Assessment of threatened species and marine resources restoration conservation in the ZMPNAH.

Developed by the Association de Gestion Intégrée des Ressources AGIR. September 2018

Report on the status of conservation and restoration of habitats of threatened species and marine resources in ZMPNAH.

Note :
This report has been prepared by the AGIR team, led by Mr. Houssine NIBANI, as part of the project Support Project by the Association for the Sustainable Financing of Mediterranean MPAs; the concerted management approach of the Al Hoceima National Park led by the Moroccan High Commission for Water and Forests and the Fight against Desertification and AGIR

Summary :

This report reviews the evolution of the state of conservation and restoration of habitats and threatened species within the Marine Zone of the Hoceima National Park (ZMPNAH) during the period 2012 to 2018. It focuses on descriptions of the approaches, systemic analyses and measurable results achieved under the program of activities of the projects supported by the GEF SGP in UNDP Morocco, the MAVA Foundation the Association for the Sustainable Financing of Mediterranean MPAs; the concerted management approach of the Al Hoceima National Park led by the Moroccan High Commission for Water and Forests and the Fight against Desertification and AGIR

Work focused on seven targets, of which the flagship species is the Osprey, the viability of each target was analyzed using key ecological attributes in terms of size, conditions and geographical context,

The selected indicators allowed us to measure our traced objectives on the one hand, and to achieve measurable results on the other hand (using the AGIR database), which allowed us to determine the impact of these results on threat reduction and eventually on the health status of the targets and the ecosystem of the project area (ZMPNAH).

Through the identification, discussion and understanding of the criteria for threat assessment in terms of Scope; Gravity and Irreversibility of on the target, threat ranking; and the understanding and definition of priority and essential strategies for improving the health status of the targets and the entire ecosystem, it was then possible to target the factors that generate the most important threats such as Dynamite and illegal trawling.

The microsystemic analysis, which was based on measuring indicators according to objectives from our action plan, allowed the achievement of a cascade and measurable result chains, which objectives converge on improving the health status of targets, whether at the species or biotope level

The report will describe in detail the results chains obtained, and the health status of flagship species within ZMPNAH.

Chapter I :

General Context

I Scope and vision

1. 1. Scope/Site Name: The Marine Zone of Al Hoceima National Park

The very high steep cliffs , 40 kilometers of length and its underwater subsoil which once sheltered, thanks to its ramparts, one of the rare original biodiversity of the Mediterranean has been transformed during the last ten years into the least protected area of Morocco, yet this area was decreed in October 2004 by a royal decree as Al Hoceima PNAH National Park.

Indeed, a significant number of direct and critical threats have been identified as a matter of urgency to target species such as poaching of Osprey chicks and eggs, whose populations are declining within the ZMPNAH, or other critical and permanent threats such as dynamite and copper sulphate fishing, which irreversibly destroys both tradable and non-tradable marine resources and its biotope, coupled with the devastating effect of illegal trawling activity in shallow areas within the ZMPNAH itself.

This project aims to eliminate direct and critical threats by strengthening species control and monitoring activities through the involvement of artisanal fishermen,

On the other hand, our strategy also aims to act in parallel with the main factors that are at the root of direct threats, such as the low level of awareness through awareness campaigns against juvenile fishing, and the involvement of fishermen in the co-management of the ZMPNAH through the creation of strictly no-fishing zones, as well as through the improvement of their income through better commercial management of the fishery product without increasing the fishing effort.

2. Vision Statement:

The marine and terrestrial ecosystem of the NAPH is well conserved for future generations.

II- ZMPNAH Targets

A Selection of ZMPNAH targets

The choice of targets within the ZMPNAH is difficult among the high density of algal, ichthyological or marine bird biodiversity; As an indication, we have chosen the Osprey, which is an umbrella species on the PNAH, it is a species on the Red List, in addition to being geographically sensitive at the Mediterranean level, other species chosen are not necessarily included in this choice framework, such as target species exploited commercially such as octopus, but which may reflect the viability of the ecosystem or certain species of flag-bearing species such

as Meru. The choice of our targets is based on three criteria:

- Targets must reflect conservation goals in relation to the landscape of the ZMPNAH.
- Must be viable and reasonably rehabilitee.
- Must be highly threatened and all critical threats must be identified and addressed by conservation actions

2. Definition of the most important ecological conditions for each healthy target

Geographical context :

Al Hoceima National Park (fig. 1) is located on the northern coast of Morocco (Al Hoceima, 42° 39' N, 11° 05' E); it is classified as a semi-arid to arid Mediterranean bioclimatic zone. It consists of two zones, marine and terrestrial, of 19,600 ha and 28,400 ha respectively. The protected area, stretching over 40 km of coastline along the Mediterranean Sea from Cala Iris to Al Hoceima, is characterized by high limestone cliffs, sea caves and many small islands near the seafront, some of which belong to Spanish territories.

Legal status :

Al-Hoceima National Park (PNAH), was decreed in 2004, however and in the absence of implementing decrees, the Park is not yet able to function in order to play its role in managing the resources of the marine ecosystem through the protection and restoration of rare or threatened habitats and species that it shelters,

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1. Definition of the most important ecological conditions for each healthy target

The selection of targets required extensive expertise based on the analysis of spatial data collectively representing all ecological systems of the ZMPNAH, communities, and species in the project area, as well as the multiple spatial scales in this case "ecological systems[3]":

[1] Algal :
The exceptional state of biodiversity in the marine part of the Al Hoceima National Park according to studies of algal populations in the coastal zone of the Al Hoceima National Park has made it possible to identify a total of 264 taxa distributed among three systematic groups: 57 Chlorophyceae, 52 Fucophyceae and 155 Rhodophyceae.

[2] Ichtyol :
The waters of Al Hoceima National Park are rich in fish species and are characterized by the presence of several endemic species from the eastern Atlantic and southern Mediterranean regions, reflecting the influence of the proximity of the Strait of Gibraltar. Overall, 72 species are present in the marine part, including 11 species typical of the Eastern Atlantic and Southern Mediterranean region.

3 La répartition des espèces en fonction de la nature des fonds est typiquement méditerranéenne. en effet, les substrats durs

i. Coastal zone: Osprey target representing coastal cliffs; as well as the Merou in rocky coastal subsoil; or soft
ii. Marine areas; which are represented by the bottlenose dolphin target and the "ash shearwater" seabirds;
iii. Benthic zones; which is represented by the target Octopus benthic marine biocenosis

Through the conservation targets chosen, it is hoped to ensure the conservation of all original biodiversity in key natural resources of the ZMPNAH...

1. Identification of the current health status of a target

These targets all represent species whose population structure and trajectories will be used as measures of the state and response of the evolution of ecosystem functioning in the ZMPNAH to actions and strategies of the evolution of our conservation project; For example, octopus is a "indicator species" that is not a priori a conservation target, but rather subject to a management plan "biological rest period and quotas", which will restore the health status of the Merou species, and then describe the health status of the Ecosystem and other species.

2. Development of monitoring plans

The number of targets identified at Seven is quite high; this is due to two reasons:
- The AGIR programmes are part of an evolutionary approach over time, which has made it possible to add new targets during all AGIR projects since 2008.

2. Definition of specific and measurable goals

It was initially agreed to define specific and measurable goals for most conservation targets on sound ecological principles that address the challenge of defining sound targets and appropriate and measurable goals over time, to be profiled in the future, through the results of our project's actions.

III - Identify, Evaluate and Classify Critical Threats

constituent le type de fond présentant le nombre d'espèces associées le plus important ; ce qui démontre l'étroite relation entre les biotopes types falaises, îlots et des cotes rocheuse et richesse ichtyologique ,mise récemment en évidence par l'étude menée par le projet « Régional pour le Développement d'Aires Protégées Marines et Côtières dans la Région Méditerranéenne (Projet MedMPA) plan de gestion provisoire de la composante marine du Parc National d'Al Hoceima »

1. Identification of threats within ZMPNAH:

Several human actions have been identified and qualified as degrading towards our conservation or management targets; they constitute threats that are generally direct and have at least one associated actor.

2. Critical Threat Assessment and Ranking

Understanding the criteria for threat assessment (Range or Area[4], Severity[5], Irreversibility[6]), while making target threat combinations, allows us to Understand and discuss the ranking of assessments; this is of crucial importance to have a draft priority action plan, which reflects the reality of the feasibility of strategies defined according to the resources available in terms of human and budgetary resources.

3. Elaboration of the Action Plan of AGIR and HCEFLCD

a. Selection of Goals and Strategies

b. Conceptualization: Development of a Conceptual Model

Good formulation of Goals meeting the following criteria:

- Target-related goals: directly associated with one or more conservation targets.
- Goals formulated in terms of Ecological Attribute(s) Key(s) (AEC) of the target you are trying to keep

Size - Geographical extent (ecosystem or habitat) - Abundance and/or demography of the population/community (species)

Chapter II :

State of conservation and restoration of the Osprey population within the ZMPNAH

- [4]Proportion spatiale de la cible affectée dans les 10 ans si les tendances et circonstances actuelles se maintiennent.
- [5]Proportion spatiale de la cible affectée dans les 10 ans si les tendances et circonstances actuelles se maintiennent.
- [6]le degré pour lequel les effets de la menace peuvent être inversés , et la cible affectée par la menace sera restaurée, si la menace disparait.

I Assessment of the viability of Target 1:'Osprey in the ZMPNAH'.

The general objective is to conduct an assessment of the viability of the Osprey; to measure its state of health over time, actions have been proposed from 2012 onwards, for its conservation in the future[7]. This involves identifying the key ecological attributes and their categories that will achieve the Osprey Target Goal stated as follows: By 2018, the population size of the Osprey will have increased by 30% within the ZMPNAH

1. Key ecological attributes :

They correspond to bio-ecological aspects of the Osprey target that will try to define it in one of the categories "either as a healthy, altered target leading to its permanent loss, or to its extreme decline over time".
AGIR was able to identify three categories of attributes[8], which will collectively determine the health status of this umbrella target

2. Target attribute categories

Table 1 shows the scale for assessing the viability of the Osprey target in the ZMPNAH from the attribute categories identified in terms of size, conditions[9] and geographical[10] context of the target;

				Echelle d'évaluation			
Cible	**Catégory**	**AEC**	**Indicator**	Low	Medium	Good	Very Good

[7] L'etat de 2018 actuel représente dans ce rapport l'etat futur escompté de la cible

[8] • Très Bon: Statuts écologiques souhaités; Requiert seulement un peu d'intervention de maintenance
• Bon: Indicateur dans le degré de variation toléré; Requiert quelques interventions de maintenance
• Moyen: En dehors du degré de variation toléré; Requiert une intervention humaine
• Faible: Réhabilitation toujours plus difficile; Il peut en résulter une extinction

9 Condition – mesure de la composition biologique et des interactions structurelles et biotiques qui caractérisent l'espace dans lequel se trouve la cible.

10 Contexte géographique – évaluation de l'environnement de la cible, incluant: les processus et régimes écologiques qui préservent l'occurrence de la cible tels que les inondations, régimes de feux et autres perturbations naturelles; la connectivité qui autorise les espèces-cibles à avoir accès aux habitats et ressources ou qui leur permettent de répondre aux changements de leur environnement par des dispersions ou des migrations.

