Darwin Initiative: Final Report

Darwin Project Information

Project reference	25-016
Project title	Promoting community-based management for secure fisheries, biodiversity and livelihoods.
Country(ies)	Madagascar
Lead organisation	SEED Madagascar (SEED)
Partner institution(s)	University College London; Blue Ventures; MIHARI; Les Directions Régionales de l'Agriculture, de l'Élevage et de la Pêche (DRAEP); Unité de Recherché Langoustière (URL); Madapêche; Le Martin Pêcheur; University of Tulear IST.
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Project leader's name	Lisa Bass
Project website/blog/social media	https://madagascar.co.uk/projects/sustainable-livelihoods/oratsimba
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1 Project Summary

Madagascar's south eastern regional lobster fishery consists of ~40 impoverished artisanal fishing communities[1] and accounts for the majority of national catch and export, directly employing 15,000 people. As lobsters are a high value commodity, the small-scale fishery is of critical socioeconomic importance to impoverished rural households[2].

Available data and local fisher knowledge suggest there have been significant declines in lobster stock over recent decades[Error! Bookmark not defined.], driven by rapid population growth and export market demand, leading to increased fishing effort. As lobsters are a keystone species in rocky reef ecosystems, fishery-induced population decreases will likely have cascading negative ecological effects[3]. Concurrently, in an area with few viable livelihoods, the fishery diverts pressure from other marine and terrestrial resources. Endangered turtles and elasmobranchs are caught in the wider fishery (Annex 7), though most fishing effort is currently targeted at lobsters. Further stock depletion may result in increased targeting of threatened species for which there are existing markets, and dramatically increase pressure on Madagascar's most threatened ecosystem[4], the Southern Littoral Forests. These forests exhibit exceptional levels of biodiversity[5] and are home to numerous endangered endemic species[6, 7, 8, 9, 10].

[1] Long, S. (2017). Short-term impacts and value of a periodic no take zone (NTZ) in a community-managed small-scale lobster fishery, Madagascar. *PLoS ONE* **12**(5): e0177858. https://doi.org/10.1371/journal.pone.0177858
[2] Tecklenberg, H. (2016). 'Lobster Fishing Households' Response to a Periodic Marine No-Take Zone Through a Gendered Lens'. Doctoral dissertation. University of Sussex.
[3] Pinnegar, J.K., et al. (2000). Trophic cascades in benthic marine ecosystems: lessons for fisheries and protected-area management. *Environmental Conservation*, **27**(2), pp.179-200. https://doi.org/10.1017/S0376892900000205
[4] QIT Madagascar Minerals S.A. (QMM). (2001). *Projet Ilménite: Etude d'impact social et environmental*. Unpublished Report. QMM, Antananarivo, Madagascar.
[5] Rabevohitra, R., Lowry, P.P., Randrianjafy, H. and Razafindrianilana, N. (1996). *Rapport sur le projet 'Assesment of Plant Diversity and Conservation Importance of East Coast Low Elevation Malagasy Rain Forests'*. Centre National de la recherché appliquée au développement rural CENRADERU-FOFIFA. Missouri Botanical Garden, USA.
[6] Jenkins, R., Randrianantoandro, C. and Ramanamanjato, J.B. (2011). *Phelsuma antanosy. The IUCN Red List of Threatened Species 2011*: e.T63658A12704038. http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T63658A12704038.en
[7] Raxworthy, C.J., Ratsoavina, F., Rabibisoa, N., Rakotondrazafy, N.A., Bora, P. and Jenkins, R.J. (2013). *Matoatoa spannringi. The IUCN Red List of Threatened Species 2013*: e.T172848A47951550. http://dx.doi.org/10.2305/IUCN.UK.2013-2.RLTS.T172848A47951550.en
[8] Rakotoarinivo, M. and Dransfield, J. (2012). *Dypsis saintelucei. The IUCN Red List of Threatened Species 2012*: e.T38562A2879456. http://dx.doi.org/10.2305/IUCN.UK.2012.RLTS.T38562A2879456.en
[9] Wesener, T. and Rudolf, E. (2017). *Sphaeromimus saintelucei. The IUCN Red List of Threatened Species 2017*: e.T65527213A65527785. http://dx.doi.org/10.2305/IUCN.UK.2017-1.RLTS.T65527213A65527785.en
[10] Rudolf, E. and Wesener, T. (2017). *Riotintobolus minutus. The IUCN Red List of Threatened Species 2017*: e.T80580936A80580952. http://dx.doi.org/10.2305/IUCN.UK.2017-1.RLTS.T80580936A80580952.en

Therefore, continued overexploitation, the likely cause for declines in catch[11], threatens livelihoods, food security, ecosystem function, and biodiversity.

Few avenues exist to mitigate this overexploitation, with rapid population growth, extreme poverty, and limited state capacity undermining environmental governance capabilities[12]. National legislation is poorly enforced, and compliance is weak.

To protect marine biodiversity and reduce poverty, this project has facilitated and supported community-based lobster fishery management through the development of Locally-Managed Marine Areas (LMMAs) in the communities of Sainte Luce and Elodrato.

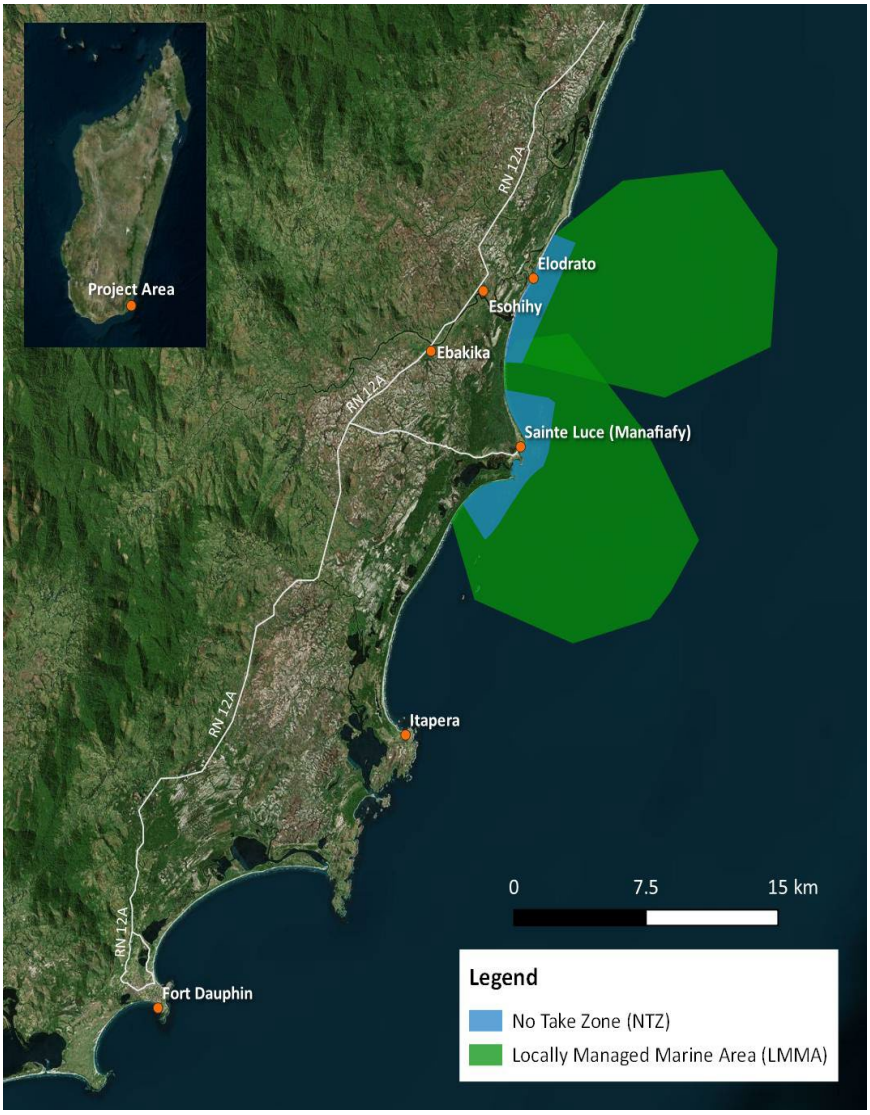

Figure 1. Map showing the regional capital Fort Dauphin and target communities Itapera, Sainte Luce, and Elodrato in the Anosy region, southeast Madagascar. Sainte Luce is formed of three hamlets (Manafiafy, Ampanastomboky, and Ambandrika), which are not depicted. Elodrato serves as the landing site for fishers from Elodrato, Esohihy, Ebakika, and several smaller hamlets (not depicted). The estimated areas of the LMMAs of Sainte Luce (~160 km^2) and Elodrato (~150km^2) (their fishing grounds) are depicted, as well as their periodic No Take Zones (NTZs).

