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Clam harvesting in Tunisia: sustainability risks and SDG opportunities

Abstract

Clam harvesting and export play a pivotal socio-economic role in Tunisia. Clam harvesting, one of the most widespread fishing activities in the country's southern coastal regions (Sfax, Gabes, and Medenine), is crucial to supporting rural and vulnerable communities in their fight for survival, particularly women clam collectors. These women are in jeopardy due to several issues, such as pollution degrading the environment in the collection regions. The Ministry of Agriculture, Water Resources, and Fisheries, in Resolution No. 3500, dated November 16, 2020, suspended the clam harvesting seasons for three consecutive years (2020–2023). This decision, influenced by environmental, biological, and harvest area health data, was then followed by several national and international initiatives within the context of the blue economy to address these issues in such underdeveloped rural areas. Within this framework, the current project intends to contribute to these efforts by establishing a clam fishery management plan. This strategy can help promote fresh commercial species in great demand in the European and global markets.

Additionally, it will strengthen the monitoring and follow-up of various manufacturing and transportation procedures and entice stakeholders to adhere to legal and health requirements. This work also aims to engage women clam collectors on the breadline in supplementary activities to ensure their financial independence and preserve their dignity. It seeks to provide unemployed young men a greater chance of finding employment locally and additional possibilities for making a living.

Keywords: Sfax area, employability, shellfish production, socio-economy, clam fishery, management plan, women clam collectors, unemployed young men, SDGs

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Abbreviations: EU, Europe; TND, Tunisian Dinar; NGO, Non-governmental organization; DGPA, General Directorate of Fisheries and Aquaculture; CRDA, Regional Commissariat for Agricultural Development; INSTM, National Institute of Marine Sciences and Technologies; DOG, Development and Operation Groups of the Clams; WP, work packages; UN, United Nations.

Introduction

Recent decades have been challenging for the fishing industry due to several factors, such as the depletion of stocks, the decline of fishery resources, and the degradation of aquatic habitats. According to an FAO (Food and Agricultural Agency of the United Nations) assessment, several marine fish stocks are still under significant stress. As per data from the FAO study from 2008, only 13% of these stocks are underexploited, 57% are entirely exploited, and 30% are overexploited. The main reasons for stock depletion are the modernization of the fleet and fishing methods, pollution, and deterioration of water quality, climate change, and inadequate management of fishing practices. Several incentive mechanisms have been implemented to promote sustainable fisheries management, including limiting fishing efforts, establishing a standard policy (in the case of the EU), strengthening the legislative and institutional framework, establishing biological rest, and even creating marine protected areas, among other things.

Many nations throughout the world have a substantial economic interest in edible shellfish. Their contribution to the aquaculture and fishing industries keeps expanding. Similarly, according to Nouaili,[1] the clam industry significantly contributes to Tunisia's social, economic, and foreign exchange gains.

While, in Tunisia, only clam, particularly *Venerupis decussata*, is being exploited and exported, an abundance of other bivalves and edible gastropod species that are suitable for export are found on Tunisian coastlines.[2–7] For instance, "*Venerupis decussata*," originally known as "*Ruditapes decussatus*," resides throughout Tunisia's coastline, except the Cap Bon and the Gulf of Hammamet.[8]

The presence of many shellfish pickers, particularly in Sfax, Gabes, and Medenine, is explained by the resource's irregular distribution, with a concentration in the southern part of Tunisia and an absence in the middle. Nearly fifty production areas were exploited, primarily by female shellfish pickers of the region or from the country's interior regions. Direct hand gathering is used for harvesting, which entails hand-collecting shellfish in flat intertidal areas. The hand pickers utilize a bucket and a sickle; no further equipment is utilized. The popularity of this occupation can be attributed to the possibility of earning money without a formal education, training, or investing in expensive fishing equipment.