Osprey,	Size	Number of breeding pairs	Abundance index of breeding pairs per year	< 25%	< 50%	< 75%	>75%
	Context of the environment	Number of nesting areas	Occurrence index = number of nests used over the potential number				
	Condition	Number of flights per year	productivity index				

Table 1 a : Assessment scale attributed to the viability of the Osprey target of the ZMPNAH

(a) Size of the Osprey population within the ZMPNAH

i. Census history:

The Osprey population was initially estimated at 10-15 pairs (Berthon and Berthon, 1984). During the period 1983-1993, it maintained a stable trend (Thibault et al. 1996) showing little variation in the number as mentioned by Thibault et al. 1996 (19-21 pairs in 1993) and by Franchimont, 1998 (15-20 pairs). Most of the recent data have been collected by the association AGIR, which has evaluated a total of 14-18 pairs in the same area (Orueta and Cherkaoui, 2010), now recognized as the protected area of the Al Hoceima National Park (ANHP).

ii. Status of the current population size of the Osprey:

Over the past ten years, AGIR's annual monitoring of the osprey population has resulted in a more regular database that complements the bibliography of the 1980s and 1990s. The outings are done in AGIR inflatable boat, a frequency that varies according to the month and the weather; they start from the beginning of the second week of March, indeed the mating of ospreys begins at this period, the exits continue in April, May and June or the feeding activities of the chicks is more intense, the flights are generally made from mid-June and continue until July,Considering that the National Park has a coastline of more than 40 km, the number of nests that have been occupied by breeding pairs, or by pairs that have carried out matings without reproductive follow-up (or even by territorial males) varies between 5 and 15 depending on the year, within the 18 distribution areas of these fish-eagles between Cala Iris and the cliff of Sidi Abid in the very centre of the

city of Al Hoceima.
Since 2011, two nesting areas have recently ceased all ecological activity, located at the western end of the AHNP, Sidi Abid and Sabadia, while the one located at the eastern end of the AHNP, "nest of the islet of Cala Iris", near the Port of Cala iris, no longer manages to nest despite trophic occupation.

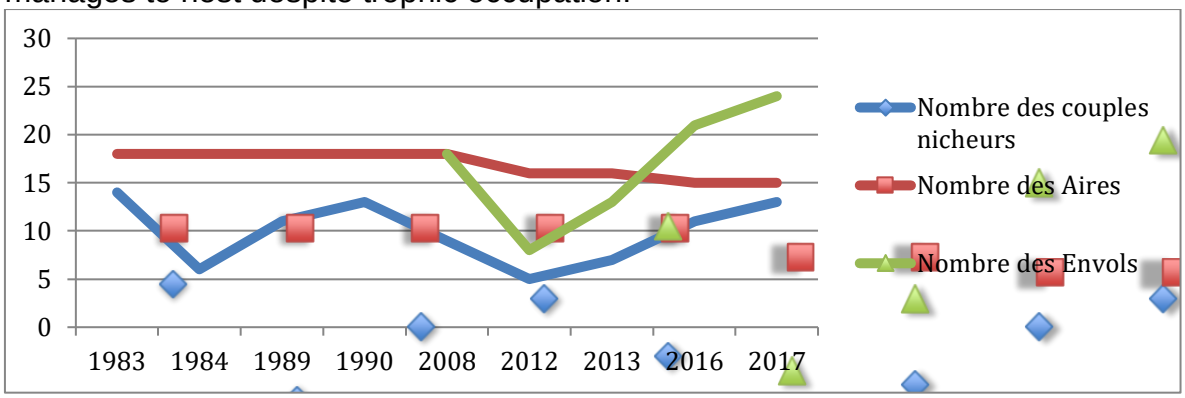


Figure 1 : Evolution de la Taille de la population nicheuse du Balbuzard au ZMPNAH Nibani h 2018

i. Determination of the threshold of allocation categories for the size of the Osprey population within the ZMPNAH

- Abundance index of breeding pairs per year

The size of the Osprey population varies naturally each year, the analysis of the Breeding Couple Abundance Index allows us to assess the viability of the target, and the evolution of this index during the 1980s to 1990s allows us to define the size of the population during this period as stable.

Année	1983	1984	1985	1986	1987	1989	1990	2008	2012	2013	2016	2017
Evolution des Nombre de couple nicheurs	14	6	15	15	16	11	13	9	5	7	11	13
Indice d'abondance des couples nicheurs par an	70	30	75	75	80	55	65	45	25	35	55	65

Tableau 1 b : Evolution des indicateurs écologique du Balbuzard pêcheur au sein du ZMPNAH

On the other hand, the negative evolution of this index over the 2008-2012 period shows anthropogenic disturbances that affect the size of the target, the index being at the critical limit of the tolerance threshold, between 25% and 50%, which corresponds to the number of breeding pairs varying between 5 and 10 (degree of anthropogenic fluctuation: interval between the yellow and red bands - Figure 2-), which required human intervention, which justifies the actions of the AGIR-

MAVA strategic programme drawn up in this direction from 2012; and continued by the actions of the Project Support Project by the Association for the Sustainable Financing of Mediterranean MPAs; the concerted management approach of the Al Hoceima National Park led by the Moroccan High Commission for Water and Forests and the Fight against Desertification and AGIR

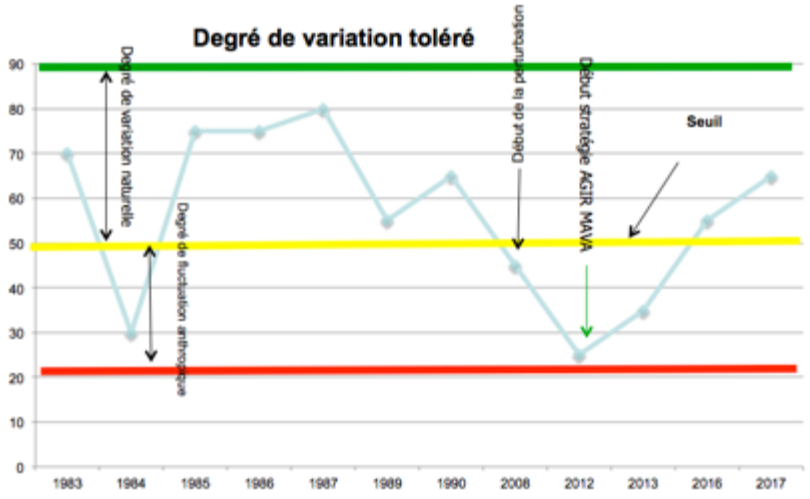


Figure 2 degré de la variation tolérée chez la population du Balbuzard pêcheur dans la ZMPNAH

Just after 2012, the variation of this index increased sharply, even allowing the return to the equilibrium band (from 2015); this corresponds to a size of about fifteen nests.

a) Context of the Osprey population environment within the ZMPNAH:

The Annual Percentage Nesting Rate Index, which describes the contextual attribute of assessing the viability of our Osprey target; allows us to plot the annual occurrence of breeding pairs within potential nesting areas (18 areas).

Année	1983	1984	1985	1986	1987	1989	1990	2008	2012	2013	2016	2017
Evolution des Nombre de couple nicheurs	18	18	18	18	18	18	18	18	16	16	16	15
Indice du taux annuel de nidification en pourcentage	77,7	33,3	83,3	83,3	88,8	61,1	72,2	50	31,25	43,7	68,75	81,25

Tbleau 2 : Evolution de l'Indice du taux annuel de nidification

With regard to the previous viability index, the index of the annual nesting rate; experienced the same negative trend from 2008 to 2012 figure 3-) ;it also followed the same very positive trend, which reveals our actions in 2015, allowing the same return of this index to the equilibrium band to reach the desired situation in 2017.

(a) Osprey population conditions within the ZMPNAH:

The viability assessment of our target is followed by another additional index, this time to track the annual productivity of breeding pairs.

Année	2008	2012	2013	2016	2017
Indice d'abondance = nbre d'envol observé /nbre d'envol théorique	80	64	74,2	76,3	73,8

Tableau 3 : Evolution de l'Indice d'abondance des couples nicheurs par an en pourcentage

The Abundance Index reflects the number of observed flights / number of theoretical flights; its scale of assessments is from 64% in 2012 to 76.3% in 2016 in accordance with the degree of natural variation (50% to 100%); this index highlights the health status of breeding pairs that have a good reproductive rate that is in a good to very good state.

Moreover, the average number of flights observed in the five breeding pairs (from 2 to 3 chicks per nest) in 2012 shows a very high degree of resilience of the species to be able to maintain a good state of health despite the various stresses resulting from the multiple threats to which it has been subjected.

(d) Conclusion on the Viability Status of the Osprey Target within the ZMPNAH:

The overall analysis of the indicators for the 3 categories of ecological attribute, in terms of population size; conditions and context of the population environment, indicates that in 2012 the state of the target was average; After the AGIR action programmes and HCEFLCD in the MAVA programme from 2012 and the Association for the Sustainable Financing of Mediterranean MPAs, the analysis of these same attributes has evolved positively and this time indicates **a current status of the target qualified as Good in 2017,** this does not prevent our strategic actions from continuing to maintain this status of the target or can still be improved in a very good state.

II - Identification, Assessment and Classification of Critical Threats to the Osprey Target within the ZMPNAH

1. Identification of threats to the Osprey target within the ZMPNAH

Several human actions within the ZMPNAH have been identified as negatively affecting the status of the Osprey conservation target; they are threats that are generally direct and have at least one associated factor; Seven direct threats in red have been identified: Dynamite fishing, urbanization and infrastructure, Disruption of nesting sites, illegal bird traffic, copper sulphate fishing, underwater trawling in shallow areas (Figure 3 and Table 4)

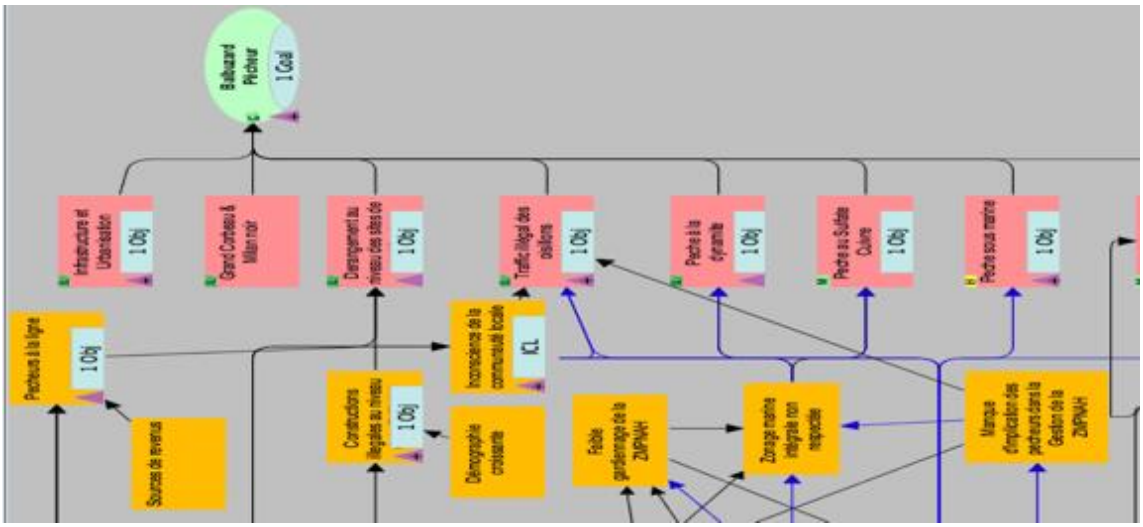


Fig 3 : Inter-relations entre les facteurs associés aux menaces directes sur la population du Balbuzard pecheur au sein de la ZMPNAH

1. Assessment and Ranking of Critical Threats to Osprey in 2012

The classification of the seven threats to the Osprey was based on the discussion, and the understanding of the classification criteria which are the scope, severity and irreversibility of the threat[11], the latter are classified as Low, Medium, High to Very High Table 4, depending on the situation in 2012; the dynamite fishery was considered very high; the summary of the classification of threats to the dynamite fishery was qualified as very high based on the scale of its scope, severity and high irreversibility. It is for these reasons that we have not chosen to deal with this threat in the first place with a priority strategic action plan while filling the gaps in the database on this threat, but this report will also detail the threat of urbanization and infrastructure, as we already have measurable indicators available; while other threats proved to be high or medium in 2016 and 2017 and require appropriate action, this is the case of underwater fishing, see Table 4:

Menace en 2012	Portée	Gravité	Irréversibilité	Résumé du classement des menaces :
Infrastructure et Urbanisation	Faible	Élevé	Élevé	Faible
Chalutage dans les zones peu profondes	Élevé	Élevé	Moyen	Élevé

