Journal homepage: www.fishtaxa.com

Assessing the impact of commercial fishing on the abundance and diversity of fish species in a marine protected area: A empirical research in the Mediterranean Sea

Darchia Maia[1, *]
[1] *School of science and technology, the University of Georgia Athens, Georgia.*
**Corresponding author: dr.darchia@stu.zf.edu.ge*

Abstract

The essential purpose of this research study is to determine the Assessing the impact of commercial fishing on the abundance and diversity of fish species in a marine protected area: A case study in the Mediterranean Sea. This research study is based on the theory analysis, and some portion is based on the numerical analysis. This research depends upon primary research data for collecting the data from the commercial fishermen and those persons who have knowledge about diverse fish species, all of them consider as research participants. For determining the research study used SPSS software and generated results. The overall result found that there is a positive and significant effect of commercial fishing on the abundance and diversity of fish species in a marine protected area. The variability of spatial structure in fish structure varies from habitat to habitat. For studying the different spatial structures, fish assemblage-based methods are used in MPA studies. The multivariate assemblage method provides an assumption about the spatial structure of marine fishes by finding the correlation between various variable parts.

Keywords: commercial fishing (CF), abundance (A), fish species (Fs), Marine Protected area (MPA), Mediterranean Sea.

Citation: Maia D. 2023. Assessing the impact of commercial fishing on the abundance and diversity of fish species in a marine protected area: A empirical research in the Mediterranean Sea. FishTaxa 27: 1-12.

Introduction

Huge populace development after that deficiency combined with unintentional growth ended in uncontrollable growth, disregarding ecological rules, and then exiting depressing predictions used for upcoming groups (Tran et al., 2020). Main struggles rise owing to an important change of country designed for adapting paddy meadows into brackish water shrimp farms, severe gardening of finfish and shellfish, instinctive organization of shrimp fishponds, reduction of the aquatic slab, inadequate imitation procedure than making phases, discharge of pool waste lacking pre-treatment. Sustainable growth has been deliberated on as well as distinct within several methods (Jayaraman et al., 2018).

The managing of coastal areas' ecosystems is made through the marine protected areas.MPA manages the whole fisheries ecosystem and helps in assessing the performance of the ecosystem concerning environmental conditions. Most of the marine protected areas serve the purpose of conserving the species of fish. The conservation provided by MPAs is limited to the fish taxa present in the limited area.in the Mediterranean Sea, the MPAs have a no-take restriction that helps in saving the fish reserves .reef fish assemblages are saved using the no-take policy in MPAS (Di Lorenzo et al., 2020). Over the years, overexploitation has been seen in the resources of fish. This overexploitation has raised sustainability concerns. The disturbance in the habitat of fishes occurs due to the usage of fifing gears. The use of fishing gear reduces the number of microbenthic species that shelter other species. The best feature of MPA is that they protect the natural habitat of fauna from harmful fishing effects.to protect the fish habitat from fishing gear, various artificial reefs are used around the boundaries of MPA. The marine specie shows variability in spatial structure. These variabilities are due to

Accepted: 16 December 2022; Published: 17 Febuary 2023

biological as well as environmental factors (Díaz-Osorio et al., 2022).

The life of marine specie gets affected due to several environmental problems, including pollution as well as sedimentation. These problems affect the global ecosystem of ocean life. The ecological fish communities get affected due to various environmental suppressor that disturbs the ecosystem associate function of marine (Grane-Feliu et al., 2019). Fishing increases the biomass of marine species, which results in drastic changes in the marine food structure. The physical properties associated with the sea get affected due to the drastic changes in fish food functioning. The solution for overcoming the impacts of change in marine food functionality is the use of spatial management systems in MPAs. The spatial management-based tools maintain the natural habitat of marine species and provide natural resource conservation. The banned on human fishing activities in MPA saves the biomass related to marine species (Hall et al., 2021). The density of the population and increase in targeted fish biomass are the result of MPA. Mediterranean Sea is characterized by having MPA with special buffer zones. The buffer zones allow restricted fishing activities in these areas. Many fully protected marine areas provide more protection to marine life than partially protected marine areas. The protection provided by fully or partially protected marine areas saves the marine habitat to a great extent by saving marine fish from the overfishing activities of humans (Knott et al., 2021).

