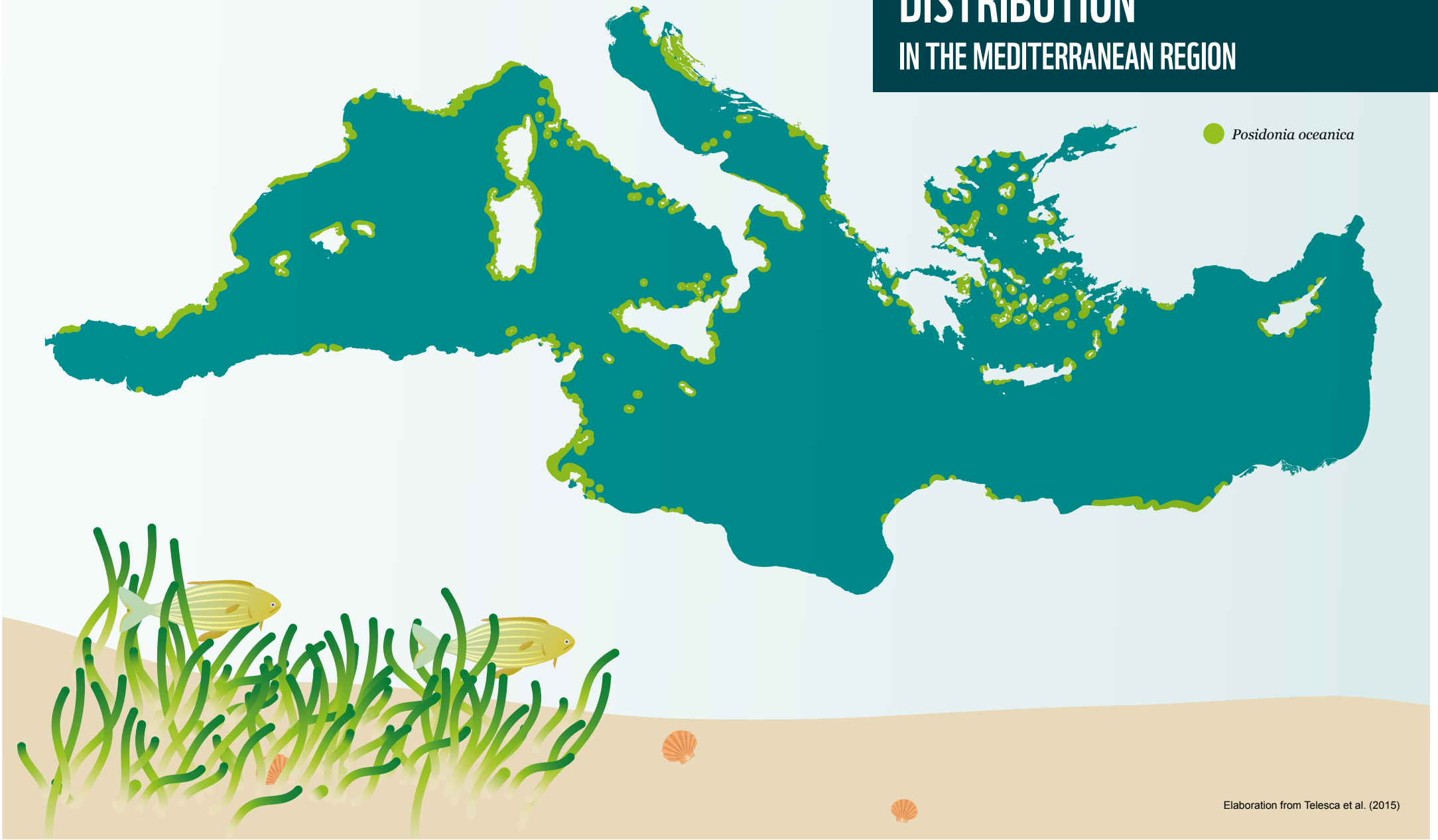
Seagrasses are coastal marine ecosystems dominated by flowering vascular plants growing on sandy or muddy seafloors to depths of up to 45 m, bunching together in large areas known as 'meadows'. Seagrasses are found on most continents, and there are seven species in the Mediterranean, five of them native to the region.

One of the most ecologically significant and widespread is *Posidonia oceanica* which is endemic to the Mediterranean. It covers more than 20,000 km² around the Mediterranean coast, an area almost as large as Slovenia.

Seagrass meadows, particularly *Posidonia oceanica*, are crucial to the ecological health and coastal resilience of the Mediterranean Sea. These vital ecosystems support biodiversity, protect shorelines, act as major carbon sinks, and have significant socioeconomic value. However, despite their importance, they face increasing threats from anthropogenic pressures, most notably from vessel anchoring.