[11] Critère de classification utilisé par FOS Foundation of Success

Grand Corbeau & Milan noir	Faible	Faible	Faible	Faible
Pêche à la dynamite	Très Élevé	Très Élevé	Élevé	Très Élevée
Pêche au Sulfate Cuivre	Très élevé	Moyen	Moyen	Moyen
Peche sous marine	Élevé	Moyen	Moyen	Moyen
Derangement au niveau des sites de niddification	Élevé	Moyen	Faible	Faible
Traffic illégal des oisillons	Moyen	Élevé	Moyen	Élevé
Résumé des classements de la cible balbuzard		Elevé		

Tableau 4 : Evaluation et Classement des Menaces Critiques sur le Balbuzard pêcheur en l'année 2012

a. Dynamite fishing,

i. Geographical context of dynamite use

The Marine Zone of Al-Hoceima National Park is made up of very high cliffs of about forty kilometres, a place conducive to the nesting of Ospreys, at the same time these cliffs are unfortunately very practical for dynamite fishing[12], which has had disastrous impacts on all fish stocks, but also on the population of Ospreys between 2010 and 2012 within the ZMPNAH,

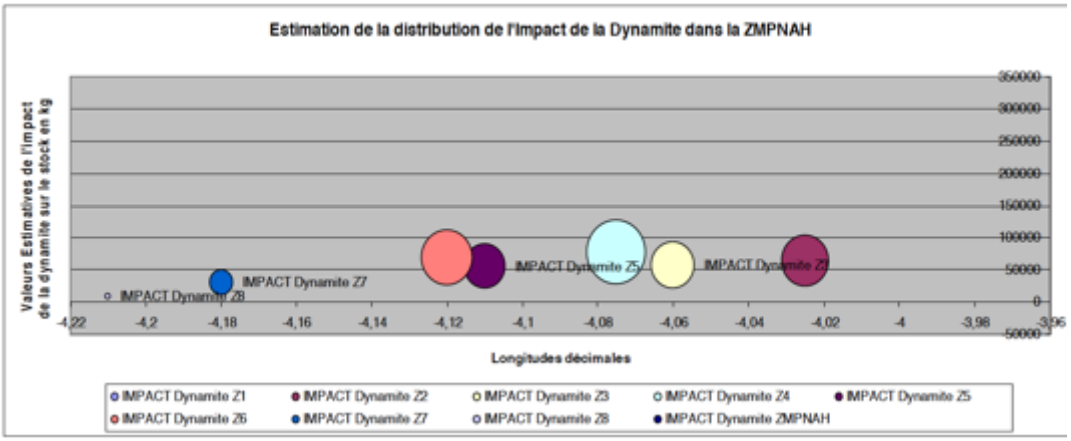


Figure 4 : Distribution spatiale de l'utilisation de la Dynamite au sein de la ZMPNAH 2010 Nibani h

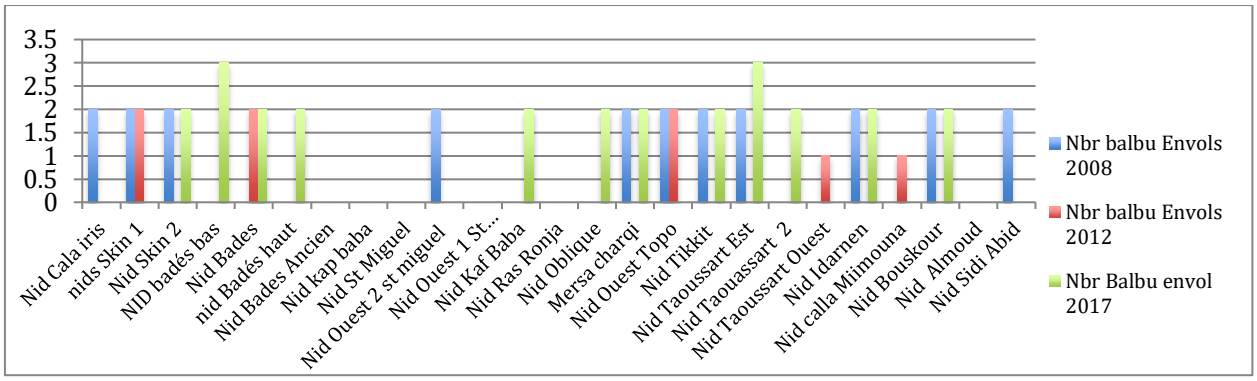
i. Impact of the dynamite fishing threat on the distribution of Osprey breeding grounds

The use of dynamite in the heart of the ZMPNAH and within cliffs and rocky areas (Figure 4), coincides with the spatial distribution of nesting areas (blue curve 2008), has created a stress whose biophysical impact is the fragmentation of the habitat of the Osprey population within the ZMPNAH.

The spatial distribution of breeding pairs successfully fledged in 2012 is completely shifted to that of dynamite fishing activity areas, this negative correlation clearly demonstrates the impact and

[12]Les dynamiteurs se mettant à la même hauteur des nids des Balbuzards, pour guetter le passage des bancs de poissons,

biophysical stress of this threat on the distribution of Osprey breeding areas, through the abandonment of most of the breeding and nesting areas in the heart of the MNMPAH[13].it is completely reveals the lowest annual nesting and flight rate recorded in 2012, at 31.25%; but also by an abundance index of 64%, which is the lowest in that year



-4,22 -3,96

Figure 5:Distribution spatiale des sites de nidification avec taux de réussite des envols entre 2008 et 2017 nibani h

1. Impact of the threat of urbanization and infrastructure construction on the distribution of Osprey breeding grounds

The effects of urbanization experienced by the Al Hoceima region, particularly in its urban area since 2011, have created stress whose biophysical impact, resulting from the fragmentation of the habitat of the Osprey population within the ZMPNAH, has resulted in the abandonment of three nesting areas and the population has recently ceased all ecological activity since 2011. Two areas are located at the western end of the PNAH, Sidi Abid and Sabadia, a third area at the eastern end of the PNAH "Nest of the islet of Cala Iris", near the Port of Cala iris,

The blue curve in Figure 5 shows that the last date that these sites were used was 2008, the geographical scope is currently low, but its severity remains fairly moderate, it can already be described as irreversible within the Sidi ABID area, and Almoud, On the other hand, the nesting area of Cala Iris could be recoverable because it is still a breeding and fishing area for the species, and if the disturbances cease it could resume, because the presence of the port is not the essential threat, it is rather the mussel farming activities that are the subject of the impacts resulting from the abandonment of the nest in the Cala Iris islet.

III Planning; Actions & Monitoring regarding the Osprey target within the ZMPNAH

[13]La zone rocheuse au cœur du PNAH qui est la plus riche en biodiversité (60%) que les zones meubles (40%)

1. Develop Goals

Goal[14] in relation to the Osprey target is "By 2028 the number of breeding pairs will have increased by 30% within the ZMPNAH and Jebha"

This goal has been formulated to meet the following criteria:
- It is directly linked to the osprey conservation target
- It is formulated in terms of the Ecological Key Attribute(s) (KAE) of the target that we will try to keep in terms of
o Size - Geographical extent (ecosystem or habitat within the ZMPNAH, as well as its abundance and demography of its population see fig 5
o Condition - Composition, structure, biotic interactions
o Geographic/landscape context - Ecological processes at the scale of the ZMPNAH, adjacent to the westernmost Jebha nests, the presence of a solitary male at Jebha Creek was detected[15], connectivity via the other Mediterranean populations in the Balearic[16] Islands

It is Impact Oriented and represents the desired future status of the conservation target over the long term.

1. Definition of strategies for the conservation of the Osprey population within the ZMPNAH

Our Action Plan (Figure 6), comprises three blocks of strategies[17], which are based on a set of actions that work together to reduce direct threats, while taking advantage of opportunities for possible restoration of natural systems within the ZMPNAH.
These strategies are based on the following criteria:

- o Includes one or more activities
- o Designed to achieve specific objectives and goals
- o developed to influence key intervention points in our conceptual model

[14] Un But n'est PAS un objectif de réduction de la menace

[15] En 2015 on a mis en évidence l'activité de nidification et d'envol de deux oisillons réussie d'une femelle Balbuzard issue des iles Baléares grâce au code de la Bague un article a été produit sur la revue Espagnole « Quercus »

[16] CASADO, E. Morandini,V. Torralvo,C. Florencio,C. Ferrer,M, Nibani ,H, Ambos lados del Estrecho.Aguilapescadora.Quercus, 361.Marzo 2016

[17] - 1 Programme de monitorage et de gardiennage participatif au sein de la ZMPNAH
-2 Stratégie de l'appui à la gestion administrative et commerciale des Coopératives des Pêcheurs artisants
- 3 Stratégie de sensibilisations et de formation ANNEXE

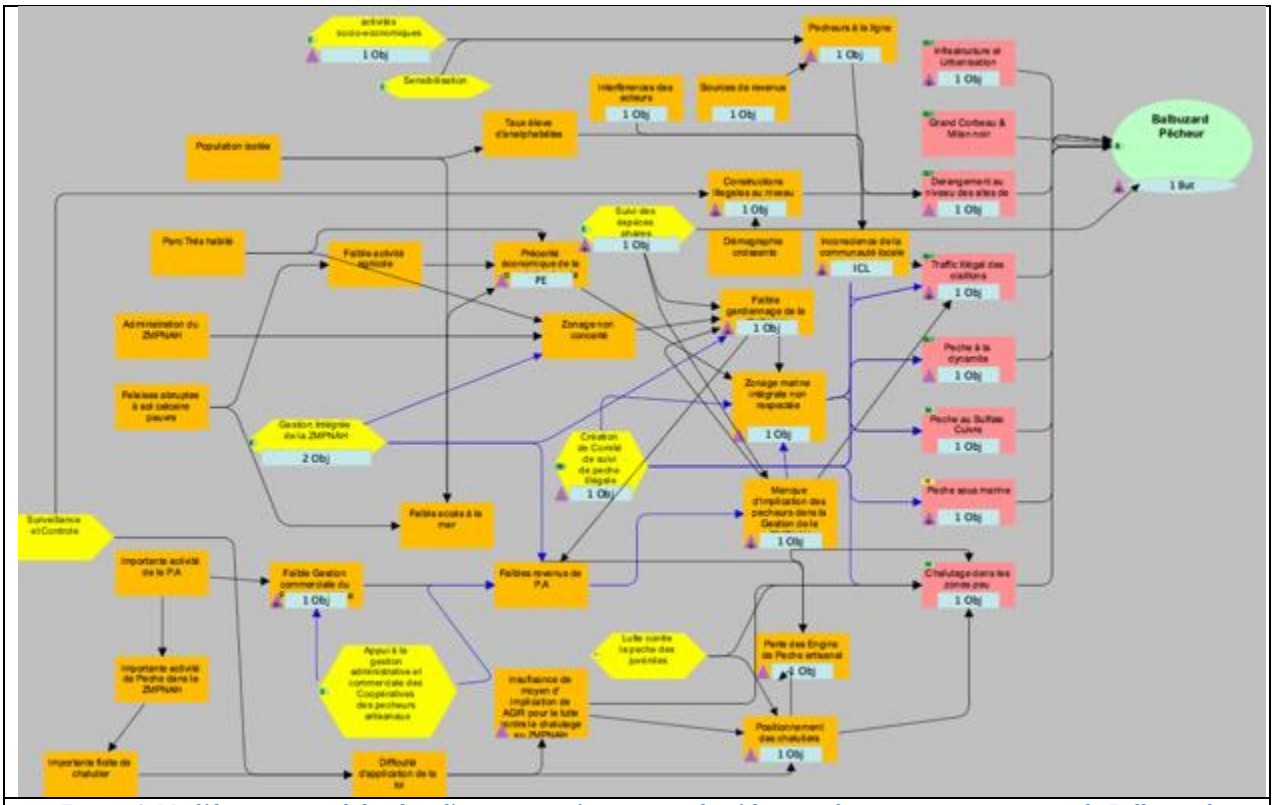


Figure 6: Modèle conceptuel du plan d'action stratégique pour la réduction des menaces concernant le Balbuzard pêcheur au sein de la ZMPNAH Nibani,h 2018