Protecting the ocean from the harm induced by humans and environmental changes results in the conservation of marine life. If the marine resources are overexploited, then these resources require proper management through the use of proper gear fishing tools (Lenihan et al., 2021). Marine law is implemented in the management system of marine life to protect the biodiversity of marine life. The management system of marine system manages all the resources of marine life with proper care. Implementation of MPAS are regarded as the main tool for managing the resource as well as biodiversity associated with marine life. The density of biomass in MPAS depends on its age. The older and higher level of MPAs possesses higher biomass, whereas the new MPAs made poses lower biomass (Murray & Hee, 2019). The biomass in MPAs increases within two to three years. The perseverance of the biodiversity of the marine ecosystem is a big biological challenge. The best solution to tackle this biological challenge is to establish MPAs. The ultimate purpose of MPAs is to preserve the composition of marine species and to support the functioning of the natural ecosystem .for measuring the composition-based similarity between various fish assemblages; the zeta diversity technique is used in the marine ecosystem (Owusu et al., 2020). These techniques work by evaluating the MPA's effectiveness for preserving the fish's zeta diversity. Fully protected marine areas provide a shallower level of zeta diversity as compared to the partially protected marine areas. The low management system of partially marine areas makes them less stable and more unprotected in comparison to fully protected and stable marine areas.

The leading marine protected area around the globe is Cuba which is established in the Caribbean region. The CUBA marine system ensures the conservation of the ecosystem of marine species. The use of monitoring system in these marine areas improves their efficiency and make them the best working marine system to protect marine life. The monitoring system improves the commercial worth of marine fish and makes them important for commercial use. Understanding the abundance of species is a successful key indicator of the resource management system. The resource management system provides great help to the marine environment because of the social and economic value linked with marine ecosystems .monitoring of large marine ecosystems is complex and requires technologies-based methodologies for the proper working of resource management systems in these big marine areas.in low marine areas, the biomass of fish species is less, and thus; they require a low-maintenance resource management system (Pettersen et al., 2022). Using the robotics technology in MPA provides information about the relative abundance of marine species and their diversity. The factors related to the commercial and economic value associated with the recreational fishing phenomenon are described through the robotics technology system. In most of the marine MPAS infrastructure, the robotic technology system is implemented and provides data about the effects of commercial fishing activities (Sanabria-Fernandez et al., 2019).so, using technology base monitoring systems in marine ecosystems holds great importance for improving the overall functionality of marine ecosystems and their associated MPAs. Many MPAs are established keeping in view their associated benefits and applications. The benefits of MPAs then ensure the better functionality of the marine ecosystem for conserving the marine species' commercial and stability worth.

Research objectives:

The research objective of this paper is to assess the impact of commercial fishing on the abundance as well as the diversity of fish species in marine protected areas.

This research study is divided into five specific research chapters: the first section represents an introduction to Assessing the impact of commercial fishing on the abundance and diversity of fish species in a marine protected area: A case study in the Mediterranean Sea. This portion also describes the research objective and research questions. The second portion represents the literature review of the research; it also explains the hypothesis development. The third portion represents research methodology, research methods, tools, and techniques and also represents the economic and theoretical framework. The fourth section describes some numerical results, and the fifth portion summarizes the overall research study and presents some recommendations about the topic.

Literature review:

Research studies explain that marine protected areas have commercial effects on the coastal codes. coastal codes are protected through MPAs to increase the survival of the population and to increase population density. MPAs exhibit novel effects as it conserves marine ecosystem.MPA impacts harvest regulations by protecting coastal species. For many years MPA has protected the coastal fishes, thereby increasing their abundance and restoration value in northern areas of the world (Moland et al., 2021). studies claim that for conserving marine and its associated species, multi-use marine protected areas are used as a tool around the globe, mostly in developing countries. MUMPCA system works efficiently by enforcing the fishing regulation in these areas by promoting core zone surveillance and promoting the diversity of fishes by conserving their functional activity (Ramírez-Ortiz et al., 2020).

Studies show that the reef resilience effect is caused by the algae removal effect. the behavior of herbivore reefs has a deleterious effect on fishing and can be overcome through the establishment of marine protected areas.in protecting the fisheries from the deleterious effects of herbivore reefs, MPA faced some limitations that can be overcome using proper management systems in MPAs (Altman-Kurosaki et al., 2021). studies explained that the proliferation of MPA's large-scale diversity in pelagic habitats has contributed to achieving the area-based biodiversity goals. The management of pressure associated with the pelagic ecosystem is made through MPAs. studies claim that MPAs greatly affect the fisheries diversity but the effect of static as well as dynamic MPAs on increasing the diversity of pelagic fishing is still unknown (Gilman et al., 2019). Research shows that climatic changes alter the structure of the community and the services of the ecosystem.to protect marine from climatic changes, marine protected areas are made with proper marine management and stability systems (Freedman et al., 2020). studies show that over time the biomass of fisheries increases while their density decreases. This change in biomass is because of the oceanographic processes. also, the reduction in the level of surveillance over the period and its effect on changing the recovery patterns of marine ecosystems is explained through the research studies of scholars (Rojo et al., 2021). studies claim that to assess the effect of an increase in the MPAs extent and its role in the conservation of biodiversity, various assessment methods are used in MPAS design. the assessment methods in the MPAS management system claim that MPAS are affected in pressurized fishing surrounding but perform effectively regardless of their connectivity level. The ecology and diversity conservation features are also associated with the MPAs network for sustaining marine biodiversity (Ferreira et al., 2022).studies show that one of the greatest sources of marine ecosystem conservation and protection is marine protected areas. these areas are sixty-nine percent protected and thus provide increased fish diversity. the MPAs provide primary protection and ecological conservation (Turnbull et al., 2021).researches shows that biodiversity preservation is a big challenge for science conservation. The main purpose of MPA is the maintenance of specie composition to support the ecosystem functioning. The effectiveness of various MPAs is estimated through their fish preservation ability. The temporal stability impacts the marine protected areas, thereby increasing the diversity of fish species. Studies show that the MPA is greatly impacted by Recreational fisheries. the monitoring of the recreational fishing process is less regulated than the MPA system. so MPA provides more regulation and benefits to marine ecosystems as compared to any other marine system (Boni, 2022; Boubekri et al., 2021).

