BirdLife Malta's feedback on the draft National Policy for the Deployment of Offshore Renewable Energy

30th September 2023

BirdLife Malta welcomes the initiative to draft the national policy aiming at fostering a sustainable energy transition in Malta and support the implementation of the EU Strategy on Offshore Renewable Energy.

BirdLife Malta believes that the development of wind energy facilities offshore is a unique chance for our country to deliver an energy transition at sea that achieves climate goals together with healthy, thriving and resilient seas. It also offers a great opportunity to enhance the monitoring efforts within the Maltese territorial waters, including but not limited to MPAs, and support marine conservation. However, such developments will inevitably impact marine ecosystems and protected species which are not necessarily in a Favourable Conservation Status. Therefore, it is essential to take all precautionary measures to avoid or minimise such impacts.

Impacts of offshore wind energy on Avifauna

The Maltese Islands lie along the central route of the European-African migratory flyway. This flyway represents a key route taken every year by these migrants and a bottleneck in their passage. In total, over 170 species regularly use Malta during migration (Casha, 2004). Malta is also home to internationally important seabird populations of *Puffinus yelkouan*, *Calonectris diomedea* and *Hydrobates pelagicus* (all Annex 1 species). These species rely entirely on the marine and coastal environments for their food, and any development in the respective area could have an impact upon the resident seabirds' foraging trips. Under the Birds and Habitats Directives, Malta has an obligation to maintain or achieve a Favourable Conservation Status of the three seabird species with restoration and enhancement measures in place to support full recovery.

Seabirds are excellent indicators of the overall health of the sea. In Europe over 30% of seabird species are experiencing population declines[1], underlining the failures of current management that has resulted in a continued loss of biodiversity at sea.

If placed in poorly chosen areas, offshore wind farms can have significant negative impacts on marine species and habitats, with seabirds being particularly sensitive. Additionally migratory species can be affected as they transit either from the African continent to the direction of Europe or vice versa, including but not necessarily stopping at the Maltese Islands or in its territorial waters. Migratory species numbers are expected to increase in their respective migratory periods (spring and autumn).

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[1] BirdLife Data Zone

Offshore wind farms can impact birds during construction and operation, contributing to increased adult mortality and reduced breeding success. In addition to impacting other marine species and habitats, impacts on birds include:

Impacts on avifauna from offshore wind facilities	
Source of potential impact	**Impact**
- turbines, mainly rotor blades and wakes - light emission	- bird collision - displacement - attraction of birds due to illumination by navigational lights and subsequent increase in the risk of collision
- wind-farm as a whole	- temporary or permanent habitat loss or change, including exclusion of habitat - fragmentation of feeding, breeding and roosting areas, as well as migratory routes due to barrier effect - change of food species availability - ecological trap - introduction of metallic pollutants into marine food chain impacting food source for seabirds
- boat traffic during construction and maintenance	- disturbance - stress and reduction of biological fitness - temporary or permanent exclusion from habitat
- electric cable to shore - increase of temperature in sediments during operation	- increased risk for botulism in coastal areas (eulittoral) resulting in an increased death rate for wading birds and water birds

Source: OSPAR Commission, 2004[2] and BirdLife ECA Position paper Winds of Change: Powering Healthy Seas through a Nature Positive Energy Transition, 2023[3]

Other effects may impact birds indirectly such as the alteration of hydrodynamics leading to large-scale changes in the ecosystem.

Solutions and recommendations

Whilst developing a policy on renewable energy offshore, it is important to integrate an ecosystem-based approach to make sure that energy transition at sea meets the nature positive criteria (Nature Positive is a call to action for governments to not only halt the current trend of biodiversity loss, but to reverse this trend by increasing the health, abundance, diversity and resilience of species, populations and ecosystems so that by 2030 nature is on the path of recovery, and is fully recovered by 2050). Furthermore, expansion of renewables requires concurrent proportionate actions to protect and enhance biodiversity. Protection and restoration of marine ecosystems should be pursued in parallel and equal ambition to the development of offshore renewables. In

2 Microsoft Word - p00385_suppl_1_what is the problem.doc (ospar.org)

3 Winds-of-Change_BirdLife-Europe-Central-Asia.pdf

terms of this, we appreciate that the draft policy contains reassuring provisions in relation to the need for a Strategic Environmental Assessment (SEA), Environmental Impact Assessments (EIA) and Appropriate Assessment (AA) and stipulates that the areas allocated for offshore facilities shall avoid Marine Protected Areas, adding them in the list of spatial constraints. The proposed fast-tracking should not compromise the aim and procedure of the environmental impact assessment. Clearly, depending on their scale and location, the environmental impacts of each separate project shall be assessed in due time in line with the national legislation on EIA, AA and SEA, however the policy should stress more on prevention of environmental risks. It is important to take all the possible preventive measures at the stage of initial planning, ahead of any project being proposed. Importantly, any potential area should be surveyed by at sea observations following standard protocols of observations from a vessel for seabirds and migratory bird species and by fixed radar and acoustic monitoring stations.

Suitable assessments to anticipate ecological impacts should ideally cover all seasons for two complete years prior to construction, and extend such monitoring throughout the entire construction and the operational phases. Surveys should cover the entire area being considered, a buffer and at least one control site. Pre-installation surveys are crucial to inform specific siting of turbines in relation to micro-siting and identification of any effects of offshore wind installations relevant to the Mediterranean region. Below we discuss further solutions which we trust can be useful in this regard.