2 Project Partnerships

University College London

University College London's (UCL) Department of Geography collaborated with SEED to undertake a critical and constructive Marine Protected Area Governance (MPAG) analysis[13] of Sainte Luce's LMMA. The analysis identified governance incentives needed or requiring strengthening, and provided recommendations for making the lobster value chain more equitable. These recommendations helped inform project planning and implementation to enable a more resilient governance structure. The MPAG analysis was published in the peer-reviewed journal *Marine Policy,* and the associated case study is available on SEED's website (Indicator 1.8; Annex 8 and 9). This empirical study provided an important external assessment and identified key themes and challenges applicable to other LMMAs in the region, contributing to regional and international knowledge of small-scale fisheries governance in Anosy.

University of Tulear: Institute of Agriculture and Hydrology (IST)

Working in collaboration with IST Assistant Professor Daniel Raberinary, SEED hosted two IST research students who undertook scientific studies on Sainte Luce's lobster fishery and the existing tuna and sardine fisheries (Indicator 2.9; Annexes 10 and 11), increasing visibility of

[11] Phillips, B.F., Wahle, R.A., and Ward, T.J. (2013). *Lobsters as part of marine ecosystems—A review*. Lobsters: Biology, Management, Aquaculture and Fisheries. Wiley-Blackwell, Oxford, 1-35.
[12] Holloway, G. and Short, S. (2014). Towards a more adaptive co-management of natural resources – increasing social-ecological resilience in southeast Madagascar. *Madagascar Conservation & Development* **9**(1), pp. 36-48. http://dx.doi.org/10.4314/mcd.v9i1.7
[13] Jones, P.J.S. (2014). *Governing Marine Protected Areas: Resilience Through Diversity*. 1st ed. Oxford: Routledge. Available at: http://www.mpag.info/

the LMMA in national research, and facilitating professional development amongst students. Similar research opportunities will be sought in the future. Raberinary also provided technical support as the project's NTZ Specialist and was instrumental in Elodrato's *dina* (local law) development.

Madapêche & Le Martin Pêcheur – two major lobster exporters in Anosy
Following the entrance and dominant establishment of a Chinese exporter, Santi, during PY1, Madapêche and Le Martin Pêcheur were only occasionally purchasing lobster in the target communities. While more challenging, the project continued to engage with these stakeholders (Indicators 3.6 and 4.1) through various avenues, including the MIHARI Lite forum and *Le Groupement des Langoustiers de Madagascar* (GLM), the umbrella organisation of lobster exporters in southeast Madagascar (Annex 12).

L'Arrivage – seafood restaurant in Madagascar's capital
As a result of the high prices being offered by Santi, this business stopped purchasing lobster in the project's target communities and terminated their partnership with the project.

DRAEP – Regional Directorate of Agriculture, Livestock and Fisheries (previously DRRHP)
DRAEP regularly visited target communities to communicate state support for community-based fisheries management (Indicator 3.5), attended the MIHARI Lite forum (Indicator 2.7) where an Action Plan for the sustainability of the fishery was created (Indicator 4.1), as well as stakeholder meetings (Activity Indicator 4.1) and mass-mobilisation events in the target communities (Activity Indicator 2.5; Annex 13). DRAEP also conducted enforcement capacity building with target communities, conferring legitimacy to the management committees (Indicators 1.2, 2.4, 3.2, and 3.5; Annex 14), and was vital in the ratification process of both the Sainte Luce and Elodrato *dina* (Indicator 3.8; Annex 15).

URL – the region's Lobster Research Unit, reporting to DRAEP
The project team held regular meetings with URL to coordinate regional lobster fisheries research and has built URL's capacity through Open Data Kit (ODK) workshops (Annex 16) and English language training (Indicator 2.8). URL also conducted regular visits to target communities (Indicator 2.8; Annex 17). As above, securing the support of state actors aided in conferring legitimacy to the LMMA and its associated regulations, and enabled capacity building amongst project beneficiaries. This partnership also enabled information and data sharing regarding the lobster fishery in the region, useful to both local and state decision-makers. SEED will continue to share catch data with URL, and plans to engage further in future project phases.

Chefs Fokontany, local communities
The engagement, support, and endorsement of the *Chefs Fokontany* and communities in Project Oratsimba were central to all activities. These activities are discussed in detail in the Sections 3, 4 and 5.

Blue Ventures
Blue Ventures (BV) provided MEL support throughout the project, and two of BV's experienced data collectors trained the project's community data collectors in mobile data collection (Annex 18). BV also hosted project staff and community representatives on two cross-visits to the Velondriake LMMA (Indicator 2.3; Annex 19 and 20), which proved instrumental in learning from a well-established LMMA and enabling participants to see a successful model. SEED and BV anticipate continuing partnership past project end, engaging in knowledge and resource sharing regarding LMMAs in Madagascar.

MIHARI Network (Madagascar's LMMA network)
The project team has taken part in MIHARI events throughout the project, such as national conferences and the FisherWomen Leadership Program (Indicators 2.6 and 2.13; Annex 21 and 22). Madagascar's first lobster forum was organised in partnership with MIHARI (Indicators 2.6 and 2.7; Annex 23). The Lobster Fishery Management Handbook was also developed in partnership with MIHARI (Indicator 1.7; Annex 24). The partnership with MIHARI has been instrumental in knowledge sharing, contextualised learning with fellow practitioners, and has provided a far-reaching communication and outreach platform which has enabled SEED to contribute knowledge and findings to other small-scale fishing communities and governing bodies. SEED and MIHARI anticipate continuing this partnership past project end.

3 Project Achievements

Progress towards, and achievements of, outputs and the outcome are detailed below, with further qualitative and quantitative evidence detailing baseline conditions and the level of change available in Annex 2.

3.1 Outputs

Output 1: Two Fisheries Management Committees, in Sainte Luce and Elodrato, have been formally incorporated into the project and are meeting independently (Indicator 1.1; Annex 25 and 26). Committees attended training sessions and demonstrated increased understanding of fisheries management measures in both communities (Indicator 1.2; Annex 27 and 28). Involvement of women in fisheries management decision-making increased in Sainte Luce, with interest in becoming more involved expressed by the majority of women in both communities (Indicator 1.3; Annex 29). To further support active community structures, SEED aided in the establishment of a Fishers' Association in Elodrato, and the majority of fishers in Sainte Luce and Elodrato are now members of a Fishers' Association (Indicator 1.6; Annex 30).

A periodic NTZ, the key management measure utilised, was operational throughout the project in Sainte Luce, and the Elodrato NTZ became operational in May 2021; the legitimacy of each NTZ is reinforced by their inclusion in a ratified *dina* (Indicator 1.4; Annex 31 and 32). The impact of the Elodrato NTZ on catch per unit effort (CPUE; Indicator 1.5) will be assessed following the first opening after project end, in August 2021.

To support and promote the development of a network of LMMAs throughout the regional lobster fishery, SEED developed a Lobster Fishery Management Handbook in partnership with MIHARI and disseminated it to all major lobster fishing communities on the Anosy coast north of Fort Dauphin (Indicator 1.7; Annex 24 and 33). The handbooks were met with enthusiasm from communities, with some discussing contents in a community meeting, demonstrating interest in fisheries management.

The Marine Protected Area Governance (MPAG) analysis of the Sainte Luce LMMA provided recommendations that enabled strengthening of community-based fisheries management in Sainte Luce. It also helped spread awareness of, and share knowledge regarding, the Sainte Luce LMMA to an international audience through its publication in the journal *Marine Policy* (Indicator 1.8; Annex 8). The dissemination of MPAG and participatory monitoring findings to stakeholders further expanded the reach of project learning, with findings applicable to community-based fisheries management across the region.

Output 1 has been achieved. The community-based fisheries management model was strengthened in Sainte Luce through Fisheries Management Committee training and the MPAG analysis, and extended to Elodrato through Committee establishment and training, with management measures ratified into the *dina* in both communities.