Studies show that the process of overfishing impacts the population of fish. To protect the marine population from this overfishing effect MPAs are used as a tool for the conservation of biodiversity.some MPAs acts are functional as fully protected areas whereas some marine areas provide partial protection.fully protected areas provide the database to assess the ecological marine spillover. the management of MPAs is enhanced through local fishery strategies.Studies show that maintaining marine ecological processes is managed by the conservation management team that works in MPA.the effect of herbivory rates through direct as well as direct pathways on coral reefs is maintained through marine protected areas.through path analytical framework it is demonstrated that MPAs increase the chances of herbivorous fisheres (Topor et al., 2019).reserach scholars explained that MPA acts as a tool for improving the chance of biodiversity conservation as well as for protecting the ecosystem.in time as well as in location the fish assemblages of seagrass vary greatly.at various locations, some species vary in relative abundance.the relative abundance of marine reserves provide information about the population of marine species in MPAs (Kiggins et al., 2020).studies explains the changes in the protection value of long-lived rockfishes reserves in the largest California marine occur due to the marine ecosystem alternation.these alternations in the marine ecosystem of these rockfishes are maintained through effective management of marine protected areas (Keller et al., 2019).studies claim that conserving marine species and ecosystems for saving humans from various risk factors the MPAs are used as a marine managing tool.the MPA management design is made to conserve the biogenic reef environment. The management of MPAS is further improved using the programming-based system (Xu & Zhiwei, 2022).

The programming system manages the whole monitoring system of MPAS, and that makes the management of the MPA system best for protecting marine pollution (Bayley et al., 2019).studies predicted that various management systems are used in MPAS for managing fish assemblages and their habitat.in most of MPAS limiting fishing is allowed for conserving or maintaining the marine population. studies show that there is a tremendous variation between different fish community structures and functions and in their temperature zones. protecting all the zones of shallows reef fish assemblages, proper management is made using a monitoring system (Quaas et al., 2019).studies show that using the best design in MPAS for managing fisheries population and conservation factors the best design includes ecological effectiveness-based design. The ecologically effective design used in MPA maintains the biological biomass fish density. The protection of local piscivorous fishes is provided through the well-enforced MPA management system (Rojo et al., 2019).studies highlighted that conserving the biodiversity of a marine ecosystem depends on environmental changes as well as on fishing pressure (Thompson et al., 2022).Studies claim that MPA provides a novel framework for protecting marine species and for assessing marine performance. This novel framework makes the MPA management system commercially significant and improves its overall success rate (Picone et al., 2020).studies show that using ecosystem approaches provides helps in assessing reef fisheries' ecological structures and managing the protected marine area (YULIANA et al., 2019).studies highlighted the significance of using the underwater visual census as a tool for surveying fish assemblages of shallow water present in the Mediterranean Sea. also, the driver-operated stereo video system is one of the technology-based systems used to facilitate the marine ecosystem monitoring program in the Mediterranean seas (Ali et al., 2017).

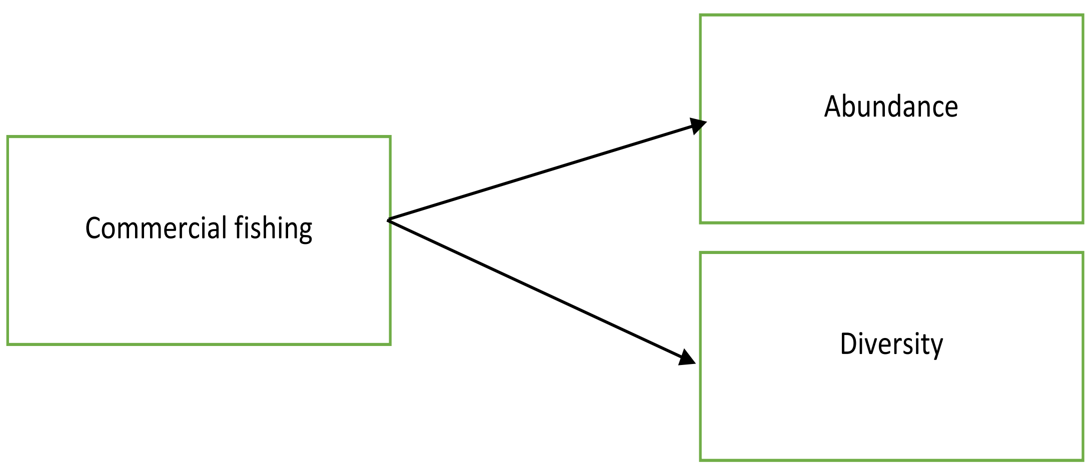
Research methodology:

This research study determines the Assessing the impact of commercial fishing on the abundance and diversity of fish species in a marine protected area: A case study in the Mediterranean Sea. This research study based on theory also depends upon the primary research data analysis for this purpose to develop different questions related to the commercial fishing and abundance also that diversity. The fishermen, commercial fishing, and those persons who have knowledge about ecosystems, marine protected are these are all considered as research participants. This research study also based on a case study related to the Mediterranean Sea. The results describe that dependent and independent variables the commercial fishing is main independent, and the abundance also diversity are considered as dependent variables.

Research tools, techniques, and methods:

This research study depends upon primary data for measuring the research study using SPSS software and generate results related to them. the one-way ANOVA, reliability test analysis, the chi square analysis, also that describe the paired sample statistical analysis, descriptive statistic, also that explain graphical analysis related to them.

Theoretical framework:



Commercial fishing: One of humanity's first occupations is fishing. In coastal regions all throughout the world, including those of China, Japan, Peru, Brazil, Portugal, and Denmark, ancient mounds of abandoned mollusk shells, some dating to prehistoric periods, have been discovered. These mounds, called kitchen middens (from the Danish kkenmdding), show that early people consumed sea mollusks. Both large businesses and small people hold significant fishing enterprises. Fishery managers and experts are concerned about this, and they go on to state that because of these factors, the viability of marine ecosystems may be in jeopardy.

Abundance: Fish abundance refers to the number or density of fish in a certain area. Scientists frequently collect data on both size and count. The following image depicts fish biomass (the total weight of fish per unit area), a measure of abundance. The environment must be enough for fish to live and reproduce. Water flow, water quality, enough food, and the lack of predators and rivals are all required to form optimal fish habitats. Ecology is the study of organisms' interactions with their natural environments. The distribution and amount of life on Earth are influenced by both biotic, or characteristics related to living beings, and abiotic, or nonliving or physical, elements.

Diversity: There is a prevalent idea that having a diversified staff benefits business. Since the 1960s, the creation of workplace diversity models has given birth to a strong business justification for diversity. The first diversity paradigm in the United States was founded on affirmative action and equal opportunity employment goals established by the Civil Rights Act of 1964. The principle of equal employment opportunity was founded on the idea that anybody intellectually or physically competent for a certain profession might strive towards (and perhaps get) the stated job without facing identity-based discrimination. This compliance-based strategy gave rise to the idea that the only reason someone who was different from the dominant group was hired into a firm was for show. Minority unhappiness gradually transformed and/or intensified the desire to obtain optimal job opportunities in all positions. The social justice model followed, which enlarged on the idea that individuals from underrepresented groups should be given opportunities in the workplace not just because it was required by law, but also because it was the right thing for them to do. Tokenism remained at the heart of this strategy, but it now contained the concept of hiring people who were a "good fit."

Numerical analysis:

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
commercial fishing 1	100	1.00	3.00	1.5300	.67353
commercial fishing 2	100	1.00	3.00	1.6600	.71379
commercial fishing 3	100	1.00	3.00	1.7500	.75712
commercial fishing 4	100	1.00	4.00	1.6400	.79798
commercial fishing 5	100	1.00	4.00	1.6700	.79207
abdunance 1	100	1.00	4.00	1.6500	.79614
abdunance 2	100	1.00	4.00	1.8200	.85729
diversity 1	100	1.00	4.00	2.2800	4.11717
diversity 2	100	1.00	5.00	1.9500	1.06719
diversity 3	100	1.00	4.00	1.7700	.86287
Valid N (listwise)	100				