Developing policies which are expected to have direct impacts on the environment (such as a policy in question) one should rely on the latest available scientific knowledge and data. Studies have shown there is a gap between the perceived and the actual risks of offshore wind farms, resulting from uncertainty or a lack of data about the real environmental impacts of ocean energy devices[4]. Therefore, the government should ensure permanent improvement of existing knowledge on environmental impacts of the offshore renewables, including by establishing a comprehensive and long-lasting video surveillance in the offshore wind energy facility to fill knowledge gaps and address other uncertainties such as collision risk[5]. Apart from that, the installation of a bird radar should be considered on the facilities - this would help with detecting migration and inform necessary decisions such as the powering down of the wind farm to prevent collisions. Such practices are already successfully applied on the offshore facilities in the North Sea[6]. The studies conducted after the installation and during operation of the first wind farm in the Maltese waters will be able to inform further strategies or improvements to applied mitigation measures. Surveillance of construction sites is important to enable monitoring of impacts. Such monitoring will also be beneficial to

4 Galparsoro I., e. a. (2022). Mapping potential environmental impacts of offshore renewable energy. AND Galparsoro, I. e. (2022). Reviewing the ecological impacts of offshore wind farms. npj Ocean Sustain.

5 Ward, J. e. (2010). Assessing the effects of marine and hydrokinetic energy development on marine and estuarine resources. Oceans 2010. Seattle. AND Wilberforce, T. e. (2019). Overview of ocean power technology. Energy.

6 Bird migration predictive modelling, threshold and protocol - Noordzeeloket UK

track the state of protected species and habitats, making sure their conservation status is not jeopardised and supporting the management of protected areas.

The draft policy should contain stronger environmental provisions and be better integrated into the existing environmental legislation. For instance, the draft states (p 32): "The competitive procedure will stipulate that the applications must be for offshore renewable energy projects of a scale and nature which is compatible with the Strategic Plan for Environment and Development (SPED), the National Energy and Climate Plan, and this Policy", not mentioning other relevant legislation. The new policy should remain strictly within the current legal frameworks for nature protection, including compliance with the Environment Protection Act, the EU Birds and Habitat Directives, Maritime Spatial Planning Directive, as well as Barcelona convention and its Protocols. Furthermore, Section 3. Policy Objectives should including ensuring the sustainable transition in line with Nature positive principles[7] and nature legislation.

In terms of references in the policy to Malta's Maritime Spatial Plan (MSP), it is worth emphasising once again that Malta's MSP at the moment is outdated and is under revision. The development of offshore wind facilities must be informed by strategic government-led spatial planning and not the other way around. Therefore we would like to stress on the urge to finalise the reviewed version of the MSP which would align with the current requirements and be based on the latest available scientific data. The policy would benefit from including guiding principles for co-location of appropriate marine activities within the renewable energy facilities offshore. Such co-location should be promoted in order to relieve pressure from sensitive areas outside wind farms. For example, fishing within wind farms should be allowed only if it is sustainable, best-practice, low-impact fisheries which would be subject to a site-specific permit. Optimising sea space for nature recovery and climate mitigation is vital for sustainable fisheries and must be at the forefront of co-location decisions[8].

The renewable energy sector offshore is still a relatively new player on the market, and its impacts on marine biodiversity during construction and operation are not yet fully understood. The situation is even less advanced with assessing the impacts during decommissioning[9] - more studies are needed to better comprehend the potential adverse effects and work for effective mitigation measures. With this said, we believe that the proposed policy could set a good start for such a strategic initiative by including the need to conduct necessary studies aiming at formulating the guiding criteria for sustainable decommissioning plans.

7 Nature Positive

8 Winds-of-Change_BirdLife-Europe-Central-Asia.pdf

9 Dannheim, J. e. (2019). Benthic effects of offshore renewables: identification of knowledge gaps and urgently needed research. ICES Journal of Marine Science.

Importantly, environmental pressures should be acknowledged and addressed ahead of the EIA process whenever it is feasible, so as to pre-empt and avoid potential impacts as much as possible. Such as, the government should set guidelines for the companies willing to submit their bids to adhere to a set of non-price ecological criteria to make sure that the avoidable pressures are indeed avoided, including by filtering the offers at the very primary stage and making sure the selected projects adjust the design and outlay of the farms to minimise potential impacts on biodiversity, including birds. The criteria should include:

- Non-polluting lighting schemes (avoiding non-mandatory illumination, adjusting the colour spectrum of lightning accordingly and using deflectors)
- Bird deterrent devices and solutions (for example, painting the turbines[10])
- Monitoring and surveillance in place (such as cctv, bird radar)
- Mandatory curtailment mechanism in place[11]
- Micro-siting exercise done prior to choosing the exact location
- Decommissioning plan in place

Consequently, we would like to call for a more proactive position of the government as opposed to the decentralised model chosen as optimal in the draft policy (Chapter 18 Different Models for Offshore Renewable Energy Developments). Particularly, the government should play a leading role in making sure the development is causing the least harm possible to the environment through monitoring and control during all phases of offshore facilities' lifecycle (pre-construction, construction, operation, decommissioning). This is important to track and timely react to emerging threats and pressures and adjust the developments accordingly, including future projects. Mitigation measures implemented before the construction are the best way to minimise ecological impacts on the marine ecosystems. However, it is important to highlight that primarily the measures called to avoid negative impacts are to be applied and only if the latter is impossible, the mitigation measures are considered. Compensation measures are only acceptable when all measures have been taken to avoid and mitigate adverse impacts on nature.

Socio-economic impacts arising from interaction with other anthropogenic activities offshore (including fisheries, maritime traffic, military use, cabling, etc) should be carefully evaluated and compensatory measures ensured accordingly. In terms of this, it would be beneficial to consider the cumulative impacts in relation to other uses or impacts in the chosen area, and ensure that the development impacts are considered in total and not singularly.

Provision 22.2 states that "at first, each project would require a dedicated grid connection Facility" whilst "later shared connections ***could be*** an option". Cabling works

10 Could zebra stripes steer birds clear of offshore wind turbines? | RenewEconomy AND Research into the effect of black blade in wind turbine - Vattenfall

11 Dutch shut down offshore wind turbines to save birds in 'international first' | Recharge (rechargenews.com)

needed for connection of offshore wind facilities to the main grid are associated with a number of environmental impacts, which is why it is important for the leading policy document to clearly guide decision-making process and ensure that future installations are established in a way to rely on shared connection.