1. Action plan and monitoring based on Osprey conservation strategies within the ZMPNAH

a. Criteria and choice of strategic actions

The strategic strategies and actions developed were based on priority threats to the main associated target, the Osprey; however, within the scope of the ZMPNAH, the other targets are also affected by the strategies listed in Table 5 below; key intervention points have been identified to reduce certain threats, they are based on the reflections of artisanal fishing groups and institutional executives, thus allowing an assessment of which ones are most likely to be effective and feasible (Fig 6).

b. Analysis and evaluation of Strategies I: Participatory Monitoring and Guarding Program within ZMPNAH

For convenience, we have chosen to analyse only one of the three strategies: it is the participatory monitoring and guarding strategy because it directly concerns the conservation of

the target species; while the other two deal with factors further upstream and support the training of fishermen and the local community[18]..
Each of the actions in this strategy provides small to medium or quite effective reductions in threat reduction[19], they are mostly in good working order, the Miradi software[20] makes it possible to assess the relevance of strategic actions in reducing threats to osprey in the marine area of Al Hoceima National Park (ZMPNAH) see Table 5,

	Stratégies	Menaces	Évaluation	Avancement
Stratégies I : Programme de monitorage et de gardiennage participatif			Efficace	
Activités	• Augmentation de 30% des activités de contrôle au sein des halles de vente.	Chalutage dans les zones peu profondes	Efficace	En bon déroulement
	• Contribution au respect du zonage de la ZMPNAH	**Chalutage dans les zones peu profondes**	Faible	Planifiée
	• Contribution à la diminution des captures des Juvéniles	**Chalutage dans les zones peu profondes**	Faible	Planifiée
	• Créer des initiatives de co-gestion de la ZMPNAH	**Pêche à la dynamite**	Faible	Planifiée
	• Implication des pêcheurs dans le Gardiennage	**Pêche au Sulfate Cuivre**	Efficace	En bon déroulement

[18] Ceci n'infirme pas les impacts important de ces deux stratégies que ce soit sur les résultats intermédiaires obtenus ou même leur efficacité quant à la réduction des menaces obtenus et par la suite leur contribution sur l'amélioration de l'état de l'espèce cible
[19] Cette analyse micro-systémique est fournie par le logiciel Maradi qui peut prendre en charge de résumer les actions différentielles pour déterminer l'ensemble des résultats et impacts
[20] Miradi : https://www.miradi.org/Miradi - - is a user-friendly program that allows nature conservation practitioners to design, manage, monitor,

	• Interdire le chalutage dans la ZMPNAH	**Chalutage dans les zones peu profondes**	Efficace	En bon déroulement
	• Programme de monitorage et de gardiennage participatif	**Peche sous marine**	Moyen	En bon déroulement
	• Promouvoir une restauration des écosystémes côtiers marins	**Pêche au Sulfate Cuivre**	Efficace	En bon déroulement
	• Renforcement du club les amis du Balbuzard	**Trafic illégal des oisillons**	Efficace	En bon déroulement
	• Réduction de la Pêche au Sulfate de Cuivre au sein de la ZMPNAH	**Pêche au Sulfate Cuivre**	Moyen	Planifiée

Tableau 5 : Suivi et Evaluation des impacts du plan d'action stratégique de monitorage sur la réduction des menaces ciblant la Balbuzard pêchue de la ZMPNAH nibani h 2018

1. Development of Results Chains for threat reduction and improvement of the Osprey target within the ZMPNAH

The development of the results chains was based on the conceptual model that includes our strategies in Figure 6; thus, some neutral or negative factors[21] are transformed into intermediate expected results[22] ; while some threats, for example, the threat ("Dynamite fishing") becomes a threat reduction result ("reduction of dynamite fishing within ZMPNAH") (Figure 7).

a. Concrete example of results chains linked to a target

The scope criteria, as well as that of gravity (classified as high in 2012), Table 6; the dynamite fishing threat[23] (resulting from the disturbance caused by dynamiters to the osprey target species and its biotope), is a concrete example in terms of priority choice for seeking solutions for this main threat, AGIR was able to reverse the order of its scope and gravity attributes (classified as low in 2018 Table 7).

These results are the result of, among other things, the activities resulting from the implementation of several awareness-raising workshops and, above all, the major workshops involving fishermen and local populations in the search for a participatory solution, which concluded with an intermediate result; very important, that of the agreement of the local populations to give their approval to AGIR to prosecute dynamiters, and then that of the total elimination of dynamite fishing[24] ;the impact hit another important target, which is that the state of the biotope, which has improved, has allowed the reconquest of breeding pairs in these areas from 2016 and 2017 onwards, as shown by the green curve in Figure 5.

[21] Faible gardiennage de la ZMPNAH

[22] 30% des pêcheurs sont impliqués dans le gardiennage de la ZMPNAH

[23] Au moins 70% de la ligne côtière de la ZMPNAH figure 4

[24] L'élimination totale de cette menace en 2015, n'est pas tombé subitement, mais il est lié à des résultats intermédiaires sous forme de cascades de liens logiques et solide ne terme de faisabilité et d'influence : Science participative

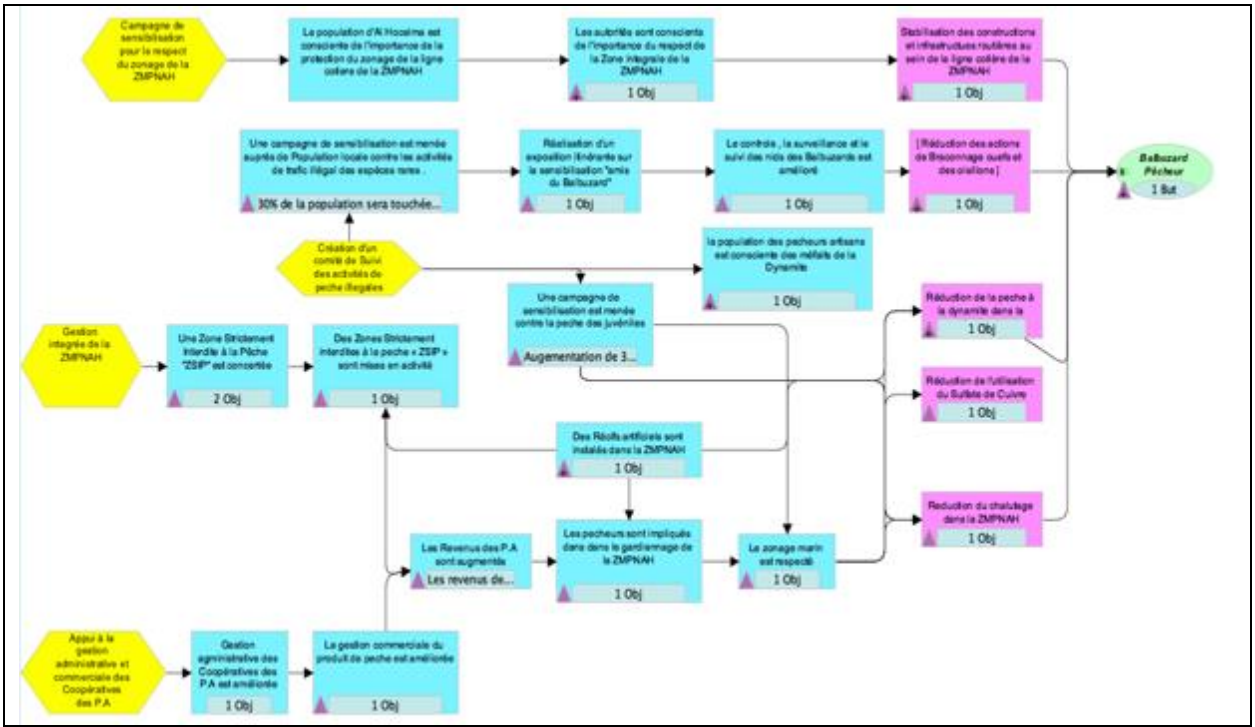


Figure 7: chaine de résultats pour la réduction des menaces concernant le Balbuzard pêcheur au sein de la ZMPNAH Nibani,h 2018

a. Evidence on the impact of results chains on the evolution of threat ranking from 2012 to 2017

By comparing criteria for assessing each threat (Range or Area, Gravity, Irreversibility), while making threat combinations with the main target of the Osprey[25], we can discuss the impact of result chains on the evolution of threat ranking from 2012 to 2017; we will essentially take the case of two threats that are Dynamite Fishing and Underwater Fishing whose impact trends are the opposite.

i. Analysis of the impact of the results chains on the evolution of the dynamite fishing classification from 2012 to 2017

The "dynamite fishing" threat was characterized in 2012 by the criteria of a very high range over the entire rocky area of the ZMPNAH, even in Sabadia, city of Al Hoceima, as well as a very high severity in terms of frequency of intensity of dynamite use until 2014, with a high irreversibility; the classification of this threat was very high and placed it as the first threat within the ZMPNAH. The impact of the results chains as explained above is very well

[25]L'etat de santé de la cible Balbuzard était en 2012 en dégradation critique H en rouge

demonstrated in paragraph III 4-a of this chapter. And made it possible to reduce the qualification of the criteria (low range, high gravity and medium irreversibility) and subsequently to achieve a new classification of this threat as low according to the Miradi software calculation.

Comparaison des Menace en 2012 / 2018		Portée	Gravité	Irréversibilité	Résumé du classement des menaces :
Pêche à la dynamite	**2012**	Très Élevé	Très Élevé	Élevé	Très Élevée
	2018	Faible	Élevé	Moyen	Faible

Table 6 a : Evolution of the Assessment and Ranking of Critical Threats to the Osprey in the year 2012-2018 Nibani h

i. Analysis of the impact of the results chains on the evolution of the underwater fishing classification from 2012 to 2017

As for the "underwater fishing" threat, in 2012, it was characterized by criteria of high significance within the rocky subbases of the ZMPNAH, but of moderate severity and irreversibility; the ranking of this threat was average in 2012. Paradoxically, the same positive impact on the dynamite fishing threat has favoured the restoration of the biotope and marine fauna and subsequently the restoration of demersal fauna (Merou, Dentex etc.).) that have increased in size and density[26] ,this has had an effect of increasing underwater fishing activity along the shores of the ZMPNAH (now high range) as well as intensifying and frequent underwater fishing activities, and has subsequently resulted in a re-ranking of this threat from medium to high in 2018.

Comparaison des Menace en 2012 / 2018		Portée	Gravité	Irréversibilité	Résumé du classement des menaces :
Pêche sous marine	**2012**	Élevé	Moyen	Moyen	Moyen
	2018	Élevé	Élevé	Moyen	Élevé

Tableau 6 b : Evolution des Evaluation et Classement des Menaces Critiques sur le Balbuzard pecheur en l'année de 2012 à 2018 Nibani h

1. Determination of the evolution of the status of the "Osprey" conservation target within the ZMPNAH

The aim is to carry out an evolutionary evaluation of the health status of the "Osprey" conservation target within the ZMPNAH from 2012 to 2018; indeed, the evolution of several of these indices has been monitored, and already reflected a disturbance within

[26]Sources plongeurs sous marins et pêcheurs artisans au sein de la ZMPNAH

this population; this required human intervention, and justified the actions of the AGIR strategic programme and the HCEFLCD developed in this direction from 2012 onwards; The continuation of this program thanks to the funding of the Association for the Sustainable Financing of Mediterranean MPAs makes it possible today in 2018, to reconsider the key ecological attributes to assess the evolution of the state of health of our main target the Osprey, we are indeed in the final phase of a first cycle of our project, we are able to measure the impact of our actions not only on threat reduction as demonstrated in the paragraph above; but also measure the impact of our strategy on our targets according to several indicators already mentioned above, we will only consider the following two representative elements:

Élément	Mode de viabilité	État	Type	Faible	Moyen	Bon	Très bo
Balbuzard Pêcheur	Attribut	Bon					
Infrsatructure et Urbanisation		Bon	Contexte				
Nombre d'aire de nidification		Bon	Taille				
l'Indice du taux annuel de nidification		Très bon					
Nombre d'aire de nidification		Bon					
2016-06-12: 16						⇒ 16	
2013-06-12: 16						⇒ 16	
2012-06-12: 16						↘ 16	
2008-06-12: 18							⇒ 18
2004-06-12: 18							⇒ 18
1990-06-12: 18							⇒ 18
1989-06-12: 18							⇒ 18
1984-06-12: 18							⇒ 18
1983-06-12: 18							⇒ 18
Nombre de projets d'urbanisation		Bon					
Nombre d'envols par an		Bon	Conditior				
Nombre d'envol par an		Bon		<25	<50	<75	> 75
2017-06-17: 73.8						▲ 73.8	
2016-06-12: 73.3						⇒ 73.3	
2013-06-12: 74.2						⇒ 74.2	
2012-06-12: 64						⇒ 64	
2008-06-12: 80							⇒ 80
nombre de couple nicheurs		Bon	Taille				
Indice d'abondance des couples niche		Bon		< 25	< 50	< 75	>75
2017-06-17: 13						↑ 13	
2016-06-12: 11						↗ 11	
2013-06-12: 07					↗ 07		
2012-06-12: 05					↓ 05		
2008-06-12: 09					↘ 09		
1990-06-12: 13						↗ 13	
1989-06-12: 11						↗ 11	
1987-06-17: 16							↑ 16
1984-06-12: 6					↓ 6		
1983-06-12: 14						⇒ 14	

Figure 8 :Situation actuelle de l'Etat de la cible conservation « Balbuzard pêcheur » au sein de la ZMPNAH nibani h 2018

o Analysis of the Abundance Index

The Abundance Index reflects the number of flights observed / number of theoretical flights; this index ranged from 64% 2012 to 76.3% in 2016. It shows the very high degree of resilience of the species to be able to recover a good state of health despite the various challenges and multiple threats to which it has been subjected, and it is for this reason that the actions carried out in its favour have been able to have such a change in situation from low in 2012 to good from 2017 onwards.

o Analysis of the abundance index of breeding pairs per year:

The annual abundance index estimated at 25% in 2012, gradually increased to 35% in 2013, 2016 and then 55% in 2016, and was able to increase further to 65% in 2017, which describes the transition from a significant state of improvement from a low state in 2012 to a Good State from 2016 onwards, this situation was able to improve even further in 2017 (Figure 8)

Conclusions :

Despite the great results and impact on the restoration of the Osprey, obtained by AGIR and its partners, by transforming its state of viability from low in 2012 to high in 2018; multiple and serious threats of great scope still cause serious disturbances among this population; only the high resilience of this population; can explain the significant reversible reduction in threats obtained by AGIR interventions; Nevertheless, the tolerance ranges indicate an unstable state of viability, in a context of dynamic anthropogenic pressure, where the reduction of some threats suddenly turns into a series of new threats that are equally hostile to the development of this species.
The conservation and preservation of the iconic Osprey requires urgent action again and again within Al-Hoceima National Park

Chapter III :

General status of conservation and target restoration at the ZMPNAH level

In this chapter we will try to describe the evolutionary process of the general state of conservation, and the restoration of other targets at the level of the ZMPNAH in less detail, using the same method and approach chosen for the Osprey umbrella target; using the ONP database, indices and indicator available for octopus, correlations will be made to cover a brief analysis of the viability status of each target, as well as that of the threats with each target, to finally demonstrate the impact of strategies and result chains on the possible improvement of the entire ecosystem

I State of conservation and restoration of the octopus stock within ZMPNAH

1. Presentation of the target

The common octopus, Octopus vulgaris Cuvier, 1797, is a marine mollusc of the family Octopodidae. An exclusively coastal species, the semelparous cephalopod with a short life span, lives mainly in coral reefs or rocks. In other regions, it is more abundant on sandy, muddy bottoms or on marine grass (Borges et al. 2000). It is caught by various methods, mainly by trawlers. Octopus, feeds mainly on crustaceans, molluscs and fish (Mangold 1983; Fiorito and Gherardi 1999; Hanlonand Messenger 1996). On the Moroccan Mediterranean coast and in particular in the NAPH area, octopus has been the target of catches by artisanal and industrial fishing because of its high economic value.

2. Assessment of the viability of target 1:'ZMPNAH octopus'.

The general objective of conducting a viability assessment of octopus is to measure its health status over time, and propose current actions for its conservation in the future through systemic analysis of prospective sustainability. The aim is to identify the key ecological attributes and their categories that will allow for a:

- **- Target attribute categories**

The health status of octopus is determined by the three categories[27] which concern the size,

[27] • Très Bon: Statuts écologiques souhaités; Requiert seulement un peu d'intervention de maintenance
• Bon: Indicateur dans le degré de variation toléré; Requiert quelques interventions de maintenance
• Moyen: En dehors du degré de variation toléré; Requiert une intervention humaine
• Faible: Réhabilitation toujours plus difficile; Il peut en résulter une extinction

conditions and geographical context of each target;

a) a) Context of the environment:

i. Presentation of the fishery

The appearance of cephalopods on both Moroccan façades dates back to the early 1960s. Before this era, Japanese and Spanish fleets operating in the West African zone mainly targeted sparid fish and cephalopods. The transition from sparidae to cephalopod fishing took place in the mid-1960s (INRH). Several hypotheses have been put forward regarding this transition:
Biological substitution of sparids by cephalopods due to overexploitation of the former;
Climate change that has affected the environment;
Adaptation of fishing techniques to cephalopod fishing.
The fishing gear used in this fishery is multiple, i.e. active gear (atomic bottom trawls, Spanish and Korean). At the level of the PNAH The artisanal segment takes part in this activity, it includes wooden boats that use passive devices such as pots, jigs and traps.
Quantitatively, the Octopodidae (octopus) family was the most represented with more than 67% of the total cephalopod catch. Ommastrephidae with 21% of the total cephalopod catch are in second place. Followed by Sepiidae with 9% and Loginids with 3% (INRH campaign 2015).

Tableau 7 : Echelle d'évaluation de la viabilité de la cible poulpe de la ZMPNAH

				Echelle d'évaluation			
Cible	**Catégorie**	**AEC**	**Indicateur**	**Faible**	**Moyen**	**Bon**	**Très Bon**
Poulpe	Contexte du milieu	Nombre de capture en poids	Nombre de capture des Cephalopodes par an en poid	< 25%	< 50%	< 75%	>75
	Contexte du milieu	Nombre de capture en revenu	Nombre de capture des Cephalopodes par an en revenu	< 25%	< 50%	< 75%	>75
	Contexte du milieu	Nombre de capture par bateau	Nombre de capture par bateau	< 25%	< 50%	< 75%	>75

i. Cephalopod stock status in the AHNP area

Over the past ten years, cooperation between AGIR and the National Fisheries Agency for the Protection of Endangered Marine Species has made it possible to monitor the evolution of the cephalopod stock in the NAPH area and to monitor the state of the stock annually.

Since 2012, catches of cephalopods in the port of Inouaren have evolved slightly until 2017 when the stock status has increased significantly (>3000 KDH).
The stock of cephalopods landed at the port of Inouaren is mainly based on small-scale fishing. Octopus accounts for more than 50% of this stock.

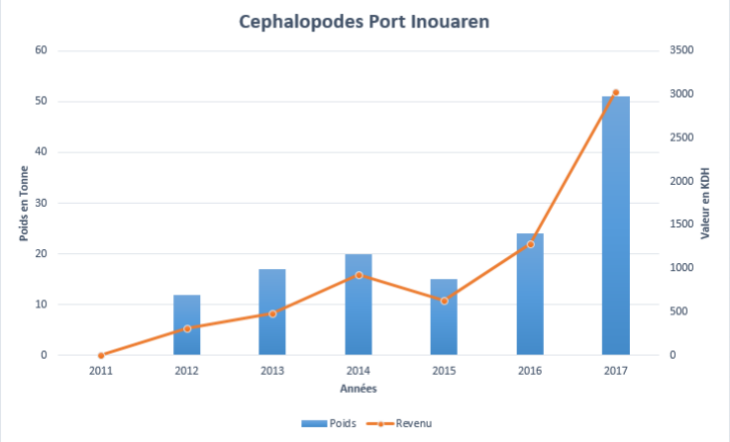


Figure 9 : Evolution du stock des céphalopodes par an (en poids et en revenu).

i. Determination of the threshold of the categories for the allocation of cephalopod catch stock in the port of Inouaren

To assess the viability of the Octopus target (Cephalopods), our prospective analysis was based on the state of the stock, which concerns the variation in cephalopod catch per year, the evolution of this indicator between 2012 and 2015 is below the equilibrium band (degree of natural variation tolerated - see Figure 2-), which allowed us to define the state of the stock during this period as unstable.

Année	2012	2013	2014	2015	2016	2017
Capture des céphalopodes en poids	12	17	20	15	24	51

Tableau 8 Evolution des Attributs écologiques clés des céphalopodes au sein du ZMPNAH

In the period 2016, the effort made by AGIR in cooperation with MAVA and ONP for the conservation of threatened species and habitats in the NAPH area has produced remarkable results in which the equilibrium band has fallen within the tolerated degree of variation[28].
The actions of the strategic programme drawn up by AGIR to increase the cephalopod stock by 30% in 2022 were the most effective and showed a 150% increase in 2017 over the previous year.

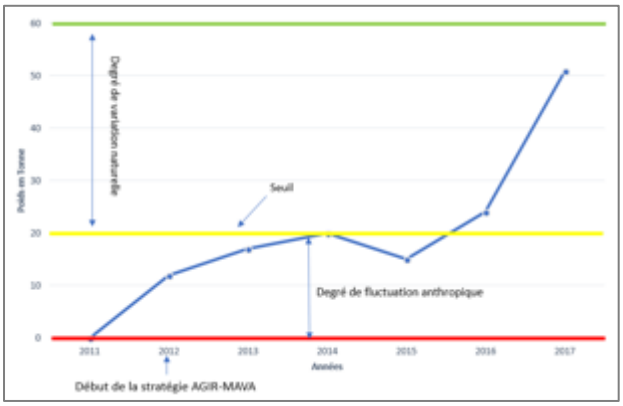


Figure 10 : degré de la variation tolérée chez la population du Balbuzard pêcheur dans la ZMPNAH

1. Identification, Evaluation and Classification of Critical Threats to Octopus Target within the ZMPNAH

a. Identification of threats to the Octopus Target within the ZMPNAH

AGIR has identified four direct threats in red: Dynamite fishing, copper sulphate fishing, underwater fishing and trawling in shallow areas (Figure 11)

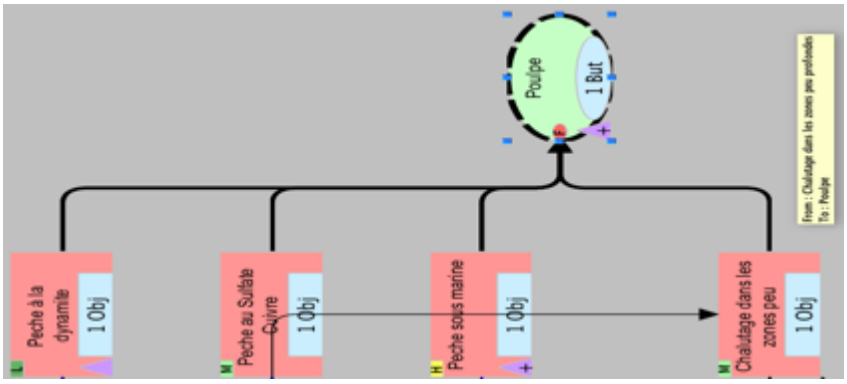


Fig 11 : menaces directes sur la population le stock du poulpe au sein de la ZMPNAH

[28] Le degré de variation naturel du poulpe est plus large que celui du Balbuzard pêcheur étant donné que le taux de reproduction du poulpe est d'environ 100000 œuf par cycle de reproduction,

a. Assessment and Ranking of Critical Threats to Octopus Target within the ZMPNAH

- The classification of the four threats on the octopus target was done in the same way as explained in the previous chapter, to determine the classification criteria which are the scope, gravity and irreversibility of the threat, thus a new reclassification was obtained
- - Dynamite fishing, which was considered very high in 2012, was significantly reduced in 2018 to a low threat.
- - The threat of underwater fishing moves to a high ranking in Table 9. The summary of threat rankings - Octopus target nevertheless remains high for this species highly targeted by artisanal fishing activity.