Table-1

The above result describes that descriptive statistical analysis the result represents the minimum values, and the mean values, and also that explains the maximum rates and standard deviation rates related to commercial fishing and diversity for determine the Assessing the impact of commercial fishing on the abundance and diversity of fish species in a marine protected area: A case study in the Mediterranean Sea. The minimum value of overall variables is 1.000 and the maximum values is 5.00 and 4.000 respectively. The result presents that the mean values of commercial fishing are 1.5300, 1.6600, 1.7500, 1.6400 and 1.6700; all values show that positive average value of the mean. The standard deviation of commercial fishing is 0.713, 0.757, 0.797, and 0.792; all values present that 71%, 75%, and 79% deviate from mean values. The result describes that the total observation used for determining the result is 100 respectively. The abundance is considered dependent its mean values are 1.6500, 1.8200 its standard deviation rates are 0.796, 0.857 shows that 79% and 85% deviate from the mean. The diversity is another dependent variable according to the result; its mean values are 2.2800, 1.9500 and 1.7700 its standard deviation values are 4.117, 1.06719, and 0.862 shows that positive deviation from mean values.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
commercial fishing 1	Between Groups	3.619	4	.905	2.081	.089
	Within Groups	41.291	95	.435		
	Total	44.910	99			
commercial fishing 2	Between Groups	2.631	4	.658	1.307	.273
	Within Groups	47.809	95	.503		
	Total	50.440	99			
commercial fishing 3	Between Groups	12.881	4	3.220	6.974	.000
	Within Groups	43.869	95	.462		
	Total	56.750	99			
commercial fishing 4	Between Groups	.887	4	.222	.339	.851
	Within Groups	62.153	95	.654		
	Total	63.040	99			
commercial fishing 5	Between Groups	1.444	4	.361	.565	.688
	Within Groups	60.666	95	.639		
	Total	62.110	99			
abundance 1	Between Groups	4.668	4	1.167	1.909	.115
	Within Groups	58.082	95	.611		
	Total	62.750	99			
abundance 2	Between Groups	8.868	4	2.217	3.296	.014
	Within Groups	63.892	95	.673		
	Total	72.760	99			
diversity 2	Between Groups	2.725	4	.681	.588	.672
	Within Groups	110.025	95	1.158		
	Total	112.750	99			
diversity 3	Between Groups	5.641	4	1.410	1.968	.106
	Within Groups	68.069	95	.717		
	Total	73.710	99			

Table-2

The above result describes that one-way ANOVA test analysis the result measures the Assessing the impact of commercial fishing on the abundance and diversity of fish species in a marine protected area: A case study in the Mediterranean Sea. The result represents the sum of square values, mean squares, F statistic values also that significant values between the group and within the group. Commercial fishing is mainly independent; its sum of square values is 3.619, 41.291, and 44.910; according to the result, its mean square values are 0.905 and 0.435 showing that 90% and 43% average square values. The result also describe that the F statistic value is 2.081 and its significant value is 0.089; its presents that positive and 8% significant analysis. Similarly, the result describes the significantly value of commercial fishing 2, commercial fishing 3, commercial fishing four and commercial fishing 5; its significant values are 0.273, 0.000, 0.851, and 0.688 represent 27%, 100%, 85% and 68% significant levels between them. abundance one and abundance two both present that dependent variable; the result describe that its F statistic values are 1.909 and 3.296 its significant values are 0.115 and 0.014, shows that 11% and 1% are significantly levels related to commercial fishing. The diversity is also considered a dependent indicator; according to the result its sum of square values is 2.725, 110.025, 5.641 the mean square values are 1.158 also that 1.410, its shows the positive average value of mean squares. The F statistic rate is 0.588 and 1.968 hits, shows the positive impact of commercial fishing on the abundance and diversity of fish species in a marine protected area: A case study in the Mediterranean Sea. The significant values are 0.672 and 0.106 showing that 67% and 10% significant level between them.

Communalities

	Initial	Extraction
commercial fishing 1	1.000	.542
commercial fishing 2	1.000	.637
commercial fishing 3	1.000	.800

commercial fishing 4	1.000	.778
commercial fishing 5	1.000	.784
abundance 1	1.000	.800
abundance 2	1.000	.643
diversity 1	1.000	.205
diversity 2	1.000	.849
diversity 3	1.000	.667
Extraction Method: Principal Component Analysis.		

The above result represents that commonalities analysis the result describes the initial values also that extraction values of each variable included independent and dependent variables. The result present that in commercial fishing 1,2,3,4 and 5 the initial values are 1.000 respectively. The extraction value is 0.542, 0.637, 0.800, 0.778 and 0.784, its, showing 54%, 63%, 80%, 77% and 78% rate of extraction. According to the result, the abundance shows 80% and 64% rates of commonalities the diversity presents positive rates of extraction between them.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	**Total**	**% of variance**	**Cumulative %**	**Total**	**% of variance**	**Cumulative %**
1	2.374	23.744	23.744	2.374	23.744	23.744
2	1.792	17.922	41.666	1.792	17.922	41.666
3	1.408	14.084	55.750	1.408	14.084	55.750
4	1.131	11.315	67.065	1.131	11.315	67.065
5	.967	9.669	76.734			
6	.702	7.021	83.755			
7	.565	5.647	89.402			
8	.437	4.373	93.776			
9	.374	3.735	97.511			
10	.249	2.489	100.000			

Extraction Method: Principal Component Analysis.