We urge the Ministry to guide the siting of the proposed wind farms. It is crucial to use the available data prior to any development starts. Knowledge of some impacts is very species/site-specific, which creates uncertainty, therefore it is important to rely on up-to-date data and have on-going monitoring. Micro-siting is an effective tool used to avoid migration routes and is taking into account various relevant data, including bird tracking data, on-site repeated boat-based observations along transects and radar monitoring stations to help avoid sensitive areas. The principles of micro-siting could fit under Section 19. *Allocation of site/s*. Pre-construction options can be examined in order to avoid high-risk areas[12].

In this context, BirdLife Malta has conducted a preliminary analysis of the available data on avifauna in the Maltese waters to identify any areas outside marine SPAs which are also widely used by our local seabird species and birds on migration and in which offshore energy development should therefore be avoided. The maps are presented in the next part of this document together with their interpretation. We emphasise that these analyses guide large scale area choice and further data collection is required for informing micro-siting and impact assessment, including as part of EIA, AA and SEA .

Preliminary assessment for Shearwaters within the Maltese 25nm

Yelkouan shearwaters (*Puffinus yelkouan*) and Scopoli's shearwaters (*Calonectris diomedea*) breed in the Maltese islands and forage in the central Mediterranean. Yelkouan shearwaters are present in Maltese waters mainly from October to July, while Scopoli's shearwaters are mainly present from March to November. The latest population estimates for Yelkouan shearwater (1680-2560 pairs) and Scopoli's shearwater (2425-3800 pairs) show that both species are in decline[13]. The adult survival rate of Yelkouan shearwaters is estimated at levels which do not allow for population recovery[14,15], and any increases in adult mortality might accelerate this decline. Since the Maltese waters offer the most immediate foraging areas for these seabirds as well as shearwaters commuting through Maltese waters to more distant foraging areas, it is important that any risks posed by offshore energy are avoided.

12 Gartman, Mitigation Measures for Wildlife in Wind Energy Development, Consolidating the State of Knowledge — Part 1: Planning and Siting, Construction, 2016

13 https://era.org.mt/wp-content/uploads/2022/11/Seabird-Fieldwork-Report-2021-public.pdf

14 Sahin, D., Austad, M., Crymble, J., Barbara, N., Sahin, D., Austad, M., … Barbara, N. (2020). Malta Yelkouan Shearwater Species Action Plan.

15 Oppel, S., Raine, A. F., Borg, J. J., Raine, H., Bonnaud, E., Bourgeois, K., & Breton, A. R. (2011). Is the 71 Yelkouan shearwater Puffinus yelkouan threatened by low adult survival probabilities? Biological Conservation, 144(9), 2255–2263

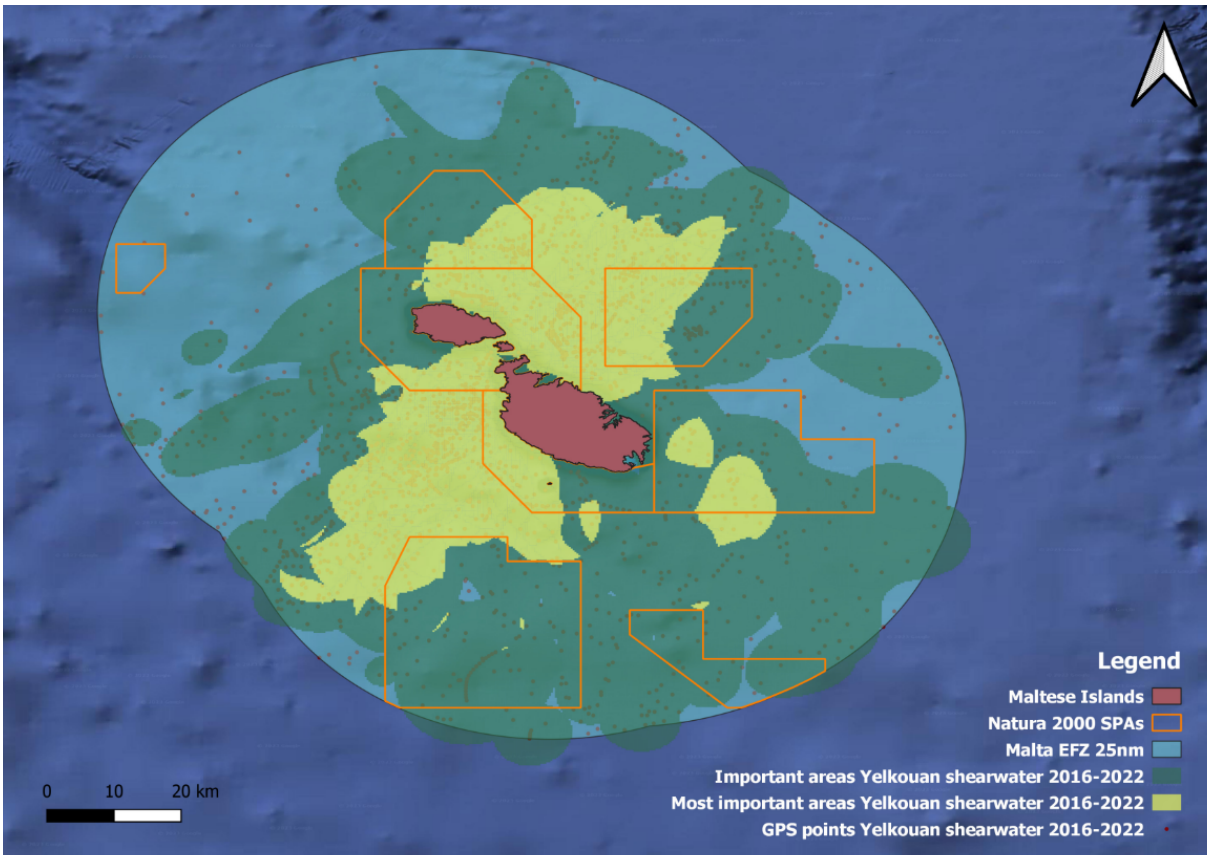

Figure 1. Important areas for Yelkouan shearwaters (Puffinus yelkouan) *within the Maltese 25nm zone, identified through GPS tracking data collected during 2016-2022. GPS-logger data was obtained from 44 individual shearwaters, and each gps-fix, at a standard 30 minute frequency interpolation, are shown in red dots. The areas in green are the 50% kernel density areas, representing important foraging, commuting and resting areas. The areas in yellow are the most important areas as identified through the latest BirdLife International workflow.*