Menace en 2018	Portée	Gravité	Irréversibilité	Résumé du classement des menaces :
Chalutage dans les zones peu profondes	Très Élevée	Élevé	Moyen	Moyen
Peche à la dynamite	Faible	Moyen	faible	faible
Peche au Sulfate Cuivre	Moyen	Moyen	faible	Moyen
Peche sous marine	Élevé	élevé	Moyen	élevé
Résumé des classements de la cible Poulpe		Elevé		

Tableau 9 : Evaluation et Classement des Menaces Critiques sur le poulpe en en l'année 2018

2. Strategies for the conservation of the Octopus stock within the ZMPNAH within the ZMPNAH

The Action Plan (Figure 12), includes both the three blocks of strategies[29], but this time it is based on the one based on the Strategy for Supporting the Administrative and Commercial Management of Artisanal Fishermen's Cooperatives, all actions work together to reduce direct threats, while taking advantage of the opportunities for possible restoration of natural systems within the ZMPNAH, as represented in the table below
restaurations des systèmes naturels au sein de la ZMPNAH, tel qu'il est représenté dans le tableau

[29]- 1 Programme de monitorage et de gardiennage participatif au sein de la ZMPNAH
-2 Stratégie de l'appui à la gestion administrative et commerciale des Coopératives des Pêcheurs artisans
- 3 Stratégie de sensibilisations et de formation ANNEXE

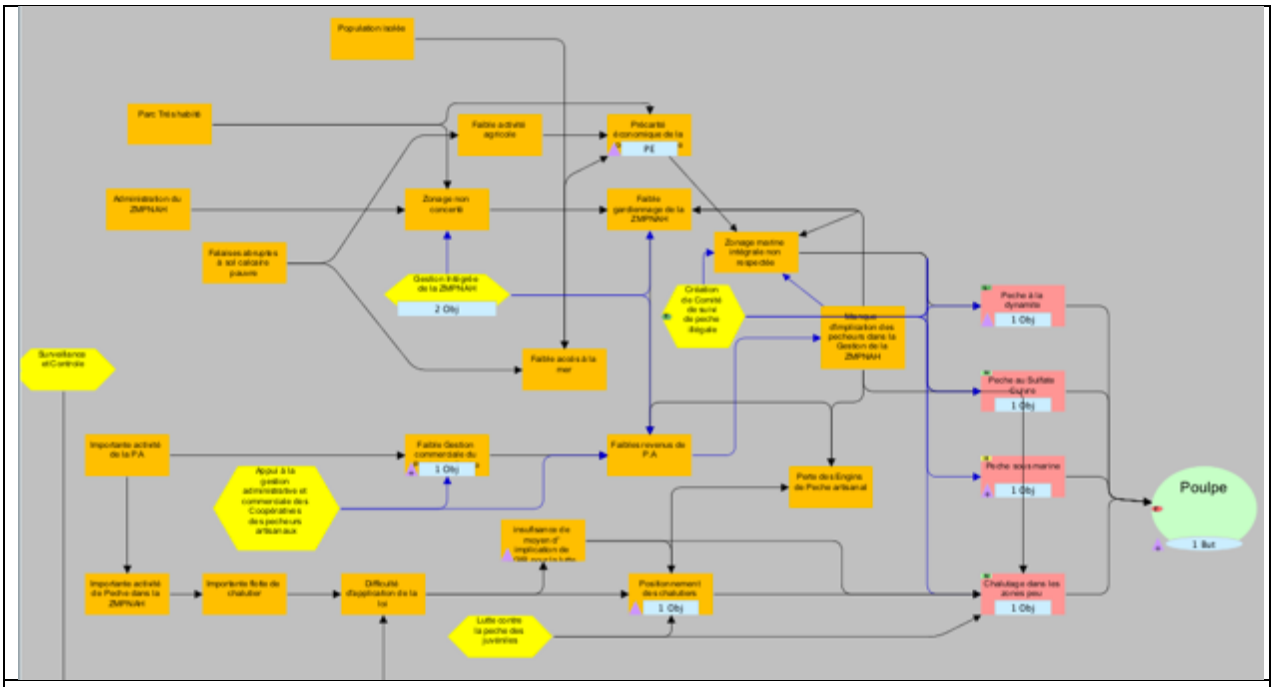


Figure 12: Modèle conceptuel du plan d'action stratégique pour la réduction des menaces concernant le Poulpe au sein de la ZMPNAH Nibani,h 2018

2. Action plan and monitoring based on octopus stock recovery strategies within ZMPNAH

a. Criteria and choice of strategic actions

The strategic strategies and actions developed were based on priority threats to the main associated target, the Osprey; however, within the scope of the ZMPNAH, the other targets are also affected by the strategies listed in Table 5 below; key intervention points have been identified to reduce certain threats, they are based on the reflections of artisanal fishing groups and institutional executives, thus allowing an assessment of those most likely to be effective and feasible (fig12).

- **Analysis and evaluation of strategy II**

This is the strategy of support for the administrative and commercial management of artisanal monitoring fishermen's cooperatives, it deals with factors further upstream and concerns support for the administrative and commercial management of artisanal fishermen, such as the promotion of socio-economic activities and the local community;

Following the example of Strategy I; each of the actions in Strategy II provides small to medium or quite effective reductions in the reduction of the Four Threats, they are mostly

in good working order, we were able to assess the relevance of the strategic actions towards the reduction of threats to octopus within the marine area of Al Hoceima National Park (ZMPNAH) see Table 10,

	Stratégies	Menaces		
	Stratégie IIde l'appui à la gestion administrative et commerciale des Coopératives des Pêcheurs artisans	**Menaces**	**Évaluation**	**Avancement**
	• Promotion de la Gestion intégrée de la ZMPNAH	**Chalutage dans les zones peu profondes**	Efficace	En bon déroulement
	• Créer des initiatives de co-gestion de la ZMPNAH	**Chalutage dans les zones peu profondes**	Efficace	En bon déroulement
	• Formation des acteurs locaux	**Peche sous marine**	Efficace	En bon déroulement
	• Promotion des activités socio-économiques	**Chalutage dans les zones peu profondes**	Efficace	En bon déroulement
	• Appui à la gestion administrative et commerciale des Coopératives des pêcheurs artisans	**Pêche à la dynamite**	Très efficace	En trés bon déroulement
	• Formation en Gestion Commerciale	**Pêche sous marine**	Efficace	En bon déroulement
	• Création de Comité de suivi de pêche illégale	**Chalutage dans les zones peu profondes**	Très efficace	En trés bon déroulement
	• Campagne de luttes contre la Pêche à la dynamite	**Pêche à la dynamite**	Très efficace	En trés bon déroulement
	• Campagne de luttes contre la Pêche au sulfate de SO4CU	**Pêche au Sulfate Cuivre**	Moyen	Planifié
	• Campagne d'amélioration de la Gestion Intégrée de la ZMPNAH	**Chalutage dans les zones peu profondes**	Moyen	Planifié
	• Campagne de lutte contre la pêche des juvéniles	**Pêche à la dynamite**	Moyen	Planifié
	• Campagnes de Lutte contre le chalutage illégal	**Chalutage dans les zones peu profondes**	Efficace	En bon déroulement
	• Campagnes de port du VMS par les chalutiers	**Chalutage dans les zones peu profondes**	Efficace	En bon déroulement

Tableau 10 : Suivi et Evaluation des impacts du plan d'action stratégique de sensibilisation et de formation sur la réduction des menaces ciblant le Poulpe au sein de la ZMPNAH nibani h 2018

3. Development of Results Chains for threat reduction and improvement of the "Octopus" target within ZMPNAH

The development of the results chains was based on the conceptual model that includes our strategies in Figure 12; similarly, some neutral or negative factors are then transformed into intermediate expected results; while some threats in this case the threat ("Copper sulphate fishing") becomes a threat reduction result ("Reduction in the use of Copper sulphate within the ZMPNAH") (Figure 12).

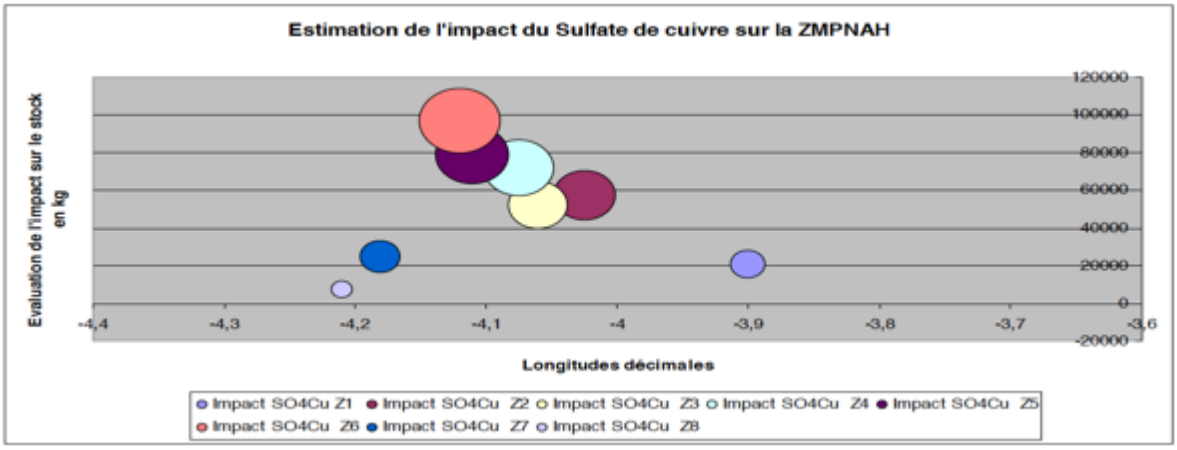


Figure 13 : Distribution spatiale de l'utilisation de la Dynamite au sein de la ZMPNAH 2010 Nibani h

a. Concrete example of results chains related to the octopus target

The scope criteria, as well as the severity criteria (classified very high in 2012) Table 6; the threat of copper sulphate fishing has been reduced (classified average in 2018) these results are the result of the same participatory solution workshops, and therefore of AGIR's action to prosecute dynamitors, which has somewhat discouraged copper sulphate users, who also operate in the same rocky areas of ZMPNAH used by map dynamitors see Figure 13.
In the same way, this positive impact has enabled the restoration of marine biocenosis, and in particular octopus, which has reclaimed the rocky foundations of the ZMPNAH[30], catches from the artisanal fishing fleet (with a constant fishing effort) at the port of Inouaren have increased by 150%[31].
Les critères de portée, ainsi que celui de gravité (classée très élevés en 2012) tableau 6; la menace

[30]Enquêtes et témoignages des plongeurs
[31]Données fournies par l'Office National de la Pêche (ONP) Al Hoceima

Pêche au sulfate de cuivre ,a été réduite (classée moyenne en 2018) ces résultats sont issus de

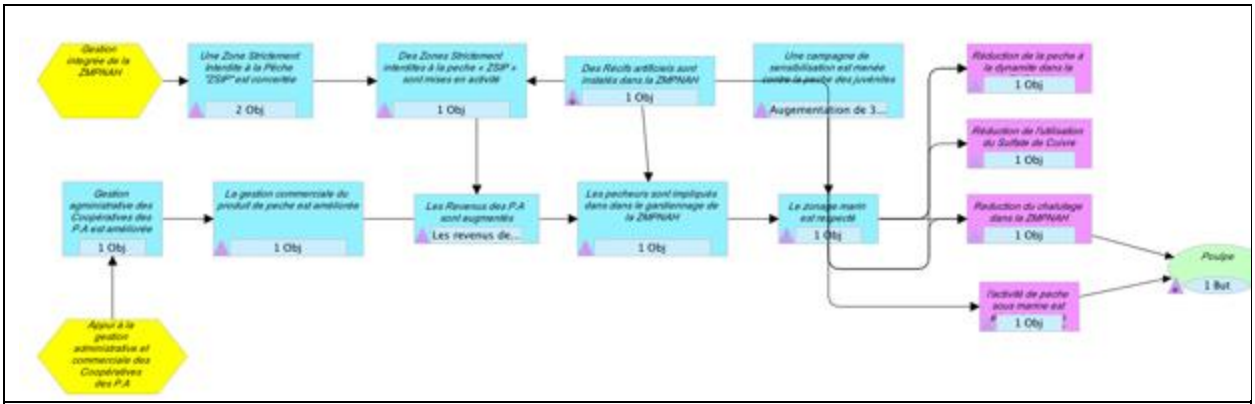


Figure 14: chaine de résultats pour la réduction des menaces concernant le Balbuzard pêcheur au sein de la ZMPNAH Nibani,h 2018

b. Evidence on the impact of results chains on the evolution of the ranking of threats to the octopus stock within ZMPNAH from 2012 to 2017

i. Analysis of the impact of results chains on the evolution of copper sulphate fishing classification from 2012 to 2017

The "copper sulphate fishing" threat was characterized in 2012 by very high scope and severity criteria throughout the rocky area of the ZMPNAH see Figure 13, with high irreversibility Table 11; the ranking of this threat was very high and placed it as the first threat within the ZMPNAH. The impact of the results chains made it possible to reduce the qualification of the criteria to a new status (range, severity and irreversibility average) and subsequently to achieve a new classification of this threat from very high to medium according to the calculation of the Miradi software.