The above result represents the total variance analysis; the result shows the % of the variance, and % of cumulative also that present the extraction sums of squared values. The total values are 2.374, 1.792, 1.408, 1.131, and 0.967 also present the positive cumulative values related to the initial eigenvalues. The result represents that the total values of extraction sums of squares and their % variance values are 23.744, 17.922, 14.084, also that 11.315, respectively. The result also describes that the total value rates are 2.374, 1.792, 1.408, and 1.131, respectively, present positive and significant. The above result shows a significant impact between commercial fishing and the diversity of fish species.

Component Matrix

	Component			
	1	**2**	**3**	**4**
commercial fishing 1	-.608	.388	.137	.057
commercial fishing 2	.677	.032	.377	-.189
commercial fishing 3	.168	.129	-.641	.586
commercial fishing 4	.684	.505	.165	.170
commercial fishing 5	.839	.281	.009	.028
abundance 1	-.321	.665	-.495	-.098
abundance 2	-.097	.593	.345	.404
diversity 1	-.123	.191	.237	.312
diversity 2	.208	.491	-.418	-.625
diversity 3	-.418	.468	.464	-.241

Extraction Method: Principal Component Analysis.

a. four components extracted.

The above result describes that the component matrix result represents four components related to commercial fishing and diversity. The values of each component are 0.388, 0.032, 0.129, 0.505, 0.281, 0.377, 0.028, 0.404, and 0.312; all values represent that positive rate between them. To determine the research study, principal component analysis methods are used for measuring the results.

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.669	2.222		.301	.764
	commercial fishing 1	.313	.705	.051	.444	.658
	commercial fishing 2	.522	.722	.090	.722	.472
	commercial fishing 3	.087	.598	.016	.146	.884
	commercial fishing 4	.823	.746	.160	1.104	.272
	commercial fishing 5	-1.149	.776	-.221	-1.481	.142
	abdunance 1	.227	.599	.044	.379	.706
	abundance 2	.169	.537	.035	.315	.754

a. Dependent Variable: diversity 1

The above graph represents the linear regression analysis related to the Assessing the impact of commercial fishing on the abundance and diversity of fish species in a marine protected area: A case study in the Mediterranean Sea. The result describes unstandardized coefficient values; standardized coefficient values also explain the t-value and significant values of each indicator. Commercial fishing is the main independent variable; its beta value is 0.313 as an unstandardized coefficient, and its beta value as a standardized coefficient is 0.051; respectively, the t statistic value is 0.444, and its significant value is 0.658 shows that the positive and significant level between commercial fishing and diversity. Similarly, commercial fishing 2, commercial fishing 3, commercial fishing 4 and commercial fishing 5 represent 0.722, 0.146, 1.104, and -1.481 rates of t statistic; its significant values are 0.472, 0.884, 0.272, 0.142 show that significant level between them.

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	71.705	7	10.244	.587	.765[b]
	Residual	1606.455	92	17.461		
	Total	1678.160	99			

a. Dependent Variable: diversity 1
b. Predictors: (Constant), abundance 2, commercial fishing 3, commercial fishing 2, commercial fishing 1, abundance 1, commercial fishing 4, commercial fishing 5

The above result describes that the ANOVA test analysis result presents the sum of square values, the mean square values also, the F rate, and the significance of regression and residual values. The sum of the square rate of regression and residual are 71.705, 1606.455, and the total value is 1678.160, respectively, shows a positive sum of squares. The result shows mean square value is 10.244 and 17.461 the \f rate presents positive its shows value is 0.587 and a significant value is 0.765, respectively, showing positive and significant values between them.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.207[a]	.043	-.030	4.17869

a. Predictors: (Constant), abdunance 2, commercial fishing 3, commercial fishing 2, commercial fishing 1, abundance 1, commercial fishing 4, commercial fishing 5

The above result represents that model summary result represents that R values, R square values, adjusted R squares values, also that standard error of the mean values of model one. The R value is 0.207, its R square value is 0.043, the adjusted R square rate present that -0.030 and its standard error of the estimation value is 4.1786 respectively shows positive error of the estimation of model.

	commercial fishing 1	abundance 1	abundance 2	diversity 1	diversity 2	diversity 3
Chi-Square	33.140[a]	58.800[b]	37.360[b]	61.300[c]	57.300[c]	42.800[b]
df	2	3	3	4	4	3
Asymp. Sig.	.000	.000	.000	.000	.000	.000

The above result describes that chi square analysis the result present chi square values, and significant values of commercial fishing and diversity also abundance. The chi square values are 33.140, 58.800, 37.360, 61.300, 57.300 also that 42.800 respectively all values show positive chi square analysis between them. according to the result overall significant value is 0.000 shows that 100% significant values related to the impact of commercial fishing and its abundance and diversity of fish species in a marine protected.