Output 2: Education sessions contributed to increasing the understanding and awareness of fisheries management and ecosystem services amongst a range of stakeholders. Community education sessions were held (Annex 34 and 35), and most survey participants in Sainte Luce and Elodrato correctly answered the majority of statements relating to governance and enforcement structures (Indicator 2.1; Annex 29). In Itapera, knowledge of fisheries management increased (Indicator 2.10) and understanding of national fisheries regulations was widespread at endline (Indicator 2.12). However, support for continuing to work with Project Oratsimba and implementing fisheries management in Itapera decreased (Indicator 2.11; Annex 29). This may be explained by participants not supporting fisheries management during a period of heightened vulnerability. Almost all participants reported a decrease in household income since the onset of Covid-19, severe drought, and famine in southern Madagascar; an NTZ, the fisheries management measure most familiar to Itapera, may reduce income during closure periods.

Education sessions with intermediaries in the supply chain resulted in an increase of knowledge of community-based fisheries management (Indicator 2.4; Annex 36, 14, and 37). Youth education sessions led to an apparent knowledge increase amongst students in age-appropriate fisheries and biodiversity knowledge, with learning supported by the distribution of comic books (Indicator 2.5; Annex 38, 39, 40 and 41). Attendance of the FisherWomen

Leadership Program (organised by MIHARI) (Annex 22), Marine Ambassador training (Indicator 2.13; Annex 42 and 43), and women-only education sessions (Indicator 2.14; Annex 44 and 45) resulted in greater participation of women in the project (see Output 1) and a demonstrated high endline knowledge of fisheries management (Annex 46).

MIHARI forums supported this knowledge and capacity building, with a Sainte Luce representative demonstrating increased understanding of national and regional priorities of *dina* ratification and livelihood opportunities during fishery closures, as well as an understanding of national fisheries laws and community problem-solving (Indicator 2.6; Annex 21). The SEED-organised MIHARI Lite forum (Indicator 2.7; Annex 23) also enabled learning amongst multiple stakeholder groups; combined with other outreach activities (Annex 47), several non-target communities demonstrated sustained interested in establishing LMMAs.

Learning was further supported by cross-visits to promote cooperation and demonstrate effective examples of community-based management. Community cross-visits resulted in a reported increase in cooperation amongst target communities and sustained cooperation between Fisheries Management Committees (Indicator 2.2; Annex 48 and 49). Though increased support for a permanent NTZ was not widely held following the Velondriake LMMA visit (Indicator 0.4; see Section 3.3), it led to LMMA establishment in Elodrato, and participants reported learning about other areas of LMMA management, including supplementary livelihoods and the importance of fisheries management (Indicator 2.3; Annex 19, 20, and 50). Data dissemination to target communities by URL (Indicator 2.8; Annex 17) and national university students (Indicator 2.9; Annex 10, 11, 51, and 52) further enabled informed, evidence-based fisheries management.

Output 2 was achieved. Target communities are equipped with the skills and knowledge to sustainably manage their own lobster fisheries, gained through education sessions, cross-visits, events, and data dissemination.

Output 3:

The Fisheries Management Committees of Sainte Luce and Elodrato chose to be tasked with enforcement (Indicator 3.1). Following training sessions (Indicator 3.2; Annex 53) and DRAEP site visits (Indicator 3.5; Annex 13), widespread understanding of enforcement and enforcement procedures was recorded (Annex 28). Capacity building was also supported by project partner DRAEP, who trained supply chain intermediaries and the municipal police on legislation and their roles in enforcement (Indicator 3.5; Annex 14). The Elodrato *dina*, which includes management measures such as an NTZ and gear restrictions (Indicator 3.7; Annex 32), was ratified at the local level and submitted for ratification into national law in June 2021, following the footsteps of the nationally ratified Sainte Luce *dina* (Indicator 3.8; Annex 31). DRAEP was vital in these ratification processes. Knowledge of regulations and enforcement of rules is demonstrated by the lack of *dina* infractions in Elodrato; and in Sainte Luce, sanctions were implemented using the correct channels for all four confirmed infractions since the national ratification of the *dina* (Indicator 3.3).

Compliance with national fisheries legislation remains a challenge. Though compliance with the Minimum Landing Size increased in Sainte Luce, it decreased in Elodrato and Itapera. Compliance with the prohibition on landing berried females increased in Elodrato, stayed approximately constant in Itapera, but decreased in Sainte Luce (Indicator 3.4; Annex 54).

The project encountered setbacks with private sector engagement. The three private sector stakeholders who contributed to the original Darwin Initiative application either occasionally or no longer purchase lobster in target communities after the arrival of dominant exporter Santi (see Section 2 and 3.3). Covid-19 also impacted the lobster value chain (see Section 8), with exporters further reducing their operations. SEED was still able to find and create avenues to engage with the private sector to garner support for the project and increase understanding of management priorities, through meetings, events, workshops, and target community site visits (Indicator 3.6; Annex 48).

Output 3 was partially achieved. Elodrato's *dina* was created, two communities' *dina* were ratified, and enforcement thereof through Fisheries Management Committees and increased collaboration with regional regulatory body DRAEP has proved effective. While progress was

made in terms of private sector engagement, future work is needed. Enforcement of national fisheries legislation remains a challenge.

Output 4: An Action Plan to maximise the sustainability of the regional lobster fishery was collaboratively developed by fishers, private sector representatives, government bodies, and civil society organisations during the MIHARI Lite forum, with responsibilities assigned and agreed upon during a follow-up meeting (Indicator 4.1; Annex 55).

Monitoring impacts of the NTZ after opening had varied results. With the first NTZ opening in Elodrato occurring after project end, it was not possible to collect data on openings. However, in Sainte Luce an increase in average lobster price per kilogram at first point of sale during NTZ opening from baseline to endline was reported (Indicator 4.3; Annex 54). This was not indicative of an overall price increase but reflected monthly price fluctuations dictated by the private sector. This also related to a reported increase in median fisher income from baseline to endline (Indicator 4.4; Annex 54), which data suggests was driven by a slight increase in CPUE in the month immediately following the NTZ opening. A higher CPUE during openings compared to closures indicates improvement economically; however, monitoring will continue to determine if this change is sustained throughout the open period.

Annual household management plans were created by fishers and women in Sainte Luce and Elodrato following participation in financial management workshops, demonstrating positive progress towards financial resilience amongst beneficiaries (Indicator 4.5; Annex 56, 57, and 58). However, while endline perception of involvement in financial management decision-making was 100.0% for all participants in Elodrato, a decrease was seen in Sainte Luce. It is possible that this is a result of having fewer financial decisions to make at endline, as available household income has decreased due to Covid-19 and severe drought. Concurrently, endline *pirogue* ownership remained low and decreased in both Sainte Luce and Elodrato (Indicator 4.2; Annex 29). Whilst fishers are aware of the benefits of owning a *pirogue*, purchasing one is a significant financial investment; the feasibility of purchasing was likely also negatively affected by the socioeconomic impacts of Covid-19 and drought.

Output 4 was not achieved. While progress was made through the agreement of the Action Plan, the project did not succeed in transferring greater benefits to fishers. This is the result of challenges in private sector stakeholder engagement (see Output 3 and Section 2), as well as Covid-19, which led to decreased lobster prices.

3.2 Outcome

The project achieved significant progress toward the Outcome, building local and regional capacity to implement adaptive, sustainable fisheries management through developing active community structures, the training of communities and state bodies, and *dina* ratification (see Section 3.1). Additionally, the LMMAs of Elodrato and Sainte Luce combined protect 310km^2 of marine habitat in southeast Madagascar.

Though measurable change was achieved by project end, multiple assumptions were challenged throughout the project. The negative socioeconomic impacts of Covid-19 on communities were significant, with almost all participants from both lobster fishing and non-fishing households reporting a decrease in household income since the onset of the pandemic. Additionally, an unprecedented and severe drought has had profound negative impacts across southern Madagascar, with the local region in Crisis Phase (IPC Acute Food Insecurity Phase 3)[14]. Combined, these external factors complicated the measurement of indicators, particularly three of the four outcome indicators that relate to poverty alleviation (Indicators 0.1-0.3). Though poverty-related indicators were not fully achieved during the project, this is not indicative of a lack of positive change realised by community-based fisheries management, but instead reflective of the extremely challenging socioeconomic landscape faced by communities at project end.

At baseline, all lobster and non-lobster fishing households in Sainte Luce and Elodrato were below the locally-defined poverty level (Indicator 0.1; Annex 59). At endline, decreases in poverty levels amongst lobster fishing households in Elodrato and Sainte Luce were recorded

[14] Famine Early Warning Systems Network [FEWS NET]. (2021). *Integrated Phase Classification*. (online) Available from: https://fews.net/sectors-topics/approach/integrated-phase-classification.