The Tunisian government has continued to support this sector by establishing a relatively comprehensive institutional and regulatory framework that complies with international standards, overseeing and regularly monitoring the harvest season, and launching several development projects. Examples of these projects include TCP/TUN/3203, "Strengthening the role of women in the clamshell fishing industry in Tunisia," and the ArtFiMed project, "Sustainable development of the Mediterranean." This practice was carried out close to coastal regions known for their clam deposits when it first spontaneously started in Tunisia in the 1960s.[9]

Intending to further regulate the health and regulatory issues by the European Union in 1998 to manage our marine products toward the European market, this initiative has garnered both central and regional attention and support from the technical interests concerned.

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Despite all these efforts, clam production witnessed a severe decline during the last five years, dropping by 95%; it decreased from 1.825 tons in the 2015–2016 season to just 84 tons in the 2019–2020 season. Table 1 shows the *Venerupis decussata* production levels distribution in the three areas under study.

Table 1 Evolution of clam production in the three main areas in Tunisia

Governorate	2015 /2016	2016 /2017	2017 /2018	2018 /2019	2019 /2020
Sfax	1618.3	748.4	329	179	84
Gabes	8	27.3	0	0	0
Mednine	198.5	32.3	0	0	0
Total	1824.8	808	329	179	84

Clam production in the 2019-2020 seasons reached 84 tons.

- Average production per person: 68 kg.
- The average income per person: is 2380 TND to 5780 TND.

Table 2 compares the products in the various locations of Sfax (Figure 1) during the harvest seasons, highlighting the significance of this activity economically and socially. The number of clam collectors and the average price of clam are listed in the Table 2.

Table 2 Production by location, number of collectors and average clam price: 2019-2021

		2019/2020	2020/2021
Production by Region (tons)	S2	10.23	0
	S4	21.34	0
	S5	12.73	0
	S6	0	0
Number of collectors	S2	92	0
	S4	132	0
	S5	71	0
	S6	0	0
Average price per kg (TND)		35-85	0

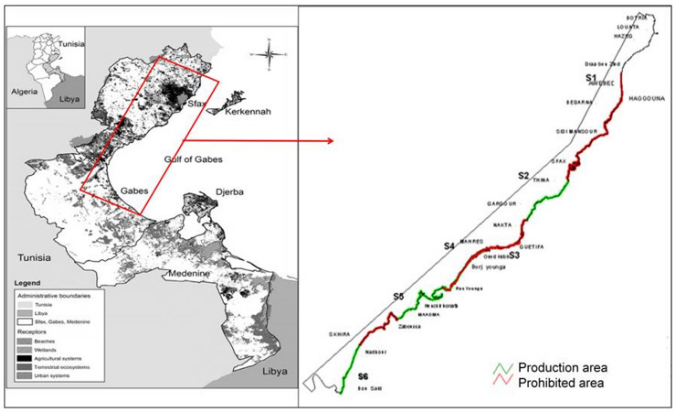

Figure 1 Clam collection areas in the Sfax region.

This project seeks to establish new opportunities in the blue economy by fostering occupations and increasing employability directly or indirectly associated with clamming in the target area, Sfax (Southeastern Tunisia).

However, this activity's development can be challenging due to several issues. Chemical and organic pollution, as well as the overuse of local resources, impact this area. Regrettably, a significant amount of industrial activity is now being created along the coastline, potentially harming this marine ecology. These activities include crude phosphate treatment, chemical industries, tanneries, and plastic factories.[10–13] As a result, a quick national bio-monitoring program is required to evaluate the level of pollution and the condition of the maritime environment. Under comparable situations, other countries have used marine mollusks like mussels and oysters in monitoring programs, such as the Mussel Watch Program.[14,15]

To pursue our goal, we need data that can add value to the project and have an economic impact. Though, there is a dearth of information concerning the number of employees and the stock quality. This effort will fulfill and strengthen the FAO mission and objectives in this field by enhancing the participation of women in the clam fisheries subsector.