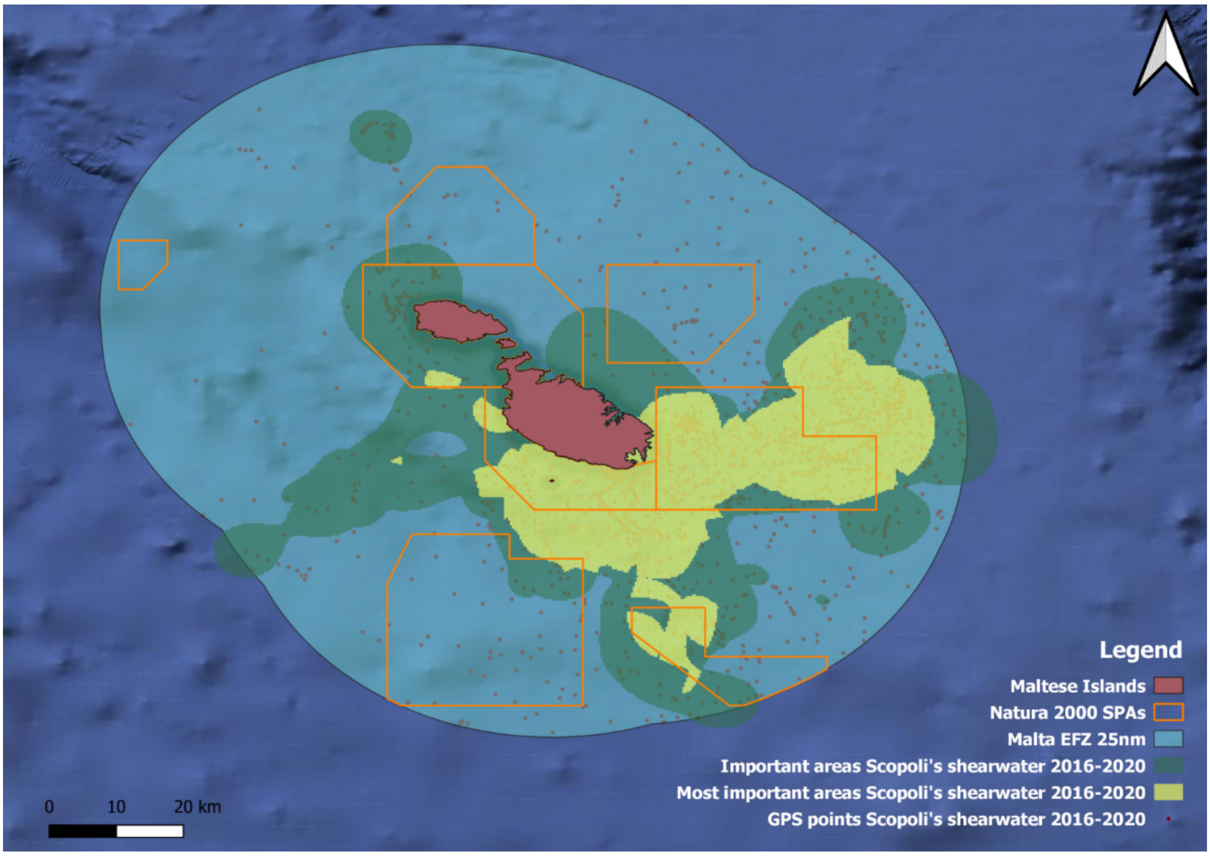

Figure 2. Important areas for Scopoli's shearwaters (Calonectris diomedea) within the Maltese 25nm zone, identified through GPS tracking data collected during 2016-2020. GPS-logger data was obtained from 20 individual shearwaters breeding at Ħal Far and Filfla colonies, and each gps-fix, at a standard 30 minute frequency interpolation, are shown in red dots. The areas in green are the 50% kernel density areas, representing important foraging, commuting and resting areas. The areas in yellow are the most important areas as identified through the latest BirdLife International workflow.