Comparaison des Menace en 2012 / 2018		Portée	Gravité	Irréversibilité	Résumé du classement des menaces :
Pêche au sulfate de cuivre	**2012**	Très Élevé	Très Élevé	Élevé	Très Élevée
	2018	Moyen	Moyen	Moyen	Moyen

Tableau 11 : Evolution des Evaluation et Classement des Menaces Critiques sur le poulpe au sein de la ZMPNAH en l'année de 2012 à 2018 Nibani h

ii. Analyse de l'impact des chaines de résultat sur l'évolution du classement de la menace Pêche sous marine sur la cible poulpe de 2012 à 2017

Table 11: Evolution of the Assessment and Ranking of Critical Threats to Octopus in ZMPNAH in the year 2012-2018 Nibani h

iii. Analysis of the impact of results chains on the evolution of the underwater fishing threat ranking on the octopus target from 2012 to 2017

As for the "underwater fishing" threat, in 2012, it was characterized by criteria of Medium scope, but of high severity and medium irreversibility; the ranking of this threat was medium in 2012. Paradoxically, the same positive impact on the dynamite fishing threat has favoured the restoration of the biotope and marine fauna, including octopus and demersal fauna (Grouper, Dentex, etc.).) that have increased in size and density[32], this has resulted in increased underwater fishing activity along the shores of the ZMPNAH (now high range) and increased and frequent underwater fishing activities, and has subsequently resulted in a re-ranking of this threat from medium to high in 2018.

Comparaison des Menace en 2012 / 2018		Portée	Gravité	Irréversibilité	Résumé du classement des menaces :
Pêche sous marine	**2012**	Moyen	Élevé	Moyen	Moyen
	2018	Élevé	Élevé	Moyen	Élevé

Tableau 12 : Evolution des Evaluation et Classement des Menaces Critiques le poulpe en l'année de 2012 à 2018 Nibani h

Conclusions :

Conclusions :

The restoration of the Octopus Stock target, obtained by AGIR and its partners, by transforming its state of viability from very low in 2012 to low in 2018; indicates that this stock is in overexploitation, given the large number of legal pressures on angling in parallel with the four illegal activities (Threats Figure 12),
Once again, the high resilience of this ecosystem has led to even a slight improvement in the conservation status of the stock;
On the other hand, catches resulting from fishing activities have been multiplied by a factor of 1.5 (with stable fishing effort); this has resulted in at least a 150% increase in fishermen's incomes; in fact, artisanal fishermen are all members of the Caisse Nationale de la Sécurité Sociale CNSS
The interventions of ACT alongside HCEFLCD, and the Department of Maritime Fisheries (DPM), which are part of the strategies for involving fishermen in monitoring and guardianship committees, co-management must be stepped up in order to influence the local population to carry out responsible fishing activities, so that fishing activity can ensure the well-being of the local population in the ZMPNAH.

[32]Sources plongeurs sous marins et pêcheurs artisans au sein de la ZMPNAH

II Global assessment of restoration and conservation, of targets within the ZMPNAH Ecosystem

1. Underwater Biotope Target: AL HOCEIMA NATIONAL PARK MARINE AREA (ZMPNAH)

a. Zoning of the ZMPNAH

Al Hoceima National Park is located in northern Morocco, along its Mediterranean coast, about 150 km east of the Strait of Gibraltar, near the city of Al Hoceima (4°N, 35°14' N). The National Park was created in October 2004 in the south of the Alboran Sea on an area of 48,460 ha, including 19,000 ha in marine areas. It is the most important protected area on the Mediterranean coast of Morocco and is the only National Park in Morocco on the Mediterranean coast which includes a marine part with several islets and rocks.

The marine part of the NWMP extends over approximately 40 km of coastline and includes: a 500 m offshore Marine Natural Resources Management Area (MNRMA) that forms the boundary of wilderness areas, three wilderness areas (NWAs) with a total area of approximately 1776 ha and three wilderness areas (NWAs) with an area of approximately 633 ha.

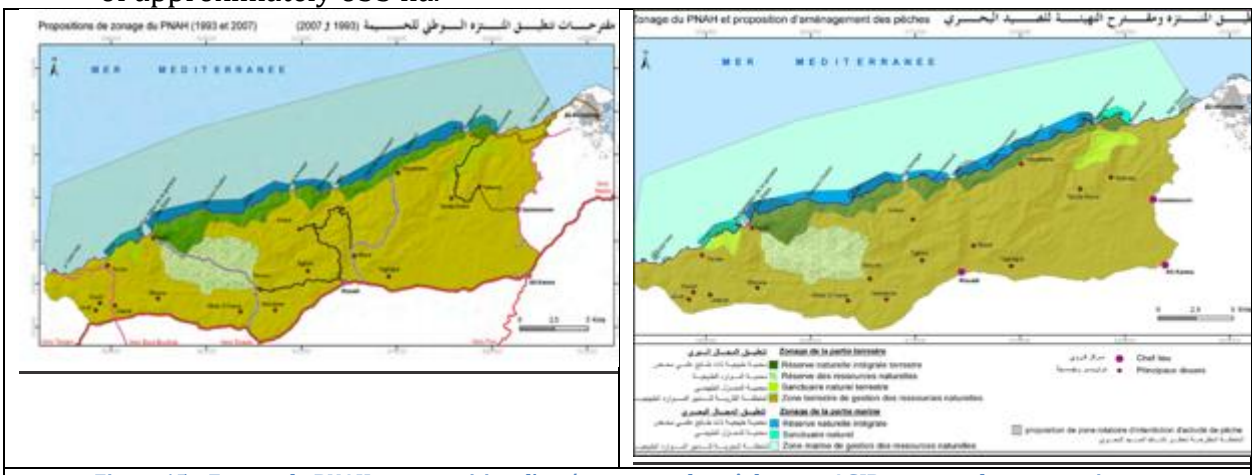


Figure 15 : Zonage du PNAH et proposition d'aménagement des pêches par AGIR en cours de concertation

a. Definition of ecological attributes

i. Size

The association AGIR worked jointly with artisanal fishermen to redefine the old zoning of 2003, which was not very concerted, the new zoning takes into consideration both the conservation of the areas richest in species, which have

become strictly closed to fishing, but also allows access for artisanal fishermen in the areas for fishing purposes.

The importance of this work is to regulate the geographical extent of the Integrated Area, which is too large and therefore not respected, the objective is therefore to reduce it in consultation with fishermen, in order to ensure co-management that will lead to a certain restoration of the composition, and the structure of this biotope, by allowing biotic interactions.

				Echelle d'évaluation			
Cible	**Catégorie**	**AEC**	**Indicateur**	**Faible**	**Moyen**	**Bon**	**Très Bon**
Biotope sous marin	Taille	Superficie de l'ancien zonage intégral en km²	Indice rapport Superficie totale / Superficie incluse dans le nouveau zonage intégrale en km²	< 25%	< 50%	< 75%	>75%
	Contexte du milieu	Superficie de la Zone intégrale (SZI)en km²	Indice d'occurrence = superficie restaurée				
	Condition	Superficie limitrophe de la ZI restaurée (SZIR)	indice de connectivité = SZIR/ SZI				

1. Assessment Threats to Underwater Biotope: AL HOCEIMA NATIONAL PARK MARINE AREA (ZMPNAH)

The various threats resulting from human actions (especially those of an illegal nature), have generated a biophysical impact that has led to the almost complete destruction of the conditions necessary for natural biotic interactions, according to Ben Harpon, the rich biotope in algal and coral biomass presents a serious anomaly which is the absence of marine fauna, this can only be explained by the serious threats reported by AGIR (Harpon b & al 2011) [33]

Menace en 2018	Portée	Gravité	Irréversibilité	Résumé du classement des menaces :

Menace en 2018	Portée	Gravité	Irréversibilité	Résumé du classement des menaces :

[33]- Harpen, B. Micheli, F 2011. Expédition Report in the Al Hoceima National Park (AntineaFoundation, StanfordUniversity, AGIR)

Chalutage dans les zones peu profondes	Moyen	Élevé	Moyen	Moyen
Peche à la dynamite	Faible	Élevé	Moyen	faible
Peche au Sulfate Cuivre	Moyen	Moyen	Moyen	Moyen
Peche sous marine	Moyen	Moyen	Moyen	Moyen
Résumé des classements de la cible biotope sous marin		Moyen		

Tableau 13 : Evaluation et Classement des Menaces Critiques sur le biotope en l'année 2018

Table 13: Assessment and Ranking of Critical Threats to the Biotope in 2018

Today, the data and surveys conducted among fishermen mentioned above, as well as the discussion of the indicators and indices mentioned above, particularly those related to the spectacular annual increase in octopus catches by the artisanal fishing fleet based in the port of Inouaren (fishing with equal effort within the ZMPNAH), have improved the ranking which became Average in 2018 see Tables 13 and 14

Menace en 2018	Portée	Gravité	Irréversibilité	Résumé du classement des menaces
Chalutage dans les zones peu profondes	Moyen	Élevé	Moyen	Moyen
Peche au Sulfate Cuivre	Élevé	Élevé	Moyen	Élevé
Peche à la dynamite	Faible	faible	faible	faible
Peche sous marine	Moyen	Moyen	Moyen	Moyen
Filets maillants dérivants	Élevé	Élevé	Moyen	Élevé
Résumé des classements de la cible biocénose marin		Moyen		

Tableau 14 : Evaluation et Classement des Menaces Critiques sur le poulpe en en l'année 2018

1. Assessment of Threats to Brown Grouper in ZMPNAH

a. Context of Threat issues within ZMPNAH:

The Al-Hoceima National Park (ANHP) ecosystem has become a place for illegal fishing techniques within the ANHP Marine Protected Area (MPA): Dynamite fishing, copper sulphate fishing, underwater fishing; and illegal trawling within the ZMPNAH; which led in the 1980s to the destruction of the biotope of an emblematic species such as the monk seal, whose tolerance threshold was unfortunately exceeded.

We fear a series of other species disappearing within the ZMPNAH our work is to prevent the irreversible disappearance of other species; pushes us to assess the criteria for threats to our targets and plan solutions in advance. 1. Assessment of Threats to Brown Grouper in ZMPNAH

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[34] Dernier spécimen du phoque moine disparu en 2003

We fear a series of other species disappearing within the ZMPNAH our work is to prevent the irreversible disappearance of other species; pushes us to assess the criteria for threats to our targets and plan solutions in advance.