(Annex 29). However, non-lobster fishing households in Elodrato and some control communities also experienced decreases, indicating a decline in poverty levels cannot solely be attributed to project intervention. Decreases in poverty levels may be reflective of a general shift in participants' perception of what constituted a basic necessity between baseline and endline; during a period of heightened vulnerability, a fluctuation in locally-defined poverty levels may have contributed to the decrease, when in reality many households were experiencing heighted financial insecurity.

From baseline to endline, an increase in mean zebu ownership for lobster fishing households in Sainte Luce and a decrease in Elodrato was observed (Indicator 0.2; Annex 29). Mean zebu ownership also increased for lobster fishing households in Itapera and control community Baie d'Italy. Therefore, the increase in mean zebu ownership in Sainte Luce could not solely be attributed to fisheries management interventions. While Assumption 2 held true (see Section 3.3), utilising zebu ownership as an indicator of wealth proved more complex. Combined with the socioeconomic impacts of drought and Covid-19, this indicator did not demonstrate a direct link to the project Outcome.

Levels of unsustainable livelihood practices detrimental to biodiversity, ecosystem function, and ecosystem services were monitored (Indicator 0.3, Annex 29). This included mosquito net fishing, sale of wood products, and sale of shark products. With the first NTZ opening in Elodrato occurring post project, a comparison of unsustainable practices before and after NTZ opening was not possible; however, overall involvement was recorded. From baseline to endline, self-reported absolute involvement in unsustainable livelihood practices in Sainte Luce decreased for mosquito net fishing and the sale of wood products, but increased for selling shark products. In Elodrato, all practices decreased. This suggests that there has been progress towards reducing unsustainable livelihood practices. In Sainte Luce, though absolute involvement decreased, all unsustainable practices were employed more frequently during the NTZ opening compared to the NTZ closure, challenging Assumption 3 (see Section 3.3). Therefore, decreases in unsustainable livelihoods practices cannot be credited to the benefits of a periodic NTZ. This may be explained by a combination of the socioeconomic impacts of Covid-19 (see Section 8), the increased distance fishers travel to fish when the NTZ is closed, and the low economic resilience and high levels of poverty in Sainte Luce.

A permanent marine reserve in Sainte Luce was a long-term goal of this project (Indicator 0.4). Support amongst Fisheries Management Committee members for a permanent NTZ increased significantly from baseline to endline (Annex 28). However, due to concerns that a permanent NTZ may temporarily reduce income during a period of heightened vulnerability due to Covid-19 and severe drought, community consultations for a permanent NTZ did not occur. A further factor in this decision was that Assumption 4 did not hold true (see Section 3.3). However, endline community support for a permanent NTZ was still assessed. The majority of participants fully or somewhat supported the idea. Whilst "full support" decreased by 5.8 percentage points since baseline, "some support" increased by 37.5 percentage points, and "no support" decreased by 32.4 percentage points (Annex 29). Although the target level of support was not achieved, there has been progress in increasing support overall.

Though positive benefits of strengthened fisheries management were perceived, and significant capacity building across communities occurred throughout the project (see Section 3.1), the subsequent effects on household poverty levels (Indicator 0.1), zebu ownership (Indicator 0.2), unsustainable livelihood practices (Indicator 0.3) and support for a permanent NTZ (Indicator 0.4) were significantly challenged by the altered socioeconomic landscape.

3.3 Monitoring of assumptions

Twenty-four key assumptions were monitored throughout the project. Key challenges with assumptions are listed below.

As a significant unforeseen external influence on the project, Covid-19 challenged many of the project's assumptions: Assumption 1 (linked to Outcome 0.1), Assumption 4 (linked to Outcome 0.4), Assumption 6 (linked to Output 1.2, 2.2 & 2.3), Assumption 15 (linked to Output 2.9), Assumption 19 (linked to Output 3.6), Assumption 24 (linked to Output 4.3 & 4.4). Movement and travel restrictions, lobster price and demand fluctuations, and negative socioeconomic

impacts due to the pandemic caused unforeseen changes, with impacts on the project described further in Section 8 and Annex 2.

Assumption 3 (Linked to Outcome 0.3): Increased income from NTZ opening periods reduces frequency of damaging livelihood activities in line with pilot project.
Comments: Monitoring the incidence of activities revealed multiple decreases in self-reported absolute involvement in unsustainable practices (see Section 3.2). However, self-reported frequency was less during NTZ closures compared to NTZ openings, challenging the assumption that income from NTZ opening periods would reduce damaging activities.

Assumption 4 (Linked to Outcome 0.4): Community and fisher interest in sustainable fisheries management remains high in Sainte Luce, with significant benefits from temporary NTZ closures perceived and providing enough motivation for the community to engage in consultation for a permanent marine reserve.
Comments: Though interest in, and support for temporary NTZs remained high, the benefits from the temporary NTZ were not strong enough motivation for establishing a permanent marine reserve in Sainte Luce (see Section 3.2).

Assumption 6 (Linked to Output 1.2, 2.2 & 2.3): Transport between the regional capital, Fort Dauphin, and target communities remains possible, and is not affected by poor road conditions or extreme weather.
Comments: The national road (RN12) between Fort Dauphin and the target communities generally remained passable by 4x4 and motorbike. Weather has caused this road to be impassable and unsafe at times, which was mitigated by re-scheduling project activities.

Assumption 8 (Linked to Output 1.5 & 4.4): NTZ induced changes in spatio-temporal distribution of effort replicates previously documented impacts on CPUE.
Comments: This assumption held true in Sainte Luce for 2019 and 2020, when a marginally higher CPUE was observed during NTZ openings, with fishers able to utilise fishing grounds that are likely more productive than surrounding areas (see Section 3.1). This assumption did not hold true in 2018, when there was no NTZ closure earlier in the year due to changes in the National Closed Season for lobster fishing (NCS).

Assumption 19 (Linked to Output 3.6): Private sector remains active in Anosy region and engaged with project activities.
Comments: Due to changes in the private sector landscape, this assumption has been challenged. Attempts to engage new actor Santi in project activities have had limited success (see Annex 2, Activity 4.2).

Assumption 23 (Linked to Output 4.2): Boat ownership continues to serve as a mechanism for financial saving/investment in fishing communities without access to formal banking systems.
Comments: This assumption has proved inaccurate, as boat ownership acts as an investment mechanism but not strictly as a way of saving. The use of boat ownership remains an important measure of wealth and independence from *collecteurs* (intermediaries in the supply chain).

Assumptions that held true throughout the project are: 2 (linked to Output 0.2), 5 (linked to Outputs 1.1, 1.4, 2.1, 2.10. 2.11, 2.12, 3.4, and 4.5), 7 (linked to Outputs 1.3 and 2.14), 9 (linked to Output 1.6), 10 (linked to Output 1.8), 11 (linked to Outputs 2.3 and 2.6), 12 (linked to Output 2.4), 13 (linked to Output 2.5), 14 (linked to Output 2.8), 16 (linked to Output 2.13), 17 (linked to Outputs 3.2 and 3.5), 21 (linked to Output 3.8) and 22 (linked to Output 4.1). These assumptions were informed by the pilot, previous learnings with SEED, consultations with a wide range of stakeholders, and held true through project end.

3.4 Impact: achievement of positive impact on biodiversity and poverty alleviation

The project's original impact statement was: *Reduction of poverty and protection of marine biodiversity in southeast Madagascar through sustainable, community-based fisheries management.*

Enabling and facilitating the management and stewardship of natural resources by local communities is paramount to achieve effective and equitable conservation. In that regard, this project has made significant contributions to sustainable, community-based fisheries management. Efforts to protect the critically important small-scale lobster fishery have

supported both impoverished rural households and contributed to the protection of wider local marine and terrestrial biodiversity.

As a keystone species, the protection of lobster populations is crucial to maintaining ecosystem function and services. In total, 310km^2 of marine habitat in southeast Madagascar is now protected by the LMMAs of Sainte Luce and Elodrato. Further, maintenance of the fishery as a dominant livelihood is likely to be important in preventing reliance on unsustainable practices[15] (Annex 7 and 29). Strengthening the community-based fisheries management model in Sainte Luce and extending it to Elodrato (Output 1) was crucial for the development of, and progression within, effective natural resource management; this was supported by knowledge and capacity building across numerous key stakeholder groups (Output 2), the creation and implementation of enforcement plans, and the formalisation of management measures including NTZs into ratified local laws (Output 3). These achievements increased the agency of actors throughout the supply chain to manage resources and address overexploitation, with local stakeholders filling the void of limited state capacity to address declining stocks. Overall, the management measures and structures implemented and supported throughout the project are crucial in ensuring lobster populations are maintained. The LMMA model has also been promoted through collaboration and outreach with multiple partners (see Section 2) and in neighbouring communities, spreading awareness of the LMMA model across the region. Further, findings from the project contributed to regional, national, and international knowledge of small-scale fishery governance and the critical link between rural livelihoods and biodiversity (Annex 7 and 8).