POSIDONIA OCEANICA DISTRIBUTION

IN THE MEDITERRANEAN REGION



Elaboration from Telesca et al. (2015)

WHY DO SEAGRASS MEADOWS MATTER?

Seagrass meadows are among the world's most valuable ecosystems, providing a broad range of services that enhance ocean health, coastal resilience, support fisheries and human well-being.

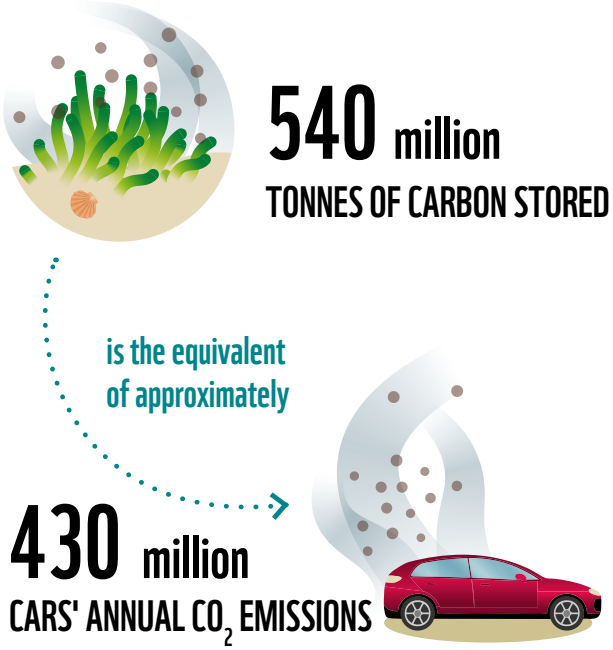
- They are **biodiversity hotspots**, providing vital habitats for numerous marine species at key life stages. As nurseries for juvenile fish, they support the continuing productivity of important commercial fisheries.
- They provide **nature-based solutions** to the impacts of climate change. Reducing flow velocities with their canopies, seagrass meadows combat erosion and enhance sedimentation processes as sea levels rise.
- They are major **carbon sinks**: on a regional scale, *Posidonia oceanica* meadows store about 540 million tonnes of carbon which is the equivalent to the annual CO2 emissions of approximately 430 million cars.
- They improve coastal **water quality**, filtering out pollutants, absorbing nutrients and reducing turbidity.

Degradation due to anchoring reduces seagrass meadows' ability to provide ecosystem services.

WHAT ARE THE MAIN THREATS TO MEDITERRANEAN SEAGRASS MEADOWS?

Despite their crucial environmental role, Mediterranean seagrass meadows are under significant pressure. It is estimated that the region lost around 34% of seagrass in the past 50 years and this is due to a number of key threats.

- **Anchoring vessels** cause direct physical and often irreversible damage.
- **Marine pollution**, mostly from industry and agriculture, degrades water quality and drives eutrophication.
- **Coastal development** overruns some seagrass areas and hinders the growth of others, particularly through reduced photosynthesis.
- **Bottom trawling** destroys seagrass meadows taking away decades of growth in seconds.
- **Climate change** is hindering the growth of seagrass meadows through extreme weather events, ocean acidification and an increasing proliferation of invasive species.



KEY THREAT: ANCHORING

Due to the region's popularity among leisure boaters, anchoring has a particularly significant impact on seagrass meadows in the Mediterranean, and this is especially true for *Posidonia oceanica*.

Anchors penetrate the seabed and uproot plants, causing scars and fragmented habitats. The *Posidonia oceanica* root system grows slowly, at just 1–6 cm per year. Recovery from anchor damage can be extremely slow or even non-existent: studies have shown scars persisting for 15 years after the initial event. Frequent anchoring further impedes natural regeneration. While restoration initiatives are becoming more successful, active restoration remains expensive (a case study in the Balearic Islands showed restoration costs of around €250 per m^2). Passive restoration and protection against threats remains the most impactful and efficient approach for the conservation of seagrass.

ANCHORING DAMAGE AROUND THE MEDITERRANEAN

Anchoring damage to *Posidonia oceanica* varies in severity around the Mediterranean. The worst impacts have been documented in locations in Italy, Spain and France. In unregulated or particularly busy areas, meadow losses of 30%–50% are often reported. In regions with enforced anchoring regulations and alternative mooring solutions impact levels are markedly lower at < 15%.