Material and methods

Project description

This project will effectively address the three-year prohibition on clam harvesting. Regrettably, Tunisia's native populations of the clam *Venerupis decussata* have been the sole target of shellfish exploitation.[16] By order of the Minister of Agriculture, Water Resources, and Fisheries No. 3500 dated November 16, 2020, the clam harvesting seasons 2020–2021, 2021–2022, and 2022–2023 have been suspended based on the environmental and biological data available and considering the global health crisis. By motivating the targeted population (collectors) and generating new employment opportunities related to fisheries, this program aims to enable adaptation measures for the issue (new fishing techniques, new fishing gear, and equipment used in other fishing activities, etc.). Additionally, it is crucial to establish partnerships with numerous national partners (NGOs, the DGPA, the CRDA Sfax, the INSTM, etc.) to enable in-depth analysis, which will be fueled by data on the ecological and socio-economic conditions that were gathered through participatory methods with the fishing community.

The results of our project will be used to develop adaptive management strategies. The communication strategy will involve essential stakeholders in managing the species *Solen marginatus* and *Venerid Polititapes aureus* and potentially interested parties through promoting civil society involvement and focused training.[17]

The three primary objectives of the Tunisia/FAO technical cooperation project are:

- Training in proper clam-collecting practices;
- Sanitary control of the harvested species by having them undergo the process of cleaning and purification; and
- Handling clams to help women achieve self-sufficiency and enhance working circumstances.

The occasional and unintentional consumption of infected edible bivalves poses a health concern, and natural detoxification is a workable alternative. The natural detoxifying ability of clams has intriguing potential. On the one hand, it can lessen the health hazards connected to consuming substances that were illegally collected. On the other hand, it might result in the judicious use of this species, which might also prevent illegal collection.[18]

Its principal mission remains to improve the livelihood of low-income families and guarantee the food security of vulnerable populations residing along the Mediterranean coast (RAMSAR Convention on Wetlands).[19]

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The project's target groups

The target groups of this project are clam collectors, particularly women, who have been affected by the three-year closure of the clam-fishing season in the region of Sfax (Figure 1). Of the 660 fishing licenses in the most recent season (2018-2019), 605 (91.7%) were granted to women, according to the Sfax Fisheries and Aquaculture Division.

These women also recently began collecting the grooved razor shell, *Solen marginatus*, in the study area. In addition, this project focuses on unemployed young men in the El Mahres and Skhira districts who occasionally work as clam collectors and participate in assistance groups (NGOs and GDPs). These organizations will benefit from the project's actions by improving their ability to support and establish a value chain unique to the substitute species (grooved razor shell and Venerid *Polititapes aureus*). The *Polititapes aureus* (= *Venerupis aurea*) is a venerid found only in the Mediterranean Sea.[20,21] It migrated through the Suez Canal and settled on the Tunisian coastline. However, despite the tremendous economic value of this mollusk, its proliferation in Tunisian waters has not been investigated yet.[16]

The target group will also include civil society as a partner, who will ensure the long-term viability of the project's outcomes. To better address the issue of discontinuing clam harvesting caused by health concerns and stock depletion and to elucidate innovative options, the project will embrace a dialogue-based approach in the form of training and awareness workshops.

The market potential for women working side jobs in the clam-collecting industry

Clam collection is the primary source of income for rural women living around the Gulf of Gabes. To boost the position of women in the clam industry, the FAO worked with the Tunisian government and launched a participatory process. This project intended to increase their revenue and preserve the resource, especially by opening the door for additional development initiatives.[19] Clam hand-picking is a demanding activity. Women clam collectors travel long distances at low tide daily in unfavorable conditions, their backs bowed in the hot sun, and their feet buried knee-deep in the muck or chilly surf.[19] After that, they sell their harvest immediately in the harbor. This place has no structures to shield them from inclement weather during transactions with intermediaries who often do not value their efforts.[19]

Harvest is excellent in the Gulf of Gabes. The most prosperous regions, where a sizable portion of the local population relies on coastal clam collection, are the governorates of Sfax and Gabes. Natural beds of clam and grooved razor shells (bivalve mollusks) are prominent features of this region, with 98% of the nation's clam production. The rising demand for these products abroad makes this activity even more alluring.