Within target communities, peoples' wellbeing is directly correlated to the health of their local environment[16]. As such, the impact of effectively conserving natural capital has a secondary influence of alleviating poverty through maintaining the social safety net afforded by the lobster fishery through healthy and productive natural systems (see Section 4.3).Though key assumptions were challenged (see Sections 3.3 and 8), advancements were made in human development and well-being, particularly with regards to community implementation of management measures that will benefit current and future fishers, safeguarding lobster fishing as a crucial source of income for impoverished households (see Sections 4.3 and 5). Additionally, the inclusion and empowerment of women within the project challenged traditional gender roles, prompted male stakeholders to consider and value women's roles in the supply chain, and increased women's' engagement and agency within the lobster fishery (see Sections 4.4 and 5; Output 2). By addressing barriers to women's participation, the project achieved more inclusive community-based management, in turn improving gender equality, a key element of poverty alleviation.

Despite the challenging socioeconomic conditions amongst the communities at endline (see Sections 4.3 and 8; Output 4), the achievement of Outputs 1 and 2, partial achievement of Output 3, and progress within Output 4 denote significant strides in the implementation of sustainable management measures, contributing both to the socioeconomic resilience of Sainte Luce and Elodrato and the long-term sustainability of the lobster fishery, supporting poverty alleviation and biodiversity protection across the region.

4 Contribution to Darwin Initiative Programme Objectives

4.1 Contribution to Global Goals for Sustainable Development (SDGs)

The project directly addressed SDG 14. In scaling up the established LMMA model, local communities were empowered to manage marine resources (SDG 14.2). Training, education, and event attendance built communities' capacity to manage these resources (SDG 14.7, Activity Indicators 1.2, 2.1, 2.3, 2.4, 2.6, 2.8, 2.9, 2.11, 2.12, 2.13, and 3.2). State actors, such as DRAEP, provided further support (Indicator 3.5), particularly during the *dina* ratification processes (SDG 14.2; Indicator 3.8). URL received training in mobile data collection and professional skills (Indicator 2.8), increasing their knowledge and capacity to contribute to Madagascar's ability to manage sustainable production (SDG 14.a and SDG 12.2). In working to ensure the sustainability of the fishery, the project contributed to the safeguarding of lobster

[15] Gardner, C., Gabriel, F., St. John, F., & Davies, Z. (2016). Changing livelihoods and protected area management: A case study of charcoal production in south-west Madagascar. Oryx,50(3), 495-505. doi:10.1017/S0030605315000071

[16] Long, S. (2017). Short-term impacts and value of a periodic no take zone (NTZ) in a community-managed small-scale lobster fishery, Madagascar. *PLoS ONE* **12**(5): e0177858. https://doi.org/10.1371/journal.pone.0177858

fishing as a livelihood (SDG 14.7 and 14.b) and protection of the ecosystem for sustainable food production, supporting a livelihood crucial to fishers' income and food security (SDG 2.4).

Women are key actors in the lobster value chain and their involvement in decision-making was actively promoted throughout the project (SDG 5.5; see Section 4.4).

In all communities, lobster fishing remained a key contributor to household income, though the Covid-19 pandemic caused income decreases (see Section 8), lobster fishing and the advancements made towards sustainable community-based natural resource management will continue to contribute to SDG 1.1 (see Section 4.3).

4.2 Project support to the Conventions or Treaties (e.g. CBD, Nagoya Protocol, ITPGRFA, CITES, Ramsar, CMS, UNFCCC)

Convention of Biological Diversity (CBD) Articles

Having promoted the extension of the LMMA model to Elodrato and contributed to the Madagascar LMMA network, the project supported Article 8(a), as lobsters hold economic value and are a keystone species. Avoiding fishery collapse decreases pressure on endangered marine megafauna and terrestrial resources, specifically on threatened littoral forests that exhibit exceptional biodiversity and endemism (Indicator 0.3). Managing this resource has fulfilled Article 8(c). Communities have been supported to develop and implement their own management measures, taking into account local knowledge, innovations and practices, in line with CBD Article 8(j).

Through supporting the implementation of measures to sustainably manage depleted lobster stocks, the project contributed to Article 10(d). Improved cooperation between communities, the state, and the private sector was facilitated through stakeholder meetings, education sessions, and site and cross-visits (Indicators 2.2, 2.3, 2.7, 2.8, 3.5, 3.6, and 4.1), fulfilling Article 10(e). By using the economic and social benefits of the NTZ to incentivise sustainable practices, the project supported efforts towards Article 11.

Strategic Plan for Biodiversity 2011-2020

This project supported Aichi Target 1 through education sessions (Indicators 1.2, 2.1, 2.4, 2.5, 2.10, 2.13, and 2.14), highlighting the value of managing lobster stocks sustainably to promote biodiversity and the links to food security. To increase compliance with national law, the project built enforcement capacity of the Fisheries Management Committees, contributing to Aichi Target 6 (Indicator 3.2).

The establishment of an LMMA in Elodrato contributed to Aichi Target 11, increasing the percentage of conserved and sustainably managed marine areas. By ensuring LMMAs and communities are well-connected through cross-visits and meetings (Indicators 2.2 and 2.3) and engagement with Madagascar's LMMA Network, MIHARI (Indicator 2.6), the project further contributed to Aichi Target 11.

Periodic NTZs (Indicator 1.4) aimed to safeguard ecosystem service provision and alleviate poverty, contributing to Aichi Target 14. Given the participatory approach to data collection and results dissemination, local knowledge, innovations, and practices were respected and fully integrated, fulfilling Aichi Target 18. The project's participatory monitoring (Indicator 1.8) and analysis dissemination also contributed directly to Aichi Target 19.

The Promise of Sydney

Now a signatory of the Promise of Sydney, Madagascar's Biodiversity Action Plan (2015-2025) set the goal of adequately conserving 15% of marine areas by 2025. The project's LMMAs contributed to these obligations.

4.3 Project support to poverty alleviation

The project has contributed directly and indirectly to poverty alleviation in Sainte Luce and Elodrato, with benefits extending to Itapera and other communities across the region. The projects' significant contributions to poverty alleviation derive from strengthened governance, management and stewardship of the lobster fishery by local communities, ensuring that measures are in place to promote sustainable harvest past project end (see Section 3.4). By building the capacity and agency of communities and other key stakeholders (Outputs 1 and 2), local actors have been empowered to manage the fishery (Output 3). Engaging with state and

private actors further strengthened communities' involvement in decision-making, with collaboration during the project creating enduring relationships (see Sections 2 and 5), whilst inciting institutional involvement and buy-in to local management measures. Progress in gender equality (see Section 4.4) also empowered women who were previously excluded from fisheries management and governance discussions. By including outreach and information dissemination to non-target communities in the region, awareness of the LMMA model and routes to sustainable fisheries management were widely spread (Indicator 2.7). Combined, these factors will safeguard lobster fishing as a central livelihood in coastal communities. Without sustainable management, formalised measures, and collaborative action amongst stakeholders, declines in lobster stock would not be addressed.

Income as an indicator of poverty reduction and well-being was more complex. The impacts of Covid-19 and severe drought in the region created a dire situation for many (see Sections 3.3 and 8). At the end of the project, the decrease in poverty levels as measured by the Basic Necessities Survey was in fact not reflective of an increase in material possessions or investments (Indicators 0.1 and 0.2). Additionally, though median fisher income reportedly increased from baseline to endline, data cannot yet support that this is indicative of sustained income increase (Indicator 4.4).

Notwithstanding the lack of direct financial-related decreases in poverty, the project has made significant contributions to poverty alleviation and well-being through the empowerment of local communities in fisheries management, facilitating effective, equitable, and inclusive governance across two target communities, whilst demonstrating the importance of the model to communities and partners on regional, national, and international levels.

4.4 Gender equality

Though women perform essential pre- and post-harvesting activities integral to the lobster value chain, women's roles have often been viewed as an extension of their household tasks and therefore undervalued, with women historically excluded from lobster fisheries management (Annex 59).