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In our study, Automatic Identification System (AIS) data provided by Global Fishing Watch was used to provide a detailed overview of anchoring pressure on Mediterranean *Posidonia oceanica* meadows in 2024.[1]

This data also enabled us to distinguish between the estimated impacts of larger (> 24 m) and smaller (< 24 m) vessels, and to analyse anchoring duration as well as location.

[1] The data only captures vessels equipped with AIS, therefore total damage is understated.

KEY FINDINGS

- Over **179,000 vessels** potentially anchoring on seagrass, **45% of which are larger than 24 m**.
- Over **50,000 hectares of seagrass are potentially affected by anchoring, which would be the equivalent of an annual economic loss, in terms of ecosystem services, of approximately € 4 billion per year**.[2]
- Around **60% of this total area is impacted by vessels larger than 24 m**.
- **Anchoring hotspots are found particularly in Italy, Spain, Türkiye, Greece, Croatia, France, Malta and Cyprus**. These alone include around 172,000 vessels potentially anchoring on seagrass (over 90% of the total). The highest numbers are 13,000+ anchorings in Italy (La Maddalena – Golfo Aranci) and Türkiye (Datça – Bodrum).
- **Italy, France, Croatia, Spain, Türkiye and Greece** not only experience the highest numbers of vessels anchoring on seagrass but also face the most potential significant ecological consequences.
- Only **France and the Balearic Islands have adopted and enforced regulations** to ban or at least to manage anchoring pressure over *Posidonia oceanica*.
- **North African countries are generally less affected** due to the smaller number of leisure boats.

[2] € 86,000 per hectare/year is the value of the ecosystem services provided by *Posidonia oceanica* according to a recent decision by a French Court.