However, clam collection in Tunisia is an artisanal activity that occupies only 70 working days a year. Most shellfish harvesters work in remote, unstable, and marginal areas. These categories of fisherwomen are exposed to several risks that make them more vulnerable to poverty or incline them toward it. Also, because they are largely illiterate, women clam collectors lack the guidance and instruction needed to establish alternative sources of income. In addition, periodic closures of production areas because of health issues, overexploitation of the resource supply, a lack of monitoring and training, significant reliance on intermediaries to sell their harvest, or even exclusion from the market aggravates their situation. The FAO states that the struggle for survival comes first in this situation.

Towards a community development plan

To generate attention around this activity and to address some administrative and organizational challenges, the Development and Operation Groups of the Clams (DOG) have been established in the production zones. The FAO was convinced that improving working conditions for women was essential while emphasizing their function as producers upstream of the sector and their significant contribution to increasing the family's income. The majority of women agree that belonging to a community can benefit them in many ways, including i) improving working conditions, ii) supporting local or individual productivity changes, iii) increasing knowledge about the sustainability of their activity through internal information exchanges, and iv) creating common structures for managing the majority of the productive cycle, from collection to cleaning to storage to selling. Initiating campaigns to raise awareness of these fisheries and the products; building a procedure to eventually develop certification for this artisanal fishery; strengthening the fishing community's position as an intermediary and market; and providing access to alternative solutions.

The affected area requires a local institutional organization that can expand the exploitation of these resources, ensure their sustainability, and guarantees an equitable transfer of the advantages among genders (men and women). This organization should support women's flexible, effective, and fair involvement in rural job markets. The development of human potential, economic progress and well-being are all positively impacted by this activity.

We must look for alternate methods to compensate for the local population's lack of activity since the clam-gathering season has been closed for three years. We can teach them other fishing-related trades like mending fishing nets and building crab traps and empower them with additional qualifications like obtaining a driving license, etc., given that these people, especially women, are fully dependent on collecting clams (from collection to marketing).

Project activities

There will be four work packages (WP) in the project:

Management-related tasks will be covered in the first work package. The main goal of this WP is to establish a robust, transparent, and coherent management strategy that will ensure proper task coordination amongst the partners. It will monitor the project's execution and assess its progress concerning the goals regarding the allocated funds, time, and resources.

The second WP will be centred on communication. It will generate open dialogue and a dissemination strategy to help define and attain the project's objectives, goals, and outcomes for the various activities. Also, deploying an effective communication plan will enable us to communicate important messages to various target audiences. In order to share their experiences and expertise with young job seekers, women leaders will form organizations in local areas as part of this communication approach. These female-led organizations will plan several seminars to disseminate knowledge and data on the species, the best ways to catch them, other fishing methods, and how to instruct women in related fields. A roadmap of the various activities must be included in the communication strategy to simplify coordination amongst the partners and achieve a broad impact through the optimal use of stakeholder and partner contacts.

The third WP will focus on a socio-economic analysis, new activity monitoring, and evaluation. We will construct questionnaires for LEK to provide researchers with field data and retrospective estimations

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of fisherwomen's preferences in the study area. This study from stakeholders will include the following:

- The initial result is a database of female clam collectors, stocks, harvesting seasons, average profits, costs, and major markets in the study area, as well as their contacts. This database will be crucial to a future management strategy. It will be easier to locate our targets, understand their requirements, and maximize social and economic benefits.
- The second output is the list of tasks required for the advancement and betterment of the social and economic standing of the fisherwomen. These data will be accessible and used to inform future trends for this community and a policy paper or strategy.
- Evaluation and development make up the third output. The most recent study will demonstrate how and where most activities are distributed among the communities and their immediate effects. This evaluation will thoroughly examine the potential socio-economic effects and anticipated changes to the standard of living in the communities under study. This part aims to establish a working group composed of female shellfish harvesters, scientists and researchers, and members of civil society. The primary goal is to increase the capacities and new skills of the end beneficiaries (primarily women) and spread awareness of the new career opportunities.
- The fourth output is a preliminary evaluation of the project's viability. In preparation for this project, we conducted field interviews with female clam diggers in two regions in S6: Skhira and Ghraiba. According to the studies, most of these women are over 30 years old and have limited schooling (secondary or primary educational level). Some women acquired new skills outside of clamming, such as sewing and mending fishing nets. Other interests are related to learning new skills, such as driving, which allows them to become more independent at work; cattle breeding; agriculture, the primary source of income for women; hatching chicks; sewing; manufacturing cleaning materials, etc. Unfortunately, most of the women polled stated that there has never been equality between men and women. Men only can engage in various activities, such as dealing in shellfish and seafood. Many professions, including contracting and building, are still beyond the reach of women. Notwithstanding their advancement in many disciplines, women still face several challenges, particularly in their freedom of movement, limited to domestic work.