Failure to include women weakens decision-making, reduces community ownership, and undermines compliance with management measures [17, 18]. Therefore, this project has worked to address cultural and structural barriers that limit women's participation in fisheries management, using a holistic approach to contribute to gender equity and inclusive community-based fishery management. As a first step, project staff, many from a traditionally patriarchal society, attended a gender and fisheries workshop, ensuring that those implementing gender-based initiatives understand their importance. The same workshop was held with both Fisheries Management Committees, URL, DRAEP, and private sector representatives. Following workshops, high agreement was seen among both men and women in Sainte Luce and Elodrato that women have a role in decision-making about the lobster fishery (Annex 46).

The first election of a woman to the Fisheries Management Committee in Sainte Luce reflected increased community recognition of the role women play in the fisheries (Indicator 1.1)[19]. To mitigate the lack of female participation in management roles, project activities focused on increasing women's engagement within the community in other ways. Women were represented at youth, intermediary, and financial education sessions, as well as cross-visits (Indicators 2.2, 2.3, 2.4, 2.5, and 4.5). Six women, two from each target community, were recruited as Marine Ambassadors and attended facilitation and fisheries management training workshops (Indicator 2.13). Ambassadors then led women-only education sessions (Indicator 2.14) to provide a platform for women to increase their skills and knowledge of management practices, aiming to empower and encourage women to play a greater role in future decision-making (Indicator 1.3). In Sainte Luce and Elodrato, where management measures were implemented, endline involvement in fisheries management decision-making was reported by 51.9% of female participants in Elodrato and 61.1% in Sainte Luce. 55.6% of female

[17] Agarwal, B. (2000) Conceptualising environmental collective action: why gender matters. *Cambridge Journal of Economics* 24: 283-310.
[18] Westerman, K. & Benbow, S. (2013). The role of women in community-based small-scale fisheries management: The case of the south west Madagascar octopus fishery. *Western Indian Ocean Journal of Marine Science*, 12: 119-132.
[19] In Elodrato, the Fisheries Management Committee was established from the Fishers' Association, of which only active fishers can be a member (thus men only).

participants in Elodrato and 75.0% in Sainte Luce expressed interest in greater involvement (Annex 29).

4.5 Programme indicators

- **Did the project lead to greater representation of local poor people in management structures of biodiversity?**

Through this project, communities have been empowered to sustainably manage the small-scale lobster fishery upon which they rely. Community-elected Fisheries Management Committees were formed in two communities (Indicator 1.1). The community of Elodrato, supported by SEED, created a *dina*, outlining rules, responsibilities, and regulations within their fishery (Indicator 3.7). Collaboration with actors DRAEP and URL (Indicators 1.8, 2.7, 2.8 and 3.5) demonstrated state support for these management structures, and national ratification of the Sainte Luce *dina* (Indicator 3.8) further affirms the legitimacy of fisheries governance by the local community, supporting local decision-making and action. Through community outreach and education sessions (Output 2), awareness of fisheries management was built, facilitating greater participation in management and decision-making. The Marine Ambassador programme in particular facilitated greater participation of women, a previously-excluded portion of the population (see Sections 4.4 and 5).

- **Were any management plans for biodiversity developed and were these formally accepted?**

The *dina* developed by Elodrato and the Sainte Luce *dina* developed prior to this project outline the communities' lobster fishery management approach and are both locally ratified (Indicator 3.7). The Sainte Luce *dina* was ratified nationally during this project, and the Elodrato *dina* is expected to be ratified into national law in August 2021 (Indicator 3.8).

An Action Plan for the sustainability of the regional lobster value chain was developed at the MIHARI Lite forum, with all stakeholders present agreeing to the Plan (Indicator 4.1).

- **Were they participatory in nature or were they 'top-down'? How well represented are the local poor including women, in any proposed management structures?**

The Elodrato *dina* was created through an iterative process between the Fisheries Management Committee and other community stakeholders, including women, with consensus reached before the *dina* could be ratified.

The Action Plan was developed in collaboration with local authorities, private sector representatives, URL, DRAEP, MIHARI, representatives from target and non-target communities, and partner organisations. Responsibilities in the Action Plan were assigned and agreed upon by all attendees during a follow-up meeting.

- **How did the project positively influence household (HH) income and how many HHs saw an increase?**

Although Covid-19 and severe drought negatively impacted income and poverty levels (see Sections 3.3 and 8) and the NTZ in Sainte Luce did not directly result in increased income (see Section 4.3), the safeguarding of this livelihood is crucial; if lobster fishing was rendered inviable due to continued stock declines, many households would lose their primary income source (see Section 3.4).

- **How much did their HH income increase (e.g. x% above baseline, x% above national average)? How was this measured?**

Mean daily lobster fishing income in Sainte Luce during NTZ openings increased by 9.5% from baseline to endline. Data suggests this may be driven by an increase in CPUE after NTZ openings (Indicator 4.4).

4.6 Transfer of knowledge

Project Oratsimba has made its (research) findings widely accessible both in Madagascar and internationally (Annex 5). Materials from this project will aid conservation practitioners and stakeholders implementing LMMAs and similar sustainable small-scale fisheries initiatives, by providing information on key challenges, solutions, and processes, widely applicable in the Southwest Indian Ocean region and beyond. The project also worked with project partners

MIHARI and Blue Ventures to increase knowledge sharing on regional and national levels in Madagascar (see Sections 2 and 3.1; Indicators 1.7, 2.3, 2.6, and 2.7).

The project worked to build local and regional capacity to implement fisheries management, including community stakeholders, URL, and DRAEP. Five students were supported to carry out research for their degrees (Indicator 2.9; Annex 3). Assistant Professor Daniel Raberinary of University of Tulear attended an eight-week course on fisheries stock assessment and diagnosis at *Institut Agro*, in France.

4.7 Capacity building

Capacity building of community actors and government bodies has been a focus of this project. Four male community data collectors received training in conducting landings surveys and mobile data collection, increasing their employability, and enabling development of new skills. Six female Marine Ambassadors were trained in public speaking, facilitation, and fisheries management, and two Ambassadors presented at the FisherWomen Leadership Program in Madagascar's capital (Indicator 2.13). This enabled these women to leave the Anosy region for the first time, discussing gender equity and women's participation in resource management with peers, whilst networking with a wide range of national stakeholders. Members of the Fisheries Management Committees (30 men; 1 woman) received training in enforcement, leadership, and sustainable resource use, again increasing and diversifying their skillset.

Dina ratification conferred legitimacy to the LMMAs and its Fisheries Management Committees, and reinforced conservation efforts of numerous other stakeholders, including DRAEP.

5 Sustainability and Legacy

By improving the regional governance framework, the project has moved towards establishing a self-sustaining model in target communities, reducing reliance on external funding.

By building and strengthening community management structures, linked to both local stakeholders and national networks, ownership and access to support mechanisms and knowledge have been ensured. Extensive capacity building of stakeholders, particularly those most involved in the fishery, was conducted (see Section 3.1). Additionally, SEED developed relationships with a wide range of stakeholders to promote and strengthen the work of the project on a regional, national, and international level. To foster government buy-in and community support, institutional knowledge was built through joint training, MEL activities, forums, and information sharing with DRAEP and URL (Indicators 1.8, 2.7, 2.8 and 3.5). These activities are indicative of the supportive framework established, of which the state is now a part; a key step in ensuring legitimacy and recognition to the Fisheries Management Committees and the wider LMMAs. Engagement with MIHARI and Blue Ventures further facilitated learning surrounding LMMAs at all levels (Indicators 1.7, 2.3, 2.6, 2.7, and 2.13). Continued engagement by project partners past project end highlights the high interest and motivation for promoting sustainable fisheries management. The MPAG, an open-access co-publication by SEED and UCL, contributes to the knowledge of governance within Marine Protected Areas across the international scientific community. Key findings informed project implementation, strengthening the lasting impact of the project with respect to community governance structures. Data sharing amongst URL, national university students, and communities (Indicators 1.8, 2.8, and 2.9) further laid the foundation for collaboration between stakeholders and management based on best practices.

This regional and national support has also strengthened and maintained enforcement. *Dina* ratification represents a formalisation of fisheries management and enforcement plans, supporting long-term, community-led enforcement; indicating further evidence of buy-in from elected village officials and state support. This was emphasised during end-of-project community consultations, with fishers reporting that the ratification of the *dina* strengthened management and helped prevent others from fishing during the NTZ closures. Further, enforcement training strengthened the capacity of Fisheries Management Committees to adequately implement enforcement strategies and address infractions through the appropriate channels (Indicators 3.2, 3.3, and 3.5).