LEISURE BOATING ANCHORING HOTSPOTS

LIKELY TO IMPACT SEAGRASS

179,000 VESSELS

45% of which are larger than 24 m

50,000 ha OF SEAGRASS

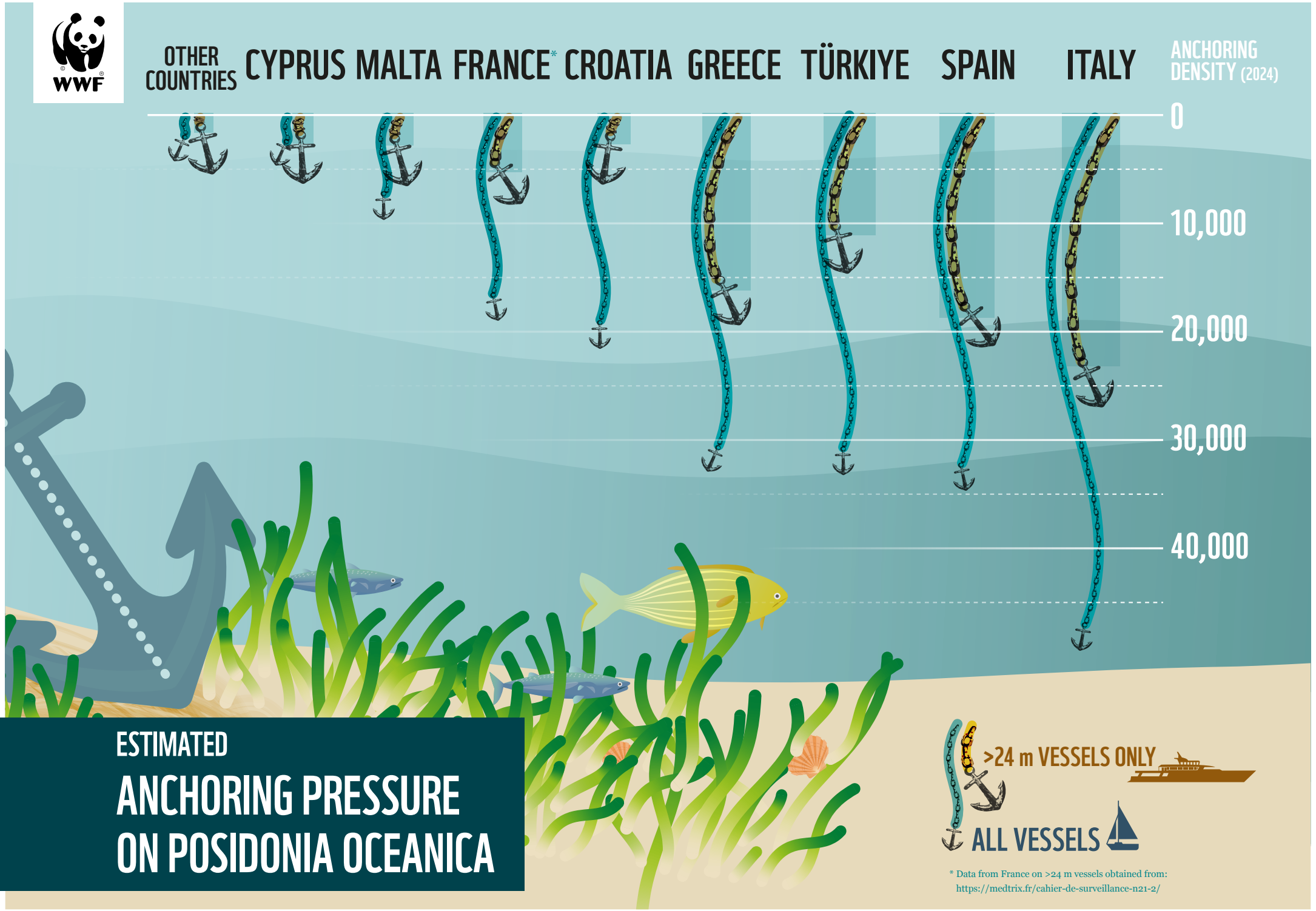
POTENTIALLY LOST FROM ANCHORING IN 2024

equivalent to approximately

70,000 FOOTBALL PITCHES

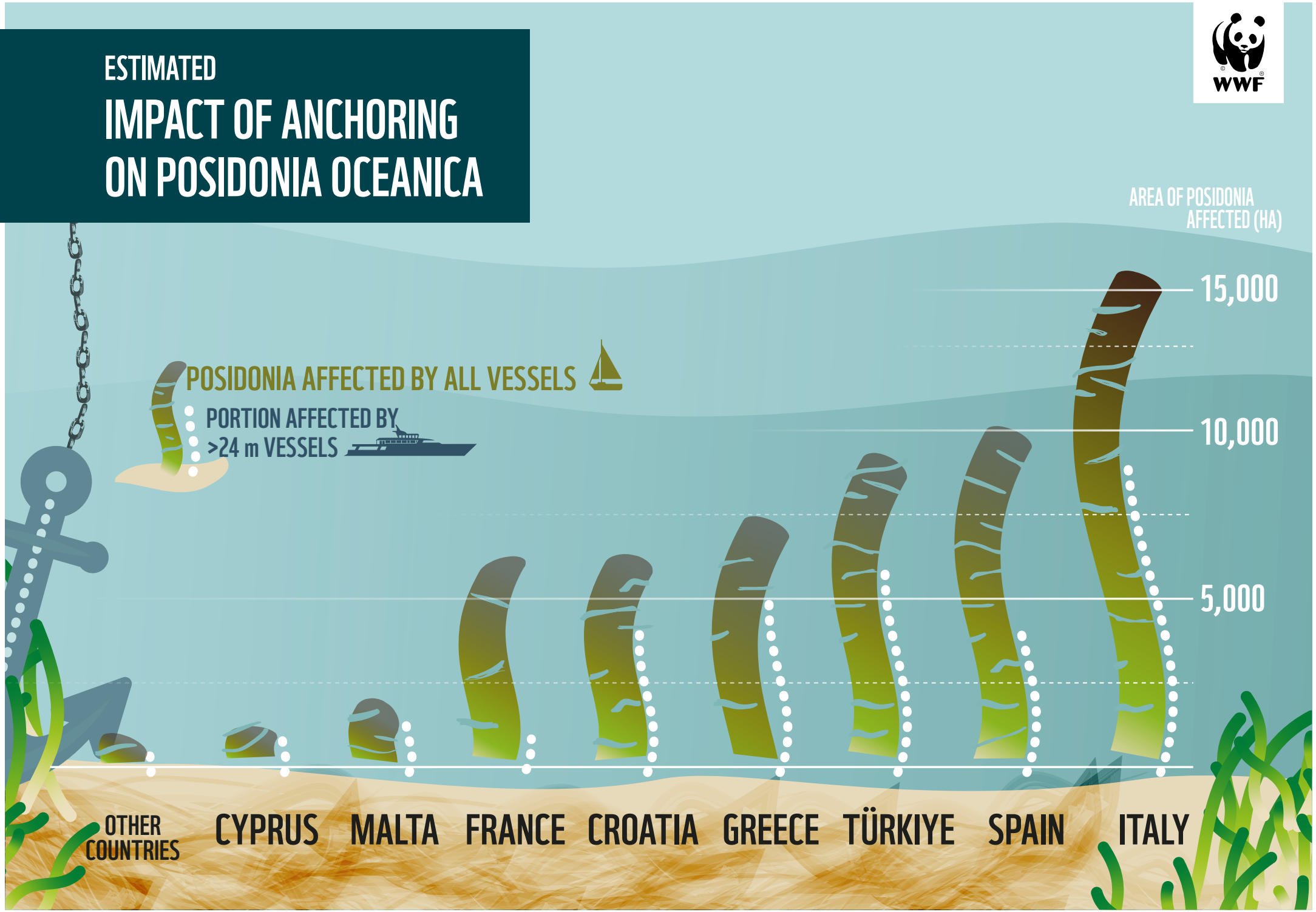
60% of the total area

impacted by vessels larger than 24 m


OTHER COUNTRIES
CYPRUS
MALTA
FRANCE*
CROATIA
GREECE
TÜRKIYE
SPAIN
ITALY
ANCHORING DENSITY (2024)
0
10,000
20,000
30,000
40,000
ESTIMATED
ANCHORING PRESSURE ON POSIDONIA OCEANICA
>24 m VESSELS ONLY
ALL VESSELS
* Data from France on >24 m vessels obtained from: https://medtrix.fr/cahier-de-surveillance-n21-2/

ESTIMATED

IMPACT OF ANCHORING ON POSIDONIA OCEANICA



RECOMMENDATIONS

Our assessment reveals that anchoring on seagrass potentially occurs over a large coastal area in the Mediterranean, and that high-traffic coastal zones are disproportionately affected by anchor-related damage, eventually resulting in long-term ecological degradation. Given the importance of *Posidonia oceanica* to biodiversity, shoreline protection, carbon sequestration and local economies, it's essential that authorities take the following actions to mitigate the impacts of anchoring and to promote sustainable practices.

RECOMMENDATIONS FOR GOVERNMENT AUTHORITIES:

To mitigate anchor-related damage and promote sustainable marine use, Mediterranean governments should:

- **Establish and enforce national anchoring regulations**, including comprehensive bans on anchoring large vessels (at least above 15 m) over seagrass meadows.
- Ensure that *Posidonia oceanica* is legally **protected at the national level.**
- Designate seasonal and permanent **no-anchoring zones** in ecologically sensitive (e.g., Marine Protected Areas) or highly impacted areas.
- Develop national **anchoring impacts mitigation plans** and integrate sustainable mooring policies into marine spatial planning, coastal zone management, and tourism development frameworks.
- Expand **eco-mooring infrastructure** (e.g., seagrass-friendly buoys) in popular boating destinations and ensure affordable access for users.
- Provide **financial incentives and regulatory support** for the adoption of low-impact mooring technologies.
- Develop **cross-border agreements** to harmonize seagrass protection standards across the Mediterranean basin.