Menace en 2018	Portée	Gravité	Irréversibilité	Résumé du classement des menaces
Chalutage dans les zones peu profondes	Moyen	Élevé	Moyen	Moyen
Peche à la dynamite	Faible	faible	faible	faible
Peche au Sulfate Cuivre	Moyen	Moyen	Moyen	Moyen
Peche sous marine	Moyen	Très élevé	Moyen	élevé
Résumé des classements de la cible Mérou		Moyen		

Tableau 15 : Evaluation et Classement des Menaces Critiques sur le Mérou brun en en l'année 2018

The criteria for assessing the three threats to the grouper target are medium to high in range and severity, and the overall ranking of these threats is medium (Table 15);
The fourth threat of underwater fishing is much higher, because the development of the ecosystem, as explained above, has benefited the restoration of demersal fauna whose life and reproduction cycle is short, so the intensity of this underwater activity has increased a notch, even if the grouper catches are small specimens[35]. likewise the restocking of octopus, which is the preferred food of large spawners, can only benefit this species if it has the time to grow over at least six years. This is why the rankings of all these threats are not good enough to restore this species (Table 15). Legislation should also be harmonized because fishing for brown grouper is still allowed in Morocco and North African countries[36].

l **Evaluation des Menaces sur le Grand Dauphin au sein de la ZMPNAH**

Assessment of Bottlenose Dolphin Threats within ZMPNAH

The bottlenose dolphin was chosen as a target because it is a territorial species, which is quite close to the coasts, particularly in the ZMPNAH, which is characterized by deep waters, and provides an ideal habitat for this species. This animal leads a family life in small groups, either isolated or in more or less separate groups.
Depredation by bottlenose dolphins is a major problem for Al-Hoceima's sardine fleet, groups of bottlenose dolphins with very strong and sharp teeth can easily attack sardine nets, lacerating them to feed on the sardines found there, causing huge losses to a fleet already suffering from the depletion of an overexploited stock, this in itself constitutes a threat to this species that could be eliminated by fishermen. However, the real threats to this target are the same as those already

[35]pour le cas du Mérou les attributs de la viabilité sont complexes , tel la taille de la population est liée à la taille des spécimens quant leur passage du statut de sexe féminin à de grands males géniteurs , les conditions de former une horde sur de grands géniteurs capable d'assurer le repeuplement de la population du mérou au sein de la ZMPNAH , sont très délicats.

[36]Le mode de vie mérou brun (hermaphrodisme successif) et le fait qu'il ne devienne mâle dominant et donc reproducteur qu'à partir de 25 à 30 ans et ce pendant seulement quelques années, ne permet pas d'affirmer que la situation est stabilisée. Il faudra attendre un cycle complet d'une cinquantaine d'années (c'est la durée de vie moyenne du mérou brun) avant d'évaluer correctement la situation.

described, while there has been a very significant improvement in these threats, from the end of 2011[37], date of the moratorium on the use of this net in national waters, which comes in a context of preserving marine biodiversity and protecting certain vulnerable species accidentally caught by this IUU gear, From 2012 onwards, a very significant reduction in strandings was noted thanks to the banning of this gear, but today the small fleet of mamparas using Tonailles, whose range is high given the very large number of these boats, but the gravity remains average because the meshes are less than 100 cm and the nets have a size of about one-tenth of what they were before 2011.

Menace en 2011/2018		Portée	Gravité	Irréversibilité	Résumé du classement des menaces
Peche aux filets maillants dérivants	2011	Très élevé	Très élevé	Elevé	Elevé
	2018	Élevé	Moyen	Moyen	Moyen
Chalutage dans les zones peu profondes	2011	Élevé	Élevé	Élevé	Élevé
	2018	faible	Moyen	faible	faible
Peche à la dynamite	2011	Élevé	Élevé	Élevé	Élevé
	2018	faible	faible	faible	faible
Peche au Sulfate Cuivre	2011	faible	moyen	faible	faible
	2018	faible	faible	faible	faible
Résumé des classements de la cible Grand Dauphin 2012			Elevé		
Résumé des classements de la cible Grand Dauphin 2018			Moyen		

Table 16: Assessment and Ranking of Critical Threats to the Bottlenose Dolphin in 2011/2018

It should also be noted that the reduction of other threats (Table 15) has been an essential factor for the protection of this species, whose general classification of threats to the bottlenose dolphin has changed from High to Medium.
The monitoring of a family of Bottlenose Dolphins that has reclaimed the heart of the National Park in the Integrated Zone, as a breeding area, is an indicator of the restoration of this habitat just before the elimination of dynamite fishing (nibani 2018).

1. Assessment of the global evolution of threats on all targets constituting the ZMPNAH ecosystem

The threat ranking summary shows that the threats to the various ecosystem targets have decreased by changing the status of their ranking criteria; particularly for Osprey, which faced threats with severity and scope criteria ranging from very high to high in 2012; these criteria changed from medium to low ranking in 2018, this shows the effectiveness of AGIR's work through the high performance of the priority strategic programmes and action plans that have targeted this umbrella species.
On the other hand, other very important targets have benefited from this systemic action program, which has a holistic vision and has been able to trigger a network of results whose

[37] le Maroc a élaboré la loi 19-07 visant la réglementation de l'utilisation du filet maillant dérivant par son interdiction définitive dés fin 2011

impacts have been finely measured through the relevant objectives with indicators

Thus, the overall ranking of the status of all threats has improved from high in 2012 to medium in 2018 (Table 17)

Menaces \ Cibles 2018	Biotope sous marin	Biocénose marine	Balbuzard Pêcheur	Grand Dauphin	Poulpe	Mérou	Puffin Cendré	Résumé du classement des menaces :
Chalutage dans les zones peu profondes	Moyen	Moyen	Moyen		Moyen	Moyen		Moyen
Peche sous marine	Moyen	Elevé	Moyen		Elevé	Moyen		Elevé
Peche au Sulfate Cuivre	Moyen	Moyen	Moyen	Faible	Moyen			Moyen
Peche à la dynamite	Faible	Faible	Faible	Faible	Faible	Faible		Faible
Filets maillants dé rivants		Moyen		Moyen			Moyen	Moyen
Derangement au niveau des sites de niddification			Faible					Faible
Chasse aux Grand Dauphins				Faible				Faible
Grand Corbeau & Milan noir			Faible					Faible
Traffic illégal des oisillons			Moyen					Faible
Infrastructure et Urbanisation			Faible					Faible
Résumé du classement actuel 2018 des menaces/ cibles	Moyen	Moyen	Moyen	Moyen	Moyen	Moyen	Faible	Moyen

Tableau 17 : Evaluation et Classement des Menaces Critiques sur l'ensemble des cibles de la ZMPNAH 2018

Conclusions and recommendations

The monitoring of the flagship species is the Osprey, over a period of twenty years has allowed us to better understand its ecology, size, conditions and geographical and temporal context. Because of its central position, this species has generously provided us with the means to understand the problems and dysfunctions of the entire ecosystem of the ZMPNAH.

Indeed, the identification, discussion and understanding of the criteria for threat assessment in terms of Scope; Gravity and Irreversibility of each threat on the target, gave us an order of ranking of these threats; guided us to better define the goals to maintain these targets; and the definition of the objectives of the priority and essential strategies for threat reduction.

The effectiveness of our work is due to the economy of effort, focusing only on the factors that generate the most significant threats; such as Dynamite and illegal trawling.

Microsystemic analyses have enabled us to continuously verify which relevant actions have had an effective impact on reducing these threats, to direct our efforts towards the gaps that have emerged each time in a participatory and adaptive action programme.

Thanks to the field work, the measurement of objective indicators has made it possible to achieve a cascade of verifiable result chains, whose objectives converge on the improvement of the health status of targets, whether at the species or biotope level

Indeed, the assessment of the evolution of the state of conservation, and the restoration of habitats and threatened species within the Marine Zone of the Al Hoceima National Park (ZMPNAH) during the period 2012 to 2018 is very positive, it has gone from a degraded to a moderately degraded state, this result is very encouraging if we compare it to the human resources and resources deployed to achieve this objective. It is therefore quite possible to improve the conservation status of this ecosystem even further, but the right methods should be deployed that initially involve the users of marine resources because they are the ones who hold a large part of the solutions.

It is therefore recommended that these results, which were achieved within the framework of the programme of project activities funded by the UNDP GEF, and more particularly by the funds of the MAVA Foundation and the Association for the Sustainable Financing of Mediterranean MPAs, be continued; the concerted management approach of the Al Hoceima National Park led by the Moroccan High Commission for Water and Forests and the Fight against Desertification and AGIR

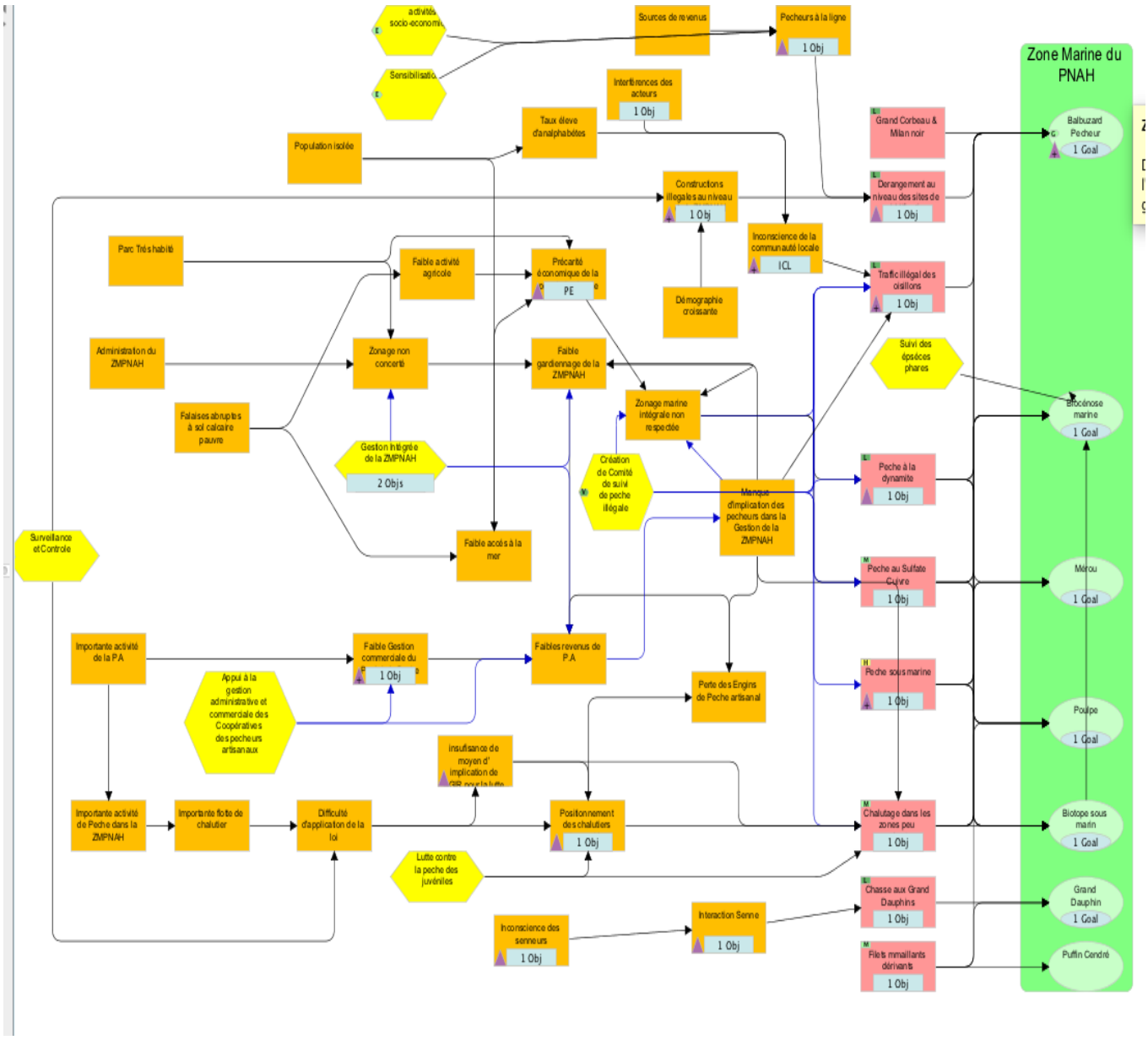

Figure 16: Modèle conceptuel du plan d'action stratégique pour la réduction des menaces sur les cibles au sein de la ZMPNAH Nibani ,h 2018

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