The fourth WP will be devoted to creating a management plan for the clam stocks and the new species gathered in the area to address the issues of clam overexploitation, pollution, and invasive species. These studies will be conducted by research institutions, including the National Institute of Marine Sciences and Technologies (INSTM), fishing districts, and other governmental and non-governmental groups.

The Tunisian policy in the fishing sector pointed towards the diversification of exploitable species and areas, and it has become crucial to promote the shellfish industry. The Laboratory of Living Resources in the National Institute of Marine Sciences and Technologies, in collaboration with many government agencies, carried out a research program for the stocks assessment and exploration of new potential shellfish production sites along Tunisian coasts.[16,22]

Studies on the genetic structure of marine bivalve species are becoming more prevalent, particularly for exploited species. One of the most crucial issues to look at is population structure knowledge. The obtained data are essential for comprehending the species' biology and improving stock management.[23] Adequate morphological characterizations is needed to guarantee the preservation and growth of the clam stock. As a result, the study of morphological variants might be considered in stock discrimination and might serve as a valuable tool to determine the best management practices.[24]

Results

The chosen sites are rural zones with several complicated problems: socio-economic (poor income from artisanal fishing or farming activity, illiteracy), ecological (stock depletion and closure of the clam-fishing season), pollution (chemical and biological), and a lack of measures to improve the conditions of the residents.

A new strategy focusing on communication and collaboration will be adopted to include clam collectors (mainly women) from across the Sfax coastal area (S1 to S6) in the project's numerous operations. The target group's participation in the project will be crucial to its success because they will directly and initially benefit from the new activities (new work prospects). These women are among the most affected groups of the target population and the ones suffering from the closure of the fishing season.

Several initiatives will be taken to improve the standard of living for these women based on emerging trends, such as the invasion of new species of commercial interest in the Gulf of Gabes (the blue crab). These initiatives aspire to promote socio-economic dynamics in communities of women. This approach will be a practical and efficient way to address these socio-economic issues and why not promote sustainable eco-tourism. It will serve as a model for other regions with similar issues by encouraging tourism-related activities like showcasing local cuisine and sharing the region's folklore. The family can make additional money from this effort all year round.

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Credibility and viability: A SWOT analysis

Strengths	Weaknesses
- The waters along the coastlines of Tunisia, Libya, Egypt, and Morocco are home to the indigenous clam, *Venerupis decussata*. This species is a favorite among chefs because of its outstanding quality and flavor. The best clams for "spaghetti allevongole," a traditional Italian dish, come from Northern Africa. - The clam is hand-picked: this collection method guarantees a high-quality result. - The government can assist the resources and industry in this field as well as the women who work in it because it is aware of their background, level of education, and earnings. - Women and those working as intermediaries in the clam industry are typically family members (spouse, brother, father, son, or cousin), and the family will receive a global income. - In these areas of Tunisia, the databank of women who gather clams aids in maintaining political stability and offers social security coverage.	- Women spend long days in the sweltering sun gathering clams. After the harvest, their involvement ceases, and they receive less than one dollar ($1) per kilogram. - There is a lack of data regarding the clam stock assessment. - The clamming season lasts about six months. Many women stay without work for the remaining six months of the year. - Women who collect clams rely on the buying price set by the intermediaries who purchase their harvests. - Councils for the development of clams do not play a part. - The decision to stop the clamming season is met with vocal opposition. - Control in clam harvesting areas is not accessible due to the distance between the administration in charge and clam collection stations.
Opportunities	**Threats**
- The product is in high demand in Italy and southern Europe, just across the Mediterranean Sea. FAO started a project in the Gulf of Gabes (clam-harvesting areas) to boost the effectiveness of the value chain and enhance the income of the women clam collectors. - There is substantial demand for artisanal trades and traditional fishing gear. - There is a way to give women and young people new professions related to the exploitation of invasive species. - INSTM created stock maps to show the locations of bivalves in the southern coastal areas that may have potential commercial worth.	- Tunisia's political and economic unrest (specifically after 2011) can directly or indirectly impact this industry. - The COVID-19's repercussions. - Although having a substantial economic impact, P. *aureus* and other mollusk species have not been the subject of any studies in Tunisia. There is a knowledge gap in stock assessment and a lack of understanding of the state of many species. - The literature analysis reveals a dearth of studies concentrating on the biology and stock size of numerous bivalve species and the socio-economic dimension of this activity.