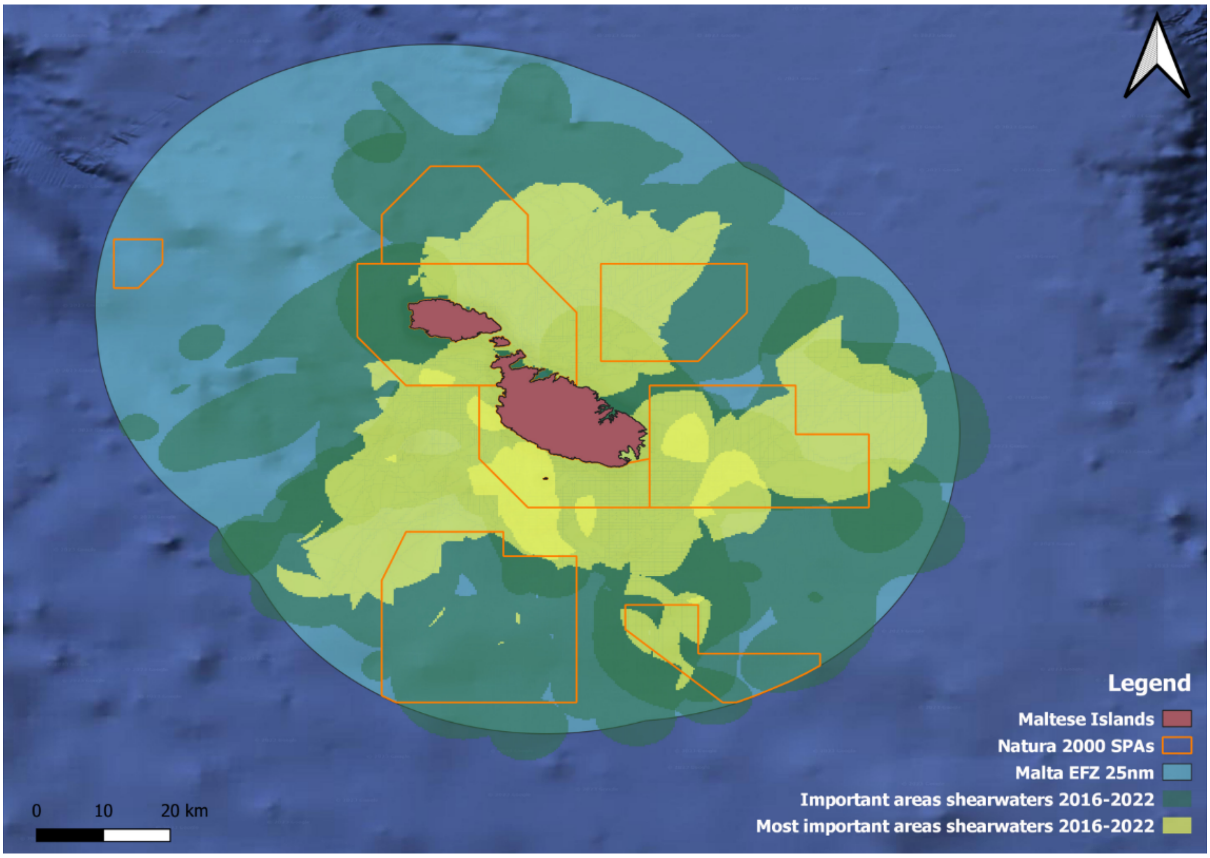

Figure 3. Combined map: Important areas for Yelkouan shearwaters (Puffinus yelkouan) *and Scopoli's shearwaters* (Calonectris diomedea) *based on gps tracking data collected in 2016-2022.*

Tracking data from the LIFE+ Malta Seabird Project (LIFE10 NAT/MT/090) was excluded due to use of this data in the identification of Important Bird Areas (IBAs) in 2015[16]. These areas were adopted by the Maltese Government and designated as Malta's first Marine SPAs (Natura 2000). Since the draft policy already takes into account the presence of SPAs and rightly avoids them, the aim of this exercise was to identify any further marine areas important to shearwaters breeding in the Maltese Islands by analysing more recent data.

For Yelkouan shearwaters we included data collected during the LIFE Arċipelagu Garnija Project (LIFE14 NAT/MT/991) in 2016 and 2017[17], LIFE Artina (LIFE17 NAT/HR/594) in 2019, LIFE PanPuffinus (LIFE19 NAT/MT/982) in 2021 and 2022, as well as other research in 2019 and 2020. Tracking took place mainly on birds originating from the seabird colonies of Rdum tal-Madonna and Majjistral Nature and History Park, but also on St Paul's Islands and Cominotto, covering all breeding stages from the pre-laying period to the late chick-rearing stages.

16 https://birdlifemalta.org/wp-content/uploads/2018/03/LIFE10NATMT090-MSP-A8_mIBA_Report_final.pdf

17 Gatt, M.C., Lago, P., Austad, M., Bonnet-Lebrun, A.S. and Metzger, B.J., 2019. Pre-laying movements of Yelkouan Shearwaters (Puffinus yelkouan) in the Central Mediterranean. *Journal of Ornithology*, 160(3), pp.625-632.

GPS data from 44 individual Yelkouan shearwaters were included in the analysis and the track2KBA workflow was followed[18]. All pre-filtering of data to identify erroneous positions was carried out on the complete data set, but following interpolation to 30 mins per individual, the data was clipped to the 25nm zone of Malta. All points within 5km from each colony were excluded. 50% kernel density estimation (KDE; probability that 50% of area use falls within that area), was carried out on the remaining points and resulting areas are marked as 'important' in Figures 1 to 3. Representativeness of the tracking data was estimated at 91.5% and core areas (marked as 'most' important' in Figures 1 and 3), are identified as being used by 10% or more of the source population (shearwaters breeding in the four colonies where tagging took place).

For Scopoli's shearwaters data collected during the LIFE Arċipelagu Garnija Project in 2016, LIFE Artina in 2020 and other research in 2020 was included. Tracking took place at two colonies which were Filfla and Ħal Far, covering all breeding stages from the pre-laying period to the early chick-rearing. GPS data from 20 individual Scopoli's shearwaters were included in the analysis, which followed the same steps as with the Yelkouan shearwater. Representativeness of the tracking data was estimated at 88.2% and due to the lower representativeness, a more conservative estimate is made for core areas (marked as 'most' important' in Figures 2 and 3), used by the source population (shearwaters breeding in the two colonies where tagging took place).

Given that current telemetry technology has not enabled suitable tracking of the Mediterranean Storm-petrel due to the small size of this seabird species, a knowledge gap in its distribution and use of Maltese waters may still exist. LIFE+ Malta Seabird Project identified a number of Marine Important Bird Areas for the Mediterranean Storm-petrel, however this may not necessarily mean that birds use exclusively such areas nonetheless.

Preliminary assessment for other bird species within the Maltese 25nm

Telemetry

Malta is important for migratory birds, due to its location on the Central Flyway between mainland Europe and Africa. The Maltese Islands are therefore critical as stop-over sites and migratory corridors for declining European species, such as the European Turtle Dove (*Streptopelia turtur*) (Vulnerable IUCN Status) and the Egyptian Vulture (*Neophron percnopterus*) (Endangered IUCN Status). Some of these species have been part of tracking studies with loggers attached locally during the non-breeding period and/or migration. Tracked species with loggers fitted in the Maltese Islands and data included in this analysis were: Turtle Dove (N=5; year=2023) and Mediterranean gull (*Larus melanocephalus*; N=1; year=2023). Additionally, BirdLife Malta contacted European

18 Beal, M., Catry, P., Phillips, R.A., Oppel, S., Arnould, J.P., Bogdanova, M.I., Bolton, M., Carneiro, A.P., Clatterbuck, C., Conners, M. and Daunt, F., 2023. Quantifying annual spatial consistency in chick-rearing seabirds to inform important site identification. Biological Conservation, 281, p.109994.