- Enhance **enforcement and monitoring capacity**, including the deployment of satellite imagery, drones, and patrols to ensure compliance.
- **Support public education campaigns and professional training**, targeting recreational boaters, charter operators, and marina personnel.
- **Fund and facilitate long-term scientific research**, including detailed mapping of seagrass habitats, monitoring of restoration efforts, and modeling future pressures under climate change scenarios.
- **Recognize the fundamental asset value** of *Posidonia oceanica* which in 2024 was estimated by a French judge to be around € 86,000 ha/year.

RECOMMENDATIONS FOR LEISURE BOATERS:

Leisure boaters play a key role in protecting seagrass ecosystems and should commit to the following best practices:

- **Use navigation screens and apps** to identify approved, seagrass-safe anchoring or mooring locations.
- **Anchor exclusively on sand**, avoiding all visible seagrass meadows.
- **Anchor with sufficient chain** (at least 3 to 5 times the depth).
- **Utilize eco-mooring systems** whenever available instead of dropping anchors.
- Stay informed about **local regulations and protected zones** before setting out.
- Participate in **boater education programmes**, both online and in marinas, to understand the ecological impact of anchoring and how to minimize it.
- **Report illegal anchoring to local authorities** to support enforcement and ecosystem recovery.

CONCLUSIONS

The future resilience of Mediterranean coastal ecosystems hinges on coordinated, science-based management and responsible user behaviour. Preserving and restoring *Posidonia oceanica* meadows is not only a conservation imperative, it is a strategic investment in biodiversity, climate stability, and the sustainable livelihoods of coastal communities.

Future research should focus on mapping fine-scale seagrass distribution, developing predictive models for human-induced pressures under climate change and evaluating long-term restoration success. A coordinated, science-based approach is essential to ensure the resilience and recovery of these vital Mediterranean ecosystems.

We must ensure the protection of the habitats we rely on for survival. Preserving and restoring seagrass meadows isn't just an ecological mission – it's a strategic necessity for our future.

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