Cross-cutting issues for sustainability

The various actions planned at the project level help us achieve many of the goals for sustainable development set by the UN and detailed in the report "The Sustainable Development Report 2020." By including women and girls in the value chain and economic cycle, this project helps to realize Sustainable Development Goal 5: "Gender Equality: Achieve gender equality and empower all women and girls." Our initiative also fits goal 14, "Life below water: conserve and sustainably use the oceans, seas and marine resources for sustainable development." Similarly, it satisfies sustainable development's first and second goals regarding hunger and poverty (no poverty, zero hunger). The 8th and 9th SDGs, which are about "Decent work and economic growth" and "Industry, innovation, and infrastructure," are met equally by this project.

Based on these goals, our project will consider the environmental, social, economic, and cultural difficulties and the four pillars of sustainable development. This initiative promotes maritime job opportunities by expanding clam fishing activities in the study region, marked by high pollution levels and overuse of indigenous resources.

Addressing social and economic issues: our proposal will help turn the adverse effects of the clam-collecting season closure into opportunities by giving the weaker residents (primarily women) of the Sfax region new work to do. Women who work in the clam collecting industry, other collectors (some men), and unemployed young people affected by poverty and illiteracy will be the primary beneficiaries of this endeavor.

The economic situation will be improved by increasing the income of the women and everyone else involved in this endeavor. Regarding the environmental pillar, changing occupations will help with the ecosystem restoration of the area and the clam stock's resilience, both of which will be advantageous to the resources. This project will alter the local cultural dynamics by allowing the women to share their hereditary abilities and market them in domestic and foreign markets.

Discussion

The main objective of this project is the implantation of the sustainable development of ecosystems, which today are threatened by the reduction of the clam resource. The economic effects of dealing with new professions and focusing on new species, like *Solen marginatus*, will be felt by those who benefit from this effort. Also, this initiative will have a substantial environmental impact by ensuring the ecosystems' resilience and will encourage blue growth in the area by generating jobs directly or indirectly related to clamming, preserving and conserving native species for future use, and safeguarding biodiversity for coming generations.

Science impacts

Solen marginatus recently appeared on the list of edible bivalves with a prospective for exploitation. Research is being done on the reproductive cycle, geographic range, and relative density of *S. marginatus* along the Tunisian coastlines, in addition to some field prospecting. Relative *S. marginatus* density in the Gulf of Gabes, where an abundance of these species on Tunisian coasts has been

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reported, with more than 30 specimens/m^2, is currently being restored.[16,25] Among the edible bivalves on our coasts that have not yet been fully utilized are razor clams and *S. marginatus*, which have potential economic value. The reproductive cycle and density of *S. marginatus* have been studied in Tunisia, particularly in the Gulf of Gabes.[16,26-28] The stock in the Gulf of Gabes was estimated to be 180 t/year based on INSTM research. If extensive research is done to ascertain the density and distribution of razor clam species by area, it will be much simpler to consider the possibilities for their utilization. In this project, we will employ innovative management techniques centered on using instruments that involve participation in monitoring, managing, and mitigating the effects of discontinuing clamming in some coastal regions.

The lack of clams (*Venerupis decussate*) and the emergence of *S. marginatus* have caused environmental issues that have put new strains on clam harvesting in Tunisia. We will deploy techniques refined via earlier studies in different Mediterranean regions to analyze these pressures.