BirdLife partners and other research institutions requesting gps-tracking data for other species passing through Maltese waters on their migration. For this aim BirdLife Malta received and included in its analysis, gps-tracking data from: Egyptian Vulture (N=7; years=2006-2023); Osprey (*Pandion haliaetus*; N=1, year=2013); Honey Buzzard (*Pernis apivorus*; N=2; year=2022) and Marbled teal (*Marmaronetta angustirostris*; N=2; year=2021) (Figure 4).

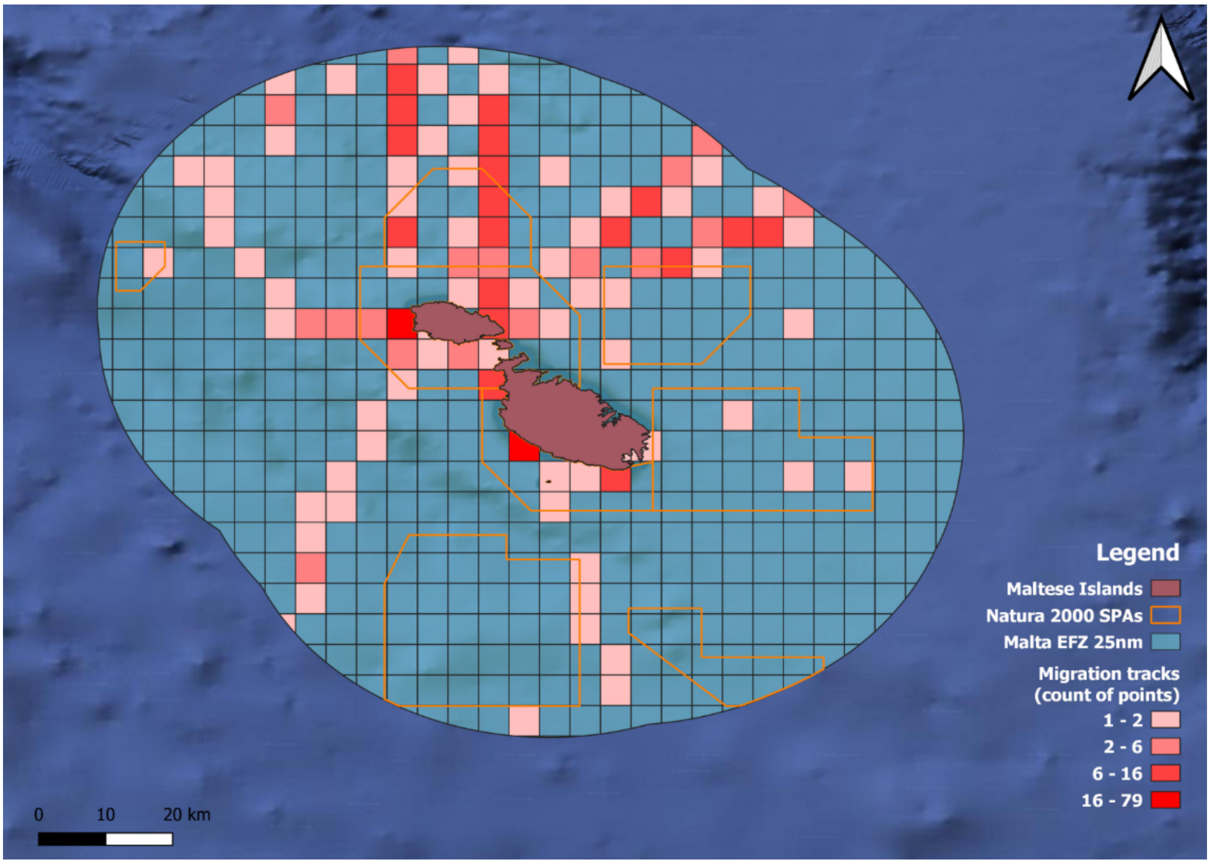

Figure 4. Combined map on migration tracks identified with data resulting from different tracking studies.

Moreover, data was made available from an ongoing study on locally breeding Yellow-legged gulls (*Larus michahellis*; N=3; breeding on St Paul's Islands in 2023). Due to the large number of points from the latter study and from the Mediterranean gull, gps-positions from these four individual gulls were analysed separately from the other species (Figure 5).

Due to low sample sizes kernel density estimation was not carried out, but rather the positions were overlaid a 0.05x0.05° grid and the number of positions per grid cell was counted.