Enforcing the *dina* and supporting the fisheries management framework necessitates buy-in, awareness, and support from the community at large. This too has seen significant progress; mass mobilisation events, cross-visits, and training sessions have aided in spreading awareness of, and increasing support for, fisheries management (Indicators 1.3, 2.1, 2.2, 2.3, 2.4, 2.5, 2.10, 2.12, 2.13, and 2.14). A notable comment from community consultations was regarding how, emphasising the inclusion and training of women, a previously-excluded portion of the population is now engaged in fisheries management, with women reporting higher awareness of the project and many fishers reporting that their partners now remind them of regulations.

Challenges in private sector engagement (see Sections 2 and 3.3) meant the leveraging of value chain opportunities and creating a consistent approach amongst buyers was not achieved. However, progress was still made with partners Madapêche and Le Martin Pêcheur, through various engagement sessions (Indicator 3.6). Additionally, the inclusion of intermediaries ensured greater reported compliance with regulations across the supply chain (Indicator 2.4).

There is also evidence that economic benefits will incentivise sustainability and replication of the LMMA model. For example, beneficiaries in Sainte Luce reported benefits during endline consultations such as being able to afford school fees for their children. The onset of Covid-19 and severe drought have hindered the development of financial resilience; however, the continued widespread support for NTZs in both Sainte Luce and Elodrato speaks to agreement amongst fishers that the temporary closure is financially beneficial, even during a particularly challenging period (see Section 3.2; Indicator 0.4)[20]. Representatives from several non-target communities have demonstrated willingness to replicate the LMMA model (Indicator 2.7).

The materials sourced during this project will continue to be used by SEED in working towards poverty alleviation and biodiversity protection goals, or will otherwise remain with the partners who received them. The majority of project staff are continuing to work with SEED on different projects, ensuring the retention of project learning. Communities will continue to be supported by SEED's overarching organisational approach, building resilience within communities through sustainable livelihoods initiatives and continued collaboration with target communities.

6 Lessons learned

Remaining Open to Adaptation

Throughout the project, the team remained adaptable, ensuring the project remained grounded in communities' emerging needs and was contextualised within the changing socioeconomic landscape. For example, the working strategy with Itapera was altered in response to the community's request; though originally Itapera was included in plans to establish an NTZ and further community-based fisheries management strategies, consensus could not be reached amongst different gear user groups and fishers using techniques not customary in the Anosy region. Without community concurrence, effective and equitable management would not be possible; as such, Itapera was removed from multiple indicators (see Section 6.1) and the focus shifted to increasing awareness of declining lobster stock and increasing compliance with national legislation. This was a necessary adaption to progress with meaningful and productive community engagement, whilst addressing their differential needs.

Additionally, despite thorough preparation, consultation, and research during project set-up, some assumptions were violated, necessitating the adjustment of project elements, while maintaining momentum towards the impact. For example, the violation of Assumption 19 (see Section 3.3) resulted in private sector stakeholder engagement requiring a more targeted approach than originally planned. In response, the project team adapted activities accordingly, employing additional avenues to effectively engage with private stakeholders including, individual meetings, events, and site visits (Indicator 3.6).

This adaptability was imperative given the unexpected socioeconomic changes brought on by the Covid-19 pandemic, with the project team quickly adjusting project activities to continue

[20] Though this indicator does not directly speak to support for a temporary NTZ, it does speak to endline support for a more far-reaching management measure, a permanent NTZ, during a period of heightened vulnerability.

progressing towards achieving project outcomes, whilst prioritising the health and safety of all stakeholders, in line with national regulations (see Section 8).

The degree of adaptability required throughout the project, in response to communities' emerging needs and the everchanging socioeconomic landscape, was at times restricted by the level of detail outlined in the original logframe. Upon reflection, a more fluid logframe would have enabled greater impact amid the unforeseen external factors that affected the feasibility and relevancy of some project elements. SEED recommends similar projects acquire such flexibility.

Community representatives and structures leading education activities
Throughout the project, multiple education sessions have been delivered involving community representatives and structures, such as data collectors, Marine Ambassadors, and Fisheries Management Committees. This not only increases the capacities of the community members conducting the activities, but it also increases overall engagement in the sessions, with participative sessions more productive for all parties. SEED recommends this strategy to other projects**.**

Stakeholder Engagement
Throughout the project, the project team has fostered close relationships with key stakeholders, such as URL and DRAEP. This has made it easier to implement activities together and to ask for support when needed (see Section 2).

Mobile Data Collection
Without utilising mobile data collection, it would not have been possible to conduct the extensive monitoring and evaluation achieved throughout project. The transition to mobile data collection improved efficiency, both in time and cost. Though initial training on phone and software use took time due to low smartphone literacy in Madagascar, this investment paid off and staff continue to use these skills past project end in other SEED projects.

6.1 Monitoring and evaluation

Ongoing monitoring and evaluation (M&E) activities informed changes to project design, as detailed in the logframe. At the community's request, Itapera was removed from Indicators 0.1-0.3, 1.1, 1.2, 1.4-1.6, 2.1, 3.1, 3.3, 3.8, and 4.2-4.5 (see Section 6). The revised approach focused on increasing awareness and understanding of fisheries management and national lobster fishing regulations (Indicators 2.10-2.12 added). Indicators were also altered in response to feedback from the Mid-Term Review site visit. To better suit the local context, enforcement duties were absorbed by Fisheries Management Committees (Output 3 partially removed; Indicator 3.2 updated) per their request, and a more reasonable timeframe was established (Indicators 1.4, 3.7, and 3.8). To more accurately reflect women's engagement efforts, Indicators 2.13 and 2.14 were added and Indicator 1.1 was adapted. Additionally, a three-month project extension was granted in response to Covid-19-related delays and reduced staff capacity, extending the timeline of several indicators.

The M&E system was informed by SEED's local knowledge and relationships with local stakeholders, frequently utilising feedback to adjust project design. Staff training on design and use of monitoring tools increased from PY2 onwards to improve efficiency and accuracy of data collected. To further increase stakeholder engagement and facilitate co-construction of knowledge, additional qualitative data collection methods were used as the project progressed. At times the emphasis on M&E resulted in survey fatigue and reduced time for implementation of activities; when possible, surveys were combined to mitigate this. Throughout the project, information was shared with stakeholders regularly through project and community meetings, training sessions, and reports.

Internal and external reviews were conducted throughout the project. During the Darwin Mid-Term Review discussed above, meetings were held with DRAEP and private sector representatives. Both parties also engaged in discussions regarding Project Oratsimba Phase IV, focussing on what partnerships should look like moving forward, and any changes to activities, including combined actions to increase compliance with national lobster fishing legislation. An internal review was conducted near project end; the project team critically evaluated all activities conducted, if planned achievements were reached, what should be included in future phases, and in what form. This evaluation is a key document that will inform

the design of future project phases and sustain the transfer of key knowledge through staff turnover. An external review was conducted with UCL in PY4, examining long-term project impacts, challenges, and successes which will also inform future phases.

In addition to ongoing community engagement, end-of-project community consultations provided valuable feedback. Stakeholders identified perceived changes due to the project, including successes, challenges, and areas of future focus, notably the continuation of financial education sessions.

6.2 Actions taken in response to annual report reviews

The project team has responded to all issues raised in reviews of annual reports throughout the project, most recently in June 2020, when the project team addressed the feedback received from the second Annual Report. Feedback concerned engagement with Itapera, the private sector, and Covid-19 mitigation strategies. Engagement with Itapera continued in order to increase support for community-based fisheries management, build trust between SEED and the community, and raise awareness of declining lobster stock and national fisheries regulations (Indicators 2.10-2.12). SEED also continued to cultivate relationships with the private sector in Y3, with details on successes and challenges outlined in Section 2; Section 3.1, Output 3; and Section 4.5. Changes due to Covid-19 were commented on in the October 2020 Half Year Report, with further information available in Section 8.

7 Darwin identity

Efforts have been made to promote the Darwin Initiative as the primary funder of this project, to as wide an audience as possible. The Darwin Initiative and UK Aid logos are on the educational comic book (Indicator 2.5; Annex 40) and Lobster Fishery Management Handbook (Indicator 1.7; Annex 24) distributed to project partners and target and non-target communities. Additionally, the logos are included on the signboard in Sainte Luce displaying *dina* guidelines (Annex 60); on posters (Annex 61-65); on t-shirts distributed to members of each Fisheries Management Committee (Annex 26); and in presentations to promote the Initiative to stakeholders. The project provided SEED with a platform to contribute to national and regional discussions (see Section 3.1), including through the MIHARI Lite forum (Activity 2.12), and acknowledged the Initiative as the funder for research published in *Marine Policy* (Annex 8).