Conclusion;

This research study determines the effect of commercial fishing related to the abundance and diversity. This research study is based on case study and some studies based on the primary research analysis to determine the research study used SPSS software and generate results related to the independent also dependent variables. This research study accepts the alternative hypothesis and reject the null hypothesis. The overall research concluded that there are positive and significant impact of commercial fishing on the abundance and diversity of fish species. Fishing for economic gain, mostly from uninhabited fisheries, is the practice known as commercial fishing. It supplies a substantial amount of food to several nations, but individuals who involve in it professionally sometimes have to chase out fish in dangerous ocean conditions. Industrial fishing is another name for large-scale commercial fishing. According to the deficit model, businesses without a strong diversity and inclusion culture would have greater expenses as a result of poorer productivity, increased absenteeism, and higher turnover. Effective unionization initiatives are less likely to occur in workplaces with a higher diversity. When these many ways of thought are merged, miracles can occur. How does one acquire knowledge? Someone with that ability and experience must educate us to learn anything innovative. We would only learn something from our lecturers if they had relevant information or expertise.

Reference

Ali, I., Bhagat, R. B., & Mahboob, S. (2017). Emigration, remittances and emerging family structure: findings from a household survey in eight selected villages in Eastern Uttar Pradesh, India. *Remittances Review*, *2*(2), 137-155.

Altman-Kurosaki, N. T., Smith, C. M., & Franklin, E. C. (2021). O ‘ahu’s marine protected areas have limited success in protecting coral reef herbivores. *Coral Reefs*, *40*, 305-322.

Bayley, D. T., Mogg, A. O., Purvis, A., & Koldewey, H. J. (2019). Evaluating the efficacy of small-scale marine protected areas for preserving reef health: A case study applying emerging monitoring technology. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *29*(12), 2026-2044.

Boni, A. A. (2022). A Special Edition Focused on new Clinical and Commercial Opportunities in Digital Health. *Journal of Commercial Biotechnology*, *27*(1). https://doi.org/https://doi.org/10.5912/jcb1021

Boubekri, I., Amara, R., Djebar, A. B., & Mazurek, H. (2021). Baseline data for marine protected areas planning and fisheries monitoring: Potential conflicts between recreational IUU and commercial fisheries in the proposed “Taza” MPA (Algeria, SW Mediterranean). *Ocean & Coastal Management*, *201*, 105425.

Di Lorenzo, M., Guidetti, P., Di Franco, A., Calò, A., & Claudet, J. (2020). Assessing spillover from marine protected areas and its drivers: A meta-analytical approach. *Fish and Fisheries*, *21*(5), 906-915.

Díaz-Osorio, A. C., Schmitter-Soto, J. J., Vega-Zepeda, A., & Espinoza-Tenorio, A. (2022). How effective are marine parks in protecting their coral reef ecosystem? A study case in the Mexican Caribbean. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *32*(7), 1126-1140.

Ferreira, H. M., Magris, R. A., Floeter, S. R., & Ferreira, C. E. (2022). Drivers of ecological effectiveness of marine protected areas: A meta-analytic approach from the Southwestern Atlantic Ocean (Brazil). *Journal of Environmental Management*, *301*, 113889.

Freedman, R., Brown, J., Caldow, C., & Caselle, J. (2020). Marine protected areas do not prevent marine heatwaveinduced fish community structure changes in a temperate transition zone. *Scientific reports*, *10*(1), 21081.

Gilman, E., Kaiser, M. J., & Chaloupka, M. (2019). Do static and dynamic marine protected areas that restrict pelagic fishing achieve ecological objectives? *Ecosphere*, *10*(12), e02968.

Grane-Feliu, X., Bennett, S., Hereu, B., Aspillaga, E., & Santana-Garcon, J. (2019). Comparison of diver operated stereo-video and visual census to assess targeted fish species in Mediterranean marine protected areas. *Journal of Experimental Marine Biology and Ecology*, *520*, 151205.

Hall, A. E., Cameron, D. S., & Kingsford, M. J. (2021). Partially protected areas as a management tool on inshore reefs. *Reviews in Fish Biology and Fisheries*, *31*, 631-651.

Jayaraman, T. K., Lau, L. S., & Ng, C. F. (2018). Role of financial sector development as a contingent factor in the remittances and growth nexus: A panel study of pacific Island countries. *Remittances Review*, *3*(1), 51-74.

Keller, A. A., Harms, J. H., Wallace, J. R., Jones, C., Benante, J. A., & Chappell, A. (2019). Changes in long-lived rockfishes after more than a decade of protection within California's largest marine reserve. *Marine Ecology Progress Series*, *623*, 175-193.

Kiggins, R. S., Knott, N. A., New, T., & Davis, A. R. (2020). Fish assemblages in protected seagrass habitats: Assessing fish abundance and diversity in no-take marine reserves and fished areas. *Aquaculture and Fisheries*, *5*(5), 213-223.