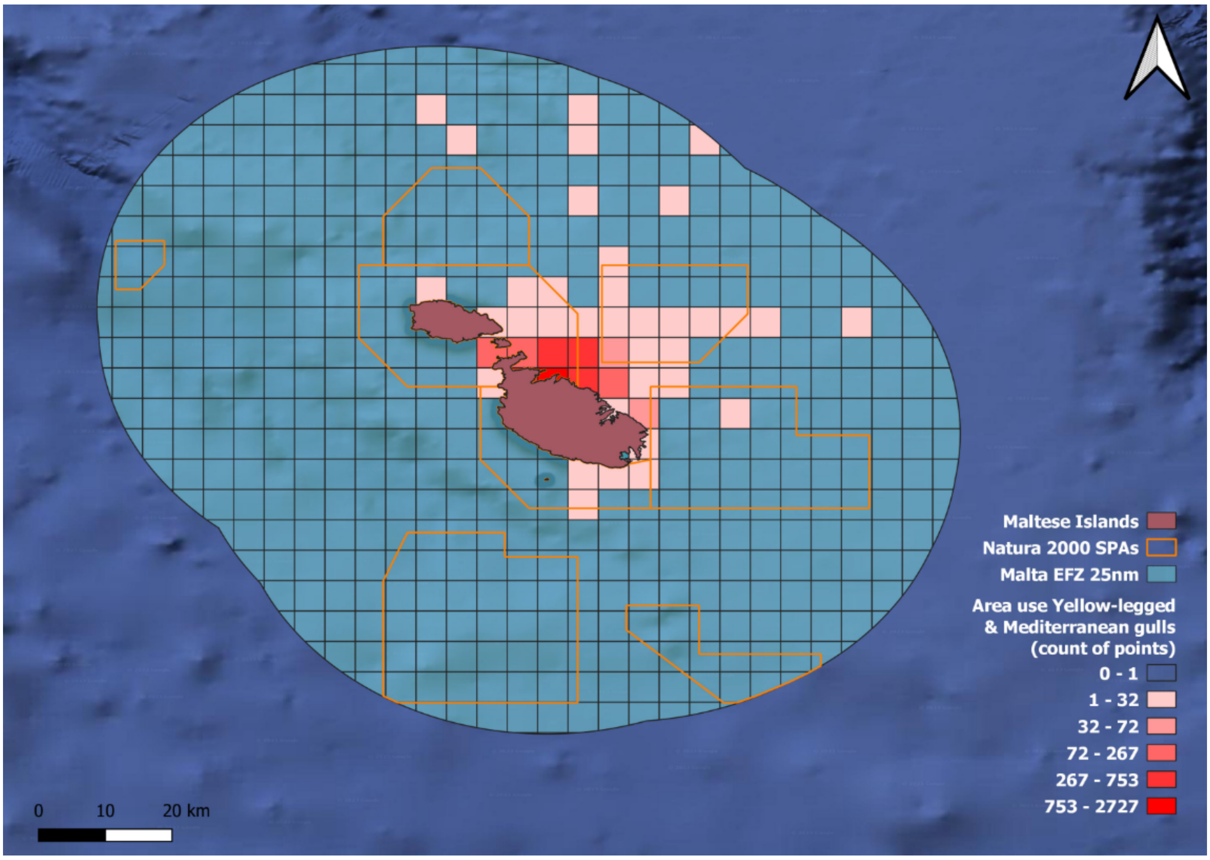

Figure 5. Areas frequently used by Yellow-legged gulls and Mediterranean gulls. Note that such data shows the distribution of individuals tagged from Salina and St. Paul' Islands, and are therefore indicative and not to be assumed as representing Malta's breeding or wintering populations. For especially the Yellow-legged Gull, the largest breeding colony occurs on the island of Filfla, which distributions are obviously not represented in the above figure.

Boat based observations

Systematic boat-based observations of birds in the Maltese 25nm FMZ have only been carried out as yet during the LIFE+ Malta Seabird project in 2012 and 2013. Observations of Yelkouan shearwater, Scopoli's shearwater and Mediterranean Storm-petrel (*Hydrobates pelagicus*) were used to identify the IBAs then designated as marine SPAs. Therefore, observations of these three species were not included. Observations of the following 32 species were included in the analysis:

- *Anas acuta*
- *Anas querquedula*
- *Ardea cinerea*
- *Ardea purpurea*
- *Adeola ralloides*
- *Asio flammeus*
- *Aythya nyroca*
- *Chlidonias niger*
- *Circus aeruginosus*
- *Circus macrourus*
- *Circus pygargus*
- *Egretta alba*
- *Egretta garzetta*
- *Falco subbuteo*
- *Falco tinnunculus*
- *Larus audouinii*
- *Larus fuscus*
- *Larus manocephalus*

- *Larus minutus*
- *Larus ridibundus*
- *Numenius phaeopus*
- *Nycticorax nycticorax*
- *Pandion haliaetus*
- *Pernis apivorus*
- *Phalacrocorax carbo*
- *Phoenicopterus ruber*
- *Platalea leucorodia*
- *Podiceps cristatus*
- *Stercorarius skua*
- *Sterna caspia*
- *Sterna sandvicensis*
- *Tadorna tadorna*

Observations were overlaid with a grid of 0.05x0.05° and the number of observations were counted within each grid cell (Figure 6). Interpolation for areas not covered by boat observation transects was not carried out but the coverage is deemed extensive [19]