The eco-biological study will make it easier to gather all the information on the dynamics of *S. marginatus*. Additional research will be carried out to analyze the stock of *S. marginatus* on the coasts and provide details on its distribution, reproduction, growth, diet, and mortality. These data will then be used as input for stock assessment models. The fishing industry and its associated follow-on activities can be sustained using razor clams (*S. marginatus*). Sfax region researched ecosystem's resilience will benefit scientific study, making this work a pilot project whose findings can be used by other coastal communities dealing with comparable issues resulting from pollution and climate change.

Economic impacts

There is considerable commercial interest in razor clam, especially *S. marginatus,* one of the edible bivalves that have not yet been fully utilized on our coastlines (Table 3). Several types of razor clams are valuable commercially everywhere.[29] This can be explained by the absence of razor clams from Tunisia's list of officially exploited bivalve species. The Gulf of Gabes has 200 specimens harvested per day throughout the spring. In this region, some *S. marginatus* specimens are gathered during the customary *V. decussata* harvesting season and sold to fishermen (for less than 5 €/30 specimens for *S. marginatus*).[25]

Table 3 Clam's exports between 2015 and 2020 (CRDA Sfax)

	2015 /2016	2016 /2017	2017 /2018	2018 /2019	2019 /2020
Exported Quantity (tons)	1358.5	808	329	179	66

With the help of our project, vulnerable young people (unemployed) and women clam collectors, who typically reside in rural areas, will be able to increase their incomes. Incorporating innovative management practices would improve the standard of living and enable subsistence in Mahres and Skhira, two areas of the Sfax region.

The outcomes of our initiative will enable the development of new job prospects within the blue economy while preserving and reviving the region of Sfax's original fishing industry. This activity has allowed women, who comprise the bulk of the workforce, to establish themselves in the Tunisian economy. The biological shutdown ordered by local authorities, concerned by the dramatic decline in stocks, violently stopped emancipation for three years. The women concentrated on *Solen marginatus*, locally called the "knife," in response to the barricade. As a result of the project's development and marketing of this resource, razor clam fisheries will be established, providing these people with steady employment and income.

The primary objective of this endeavor is to offer new opportunities and vocations, like collecting new species, to the people engaged in harvesting while keeping in mind the preservation of the maritime ecology. However, before engaging in any exploitation, we also want to ensure the safety of the collected razor clams. For now, no data on sanitary requirements for razor clams are available.

Social impacts

By including female clam diggers, this effort will achieve gender equality by preserving their independence from exploitation and a sense of worth. The likelihood that unemployed young men in the area will find jobs will increase, giving them more options for a living and slowing the rate of illegal immigration to Europe. Additionally, family members and young people in the school can be made aware of environment protection.

Impacts on future careers

A conference will be organized following the project's completion to present the approaches employed and the key findings (limits, pros, cons, etc.). Moreover, testimonials from professionals in the field will be gathered. The project team will suggest related subjects for master's thesis and student projects. As a result, more scientific groups will have access to the project's findings. To balance the environment's needs with the economy and the socio-cultural context, maintaining continuity between the present and the future, we developed our project under sustainability principles. The possibility of switching to new fishing activity may arise from the two-year stoppage of clam harvesting operations. By doing this, we can protect our marine and coastal space stock. For production reasons, additional biological and ecological research should be carried out to monitor shellfish harvest and implement fisheries management strategies closely. *V decussata* significantly affect the nation's trade balance and employment through export to Europe. The management of fisheries is necessary for the preservation of this resource, as is the development of aquaculture, which would, among other things, enable the replenishment of the medium with juveniles raised in hatcheries. This activity entails perfecting field-rearing procedures and developing production methods in the hatchery.[30] Understanding bivalve variety is crucial for this region's booming growth of these organisms. By providing chances for the opening of new aquaculture projects, the presence of this species in this area can be encouraged. Lastly, further morphometric analysis methods and molecular genetic markers can be used to support this species' phenotypic diversity.[31]

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Conflicts of interest

The author declares no conflict of interest.

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