Knott, N., Williams, J., Harasti, D., Malcolm, H., Coleman, M., Kelaher, B., Rees, M., Schultz, A., & Jordan, A. (2021). A coherent, representative, and bioregional marine reserve network shows consistent change in rocky reef fish assemblages. *Ecosphere*, *12*(4), e03447.

Lenihan, H. S., Gallagher, J. P., Peters, J. R., Stier, A. C., Hofmeister, J. K., & Reed, D. C. (2021). Evidence that spillover from Marine Protected Areas benefits the spiny lobster (Panulirus interruptus) fishery in southern California. *Scientific reports*, *11*(1), 2663.

Moland, E., Fernández-Chacón, A., Sørdalen, T. K., Villegas-Ríos, D., Thorbjørnsen, S. H., Halvorsen, K. T., Huserbråten, M., Olsen, E. M., Nillos Kleiven, P. J., & Kleiven, A. R. (2021). Restoration of abundance and dynamics of coastal fish and lobster within northern marine protected areas across two decades. *Frontiers in Marine Science*, *8*, 674756.

Murray, S., & Hee, T. T. (2019). A rising tide: California's ongoing commitment to monitoring, managing and enforcing its marine protected areas. *Ocean & Coastal Management*, *182*, 104920.

Owusu, K. A., Acevedo-Trejos, E., Fall, M. M., & Merico, A. (2020). Effects of cooperation and different characteristics of Marine Protected Areas in a simulated small-scale fishery. *Ecological Complexity*, *44*, 100876.

Pettersen, A. K., Marzinelli, E. M., Steinberg, P. D., & Coleman, M. A. (2022). Impact of marine protected areas on temporal stability of fish species diversity. *Conservation Biology*, *36*(2), e13815.

Picone, F., Buonocore, E., Claudet, J., Chemello, R., Russo, G., & Franzese, P. (2020). Marine protected areas overall success evaluation (MOSE): a novel integrated framework for assessing management performance and social-ecological benefits of MPAs. *Ocean & Coastal Management*, *198*, 105370.

Quaas, Z., Harasti, D., Gaston, T., Platell, M., & Fulton, C. J. (2019). Influence of habitat condition on shallow rocky reef fish community structure around islands and headlands of a temperate marine protected area. *Marine Ecology Progress Series*, *626*, 1-13.

Ramírez-Ortiz, G., Reyes-Bonilla, H., Balart, E. F., Olivier, D., Huato-Soberanis, L., Micheli, F., & Edgar, G. J. (2020). Reduced fish diversity despite increased fish biomass in a Gulf of California Marine Protected Area. *PeerJ*, *8*, e8885.

Rojo, I., Anadón, J. D., & García-Charton, J. A. (2021). Exceptionally high but still growing predatory reef fish biomass after 23 years of protection in a Marine Protected Area. *PloS one*, *16*(2), e0246335.

Rojo, I., Sánchez-Meca, J., & García-Charton, J. A. (2019). Small-sized and well-enforced Marine Protected Areas provide ecological benefits for piscivorous fish populations worldwide. *Marine Environmental Research*, *149*, 100-110.

Sanabria-Fernandez, J. A., Alday, J. G., Lazzari, N., Riera, R., & Becerro, M. A. (2019). Marine protected areas are more effective but less reliable in protecting fish biomass than fish diversity. *Marine pollution bulletin*, *143*, 24-32.

Thompson, P. L., Anderson, S. C., Nephin, J., Haggarty, D. R., Peña, M. A., English, P. A., Gale, K. S., & Rubidge, E. (2022). Disentangling the impacts of environmental change and commercial fishing on demersal fish biodiversity in a northeast Pacific ecosystem. *Marine Ecology Progress Series*, *689*, 137-154.

Topor, Z. M., Rasher, D. B., Duffy, J. E., & Brandl, S. J. (2019). Marine protected areas enhance coral reef functioning by promoting fish biodiversity. *Conservation Letters*, *12*(4), e12638.

Tran, N., Le Cao, Q., Shikuku, K. M., Phan, T. P., & Banks, L. K. (2020). Profitability and perceived resilience benefits of integrated shrimp-tilapia-seaweed aquaculture in North Central Coast, Vietnam. *Marine Policy*, *120*, 104153.

Turnbull, J. W., Johnston, E. L., & Clark, G. F. (2021). Evaluating the social and ecological effectiveness of partially protected marine areas. *Conservation Biology*, *35*(3), 921-932.

Xu, F., & Zhiwei, L. (2022). Design method of intangible cultural creative products based on pharma Industries Ethics Education among Educators. *Journal of Commercial Biotechnology*, *27*(1). https://doi.org/https://doi.org/10.5912/jcb1035

YULIANA, E., BOER, M., FAHRUDIN, A., KAMAL, M. M., & PARDEDE, S. T. (2019). Using ecosystem approach indicators for assessing the ecological status of reef fisheries management in a marine protected area. *Biodiversitas Journal of Biological Diversity*, *20*(7).