SEED regularly highlighted the work of the project to over 17,250 followers across social media platforms[21] and linked to Darwin Initiative channels. SEED linked to the Initiative on the project page on SEED's website[22] and in our monthly newsletters.

8 Impact of COVID-19 on project delivery

The impact of Covid-19 on Madagascar's economy has resulted in a GDP contraction of 4.2%, a rate that is expected to set back the country's efforts in alleviating extreme poverty by a decade[23]. The socioeconomic consequences of the pandemic will be particularly acute in communities such as those targeted by the project: areas with low economic resilience, high poverty levels, and a lack of alternate livelihoods.

With most regional lobster catch exported to Europe and Asia, the suspension of international travel caused demand for lobster to decrease and the price/kg to drop by 50%. The rising price of household staples such as rice, oil, and cassava, coupled with the impact of Covid-19 on lobster fishing as a livelihood, led to food insecurity for many households in target communities (Annex 66 and 67).

Throughout the pandemic, lobster fishing remained a primary source of income, with the notable exception of the NCS. The fluctuations in lobster price and the NCS prompted fishers to rely on supplementary livelihoods, including potentially unsustainable harvest of other marine and terrestrial resources. However, during the first week of April 2021, following the NCS end,

[21] Platforms include Instagram https://www.instagram.com/seedmadagascar/, Twitter https://twitter.com/SEEDMadagascar, and Facebook https://www.facebook.com/SEEDMadagascar/
[22] https://madagascar.co.uk/projects/sustainable-livelihoods/oratsimba
[23] World Bank (2020). *Madagascar Economic Update: COVID-19 Increases Poverty, a New Reform Momentum is Needed to Build Back Stronger.* (Online) Available at: https://www.worldbank.org/en/country/madagascar/publication/madagascar-economic-update-covid-19-increases-poverty-a-new-reform-momentum-is-needed-to-build-back-stronger

approximately 3.8 tonnes of lobster were caught in just Sainte Luce, bringing over £14,500 into the community during the pandemic. By supporting this high-value livelihood through sustainable management, a vital income source is sustained, building greater socioeconomic resilience, and facilitating recovery from the pandemic.

National restrictions impacted the delivery of several project activities, with SEED adapting activities accordingly. In response to restrictions on group sizes, SEED conducted activity sessions with multiple small groups in target communities. In line with national travel guidelines, activities deemed unsafe, such as the second MIHARI Lite Forum (Activity 2.12) and the return cross-visits of Velondriake fishers (Activity 2.10), were cancelled. SEED also adapted fieldwork protocol to ensure the health and safety of project staff and beneficiaries, limiting numbers in transport, undertaking activities outside, and enforcing mask wearing and social distancing. Handwashing stations and masks were provided in target communities to continue activities in line with organisation and government protocol.

9 Finance and administration

9.1 Project expenditure

Project spend since last annual report (PY3)	2019/20 Grant (£)	2019/20 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items (see below)				
Others (see below)				
TOTAL				

Staff employed (Name and position)	Cost (£)
Jeremie Ndriamanja – Project Coordinator	
Sylvestre Mbola – Rural Livelihoods Coordinator	
James Antilahy – Education Specialist	
Hoby Tsimijaly – Education Specialist	
Danick Trouwloon – Marine Specialist	
Jessica Savage – MEL Specialist	
Annelin Verkade – Deputy Head of Programmes	
Quinn Parker – Senior Programme Officer	
Eve Englefield – Programme Officer	
Yvon Ratefiarivelo – Community Liaison Officer	

Kristin Andry – Data Collector	
Landry Razafimananandro – Data Collector	
Dodo – Data Collector	
Julios – Data Collector (replacement)	
Octave Rabetany – Head of Department	
Lisa Bass – Director of Programmes and Operations	
Tsinampoizina Endor – Deputy Director	
Joel Rajaobelina – Head of Finance	
Mark Jacobs – Managing Director	
Zachary Parsons – Project Development Coordinator	
TOTAL	

Other items – description	Other items – cost (£)
Covid-19 prevention - disinfection supplies	
Covid-19 prevention - hand hygiene	
Covid-19 prevention - masks	
Focus group refreshments	
Internet	
IT support	
Lamination	
Language lessons	
Mobile communications	
Postage	
Printer ink	
Printing - government reports	
Printing - posters	
Printing and scanning - training and MEL documents	
Radio broadcasts	
Stationery	
Translation	
Translators	
Workshop refreshments	
Zoom subscription fees	
TOTAL	

Project spend since last annual report (PY4, draft)	2020/21 Grant (£)	2020/21 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items (see below)				
Others (see below)				
TOTAL				

Staff employed (Name and position)	Cost (£)
Sylvestre Mbola – Rural Livelihoods Coordinator	
Hoby Tsimijaly - Education Specialist	
Jessica Savage – MEL Specialist	
Annelin Verkade – Deputy Head of Programmes	

Quinn Parker - Senior Programme Officer	
Landry Razafimananandro – Data Collector	
Dodo – Data Collector	
Andrivola Indrafo - Data Collector	
Lisa Bass – Director of Programmes and Operations	
Tsinampoizina Endor - Deputy Director	
Joel Rajaobelina – Head of Finance	
Mark Jacobs – Managing Director	
Melissa Hornby - Programmes and Funding Coordinator	
TOTAL	

Other items – description (PY4)	Other items – cost (£)
Covid-19 prevention materials	
Dina ratification costs	
Internet	
IT support	
Lobster Fishery Management Handbook printing	
Mobile communications	
NTZ closure ceremony	
Postage	
Printer ink	
Radio broadcast	
Sound system rental	
Stationery	
Translation	
TOTAL	

9.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
Blue Ventures (supplementary livelihoods pilot)	
OverBoard (dry bags – in kind)	
University College London (open access fee – in kind)	
University of Roehampton (Festival of the Sea)	
TOTAL	

Source of funding for additional work after project lifetime	Total (£)
10% for the ocean	
Blue Ventures	
TOTAL	

9.3 Value for Money

SEED considered Value for Money (VfM) at each stage of the results chain. All relevant staff were trained in the management of the procedures designed to support VfM.

SEED is committed to efficient fund management, ensuring budgets were targeted to achieve sustainable outcomes, thus maximising impact and equity. To maximise the impact of project intervention in relation to inputs, the project conducted extensive capacity building and collaborated with a range of stakeholders, including government bodies; this extended project benefits beyond target communities throughout the regional fishery.

To ensure the best value of inputs was achieved, all project expenditure was overseen by SEED's in-country Head of Finance and Director of Programmes and Operations (Project Lead) in line with SEED's Procurement Procedures, prioritising local procurement and cost-effectiveness.

SEED's 20+ years of experience working in the Anosy region and having implemented previous phases of Project Oratsimba optimised the project's efficiency. Project implementation was led by Malagasy staff, who have extensive local knowledge and pre-existing relationships with target communities and stakeholders, increasing both implementation efficiency and effectiveness throughout the project.

Overall, SEED managed a cost-effective and efficient project, achieving good value for money.

10 OPTIONAL: Outstanding achievements of your project during the (300-400 words maximum). This section may be used for publicity purposes

I agree for the Darwin Secretariat to publish the content of this section. Please see the two accompanying images (*25-016 Final Report Photo, Section 10*) attached.

SEED Madagascar's Project Oratsimba has supported and facilitated community-based lobster fishery management in southeast Madagascar, protecting marine biodiversity, reducing poverty, and safeguarding lobster fishing as a sustainable livelihood. A notable achievement was the successful development of a new Locally-Managed Marine Area in the rural community of Elodrato, which includes a periodic No Take Zone (NTZ). The NTZ, which became operational and ratified in a local law in May 2021, is a milestone in ensuring the security of lobster stock in the region. Further project success was evident in gender-based initiatives, implemented to increase the inclusion of women in fisheries management roles. The first election of a woman to a Fisheries Management Committee in Sainte Luce and the recruitment of six women as Marine Ambassadors in target communities promoted gender inclusivity and equity to empower and engage women in decision-making. By strengthening community-based fisheries management in rural Madagascar, Project Oratsimba has supported the development of effective natural resource management, improving the sustainability of lobster fishing as a livelihood for impoverished households.