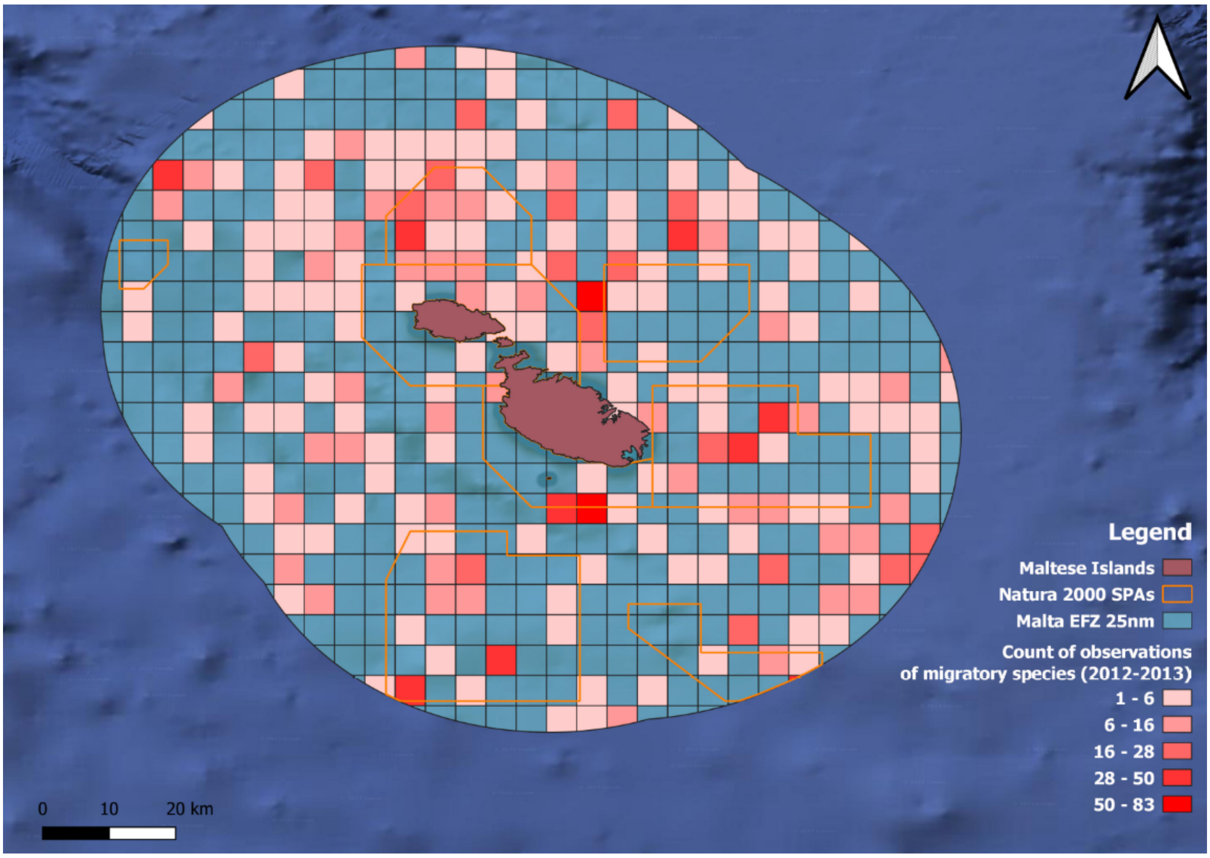

Figure 6. Count of observations of 32 migratory species made during 2012-2013 boat-based observations in the Maltese 25nm zone per 0.05x0.05° grid cell. The list of specific species included are presented above. Data is represented only on the basis of numbers and not the sensitivity of particular species.

Currently, BirdLife International is working on improving the data on wind energy sensitivity for each species, including for the Mediterranean region. Sensitivity mapping of species potentially exposed to pressures posed by offshore wind enables identification of the species impacted the most (due to their conservation status, higher

19 https://birdlifemalta.org/wp-content/uploads/2018/03/LIFE10NATMT090-MSP-A8_mIBA_Report_final.pdf

risks of collision, displacement, etc.), as well as allows to define sensitive areas which should remain free from offshore energy development. The mapping of area sensitivity is a vital step in prevention of environmental risks, such as negative impact on birds, and maps are a crucial tool to inform weighted and evidence-based decision-making in relation to deployment of offshore wind facilities. Species sensitivity information was not completed and available at the time of the closing of this public consultation exercise. Therefore, the presented information does not include assessing the sensitivity of each species, which could improve the analysis in the near future. We encourage the Ministry to find capacity and extend the current preliminary analysis presented here to such a sensitivity mapping exercise as part of the environmental impact assessment processes (in particular, SEA, EIA, AA).

Maps interpretations and conclusions

From the preliminary maps presented above, it is evident that shearwaters and migratory species make extensive use of the whole Maltese marine 25nm zone. Therefore, further assessments prior to site selection to inform micro-siting are deemed crucial and essential. Additionally, during the operational phase, monitoring of area use (video, radar and observers), as well as mitigation measures should be in place in any area chosen for offshore energy development.

Based on the data at hand, some areas are used more frequently by shearwaters and migratory species. These areas should be avoided for any offshore development because the risks are evidently higher. Certainly, no offshore development should be placed in the 'most important' areas, marked in yellow, for locally breeding shearwaters (Figure 3). We strongly advise against development in the areas marked as 'important', in green, for locally breeding shearwaters since these represent areas with high probability of use.

Based on the boat-based observations data (Figure 6), it is evident that migratory species are widespread throughout the 25nm zone. However, we recommend against offshore wind farms in areas with higher concentrations of observations (red to dark red).

The number of migratory tracks (Figure 4) are too few to identify any patterns in migratory routes taken, but based on the current data, areas North-West, North and Northeast, as well as South of the Maltese Islands should be avoided. Migratory pathways are dependent on weather, but also local scale uplift is affected by the seascape (Becciu et al. 2023; Nourani et al. 2021). Therefore, prior to final site selection we recommend repeated at-sea surveys, and potentially further tracking

studies, especially during spring and autumn migration to identify any fine-scale patterns in area use that might not have been identified yet. We once again, would like to point out that additional studies are required at this stage to fill the knowledge gaps. In any chosen area continuous and autonomous monitoring needs to be in place to detect migration events of medium to large sized migratory species that can be affected by operating wind farms.

Note: In the analysis at hand, shearwater tracking data was not available from all Maltese colonies, and while the sample sizes are representative of the colonies studied, one cannot exclude that shearwaters from other colonies forage in areas not identified during this analysis. For Yelkouan shearwaters the studied colonies represent 40% of the national population, while for Scopoli's shearwaters the studied colonies represent 9% of the national population. Furthermore, other colonies in the central Mediterranean hold large numbers of shearwaters (f.eg. Linosa), and some birds from those colonies are likely to visit Maltese waters. Due to the short time period available, it was not possible to acquire all available data and some marine areas within the Maltese 25nm used by shearwaters might not have been identified.

Likewise, the data available for other species than shearwaters is limited and it is very likely that the analysis at hand does not identify all areas used by migratory species in the Maltese waters. Data was also limited by season which could determine different migratory routes.

In summary, identified areas are used and important for locally breeding shearwaters or migratory species for which data was available. Lack of identified importance in any area should be subject to further observations and study to confirm the lower use by birds.

All spatial analysis was carried out in QGIS *and maps produced in the coordinate reference system* WGS84 (EPSG:4326).