LIFE MEDTURTLES

COLLECTIVE ACTIONS FOR IMPROVING THE CONSERVATION

STATUS OF THE EU SEA TURTLE POPULATIONS: BORDERING AREAS

Action D4 (monitoring action C4)

(Action C4: Fishing gear modification for reducing turtle bycatch)

Report on indicators and changes

August 2024
LIFE18 NAT/IT/000103

Collective actions for improving the conservation status of the EU sea turtle population (**LIFE18 NAT/IT/000103**) Project is carried out with the assistance of LIFE financial instruments of the European Union

Action C4:

This Action is considered as a Concrete Conservation Action, because it will directly benefit sea turtle populations by reducing sea turtle by-catch levels. The action aims at the introduction of new methods for reduction of sea turtle bycatch in the fisheries of all 5 project countries. Target fishing gears for this Action are set nets, trawl nets and longliners. All of them represent major threats to sea turtles.

The Action comprises one sub-action for each of 5 countries and each sub-action will be carried out by a specific Beneficiary as follows:

HAS: Albania

2 fishing gears targeted: bottom trawl and set nets. The project will promote the use of LED lights on set nets and a modification of bottom trawlers with TEDs (turtle excluder device).

UNIPI: Italy

2 fishing gears targeted: bottom trawl and set nets. The project will promote a modification of bottom trawlers with TEDs and substitution of the set nets with traps (that do not catch turtles).

FC: Italy

TEDs and traps will be demonstrated. (Substitution of the set nets with traps (that do not catch turtles)).

UVEG: Spain

2 fishing gears targeted: bottom trawl (TED) and set nets (LEDs).

FSS: Tunisia

2 fishing gear targeted: set nets and longlines. The project will promote the use of LED lights on set nets and substitution of standard hooks with circle hooks for longliners.

PSCA: Turkey

3 fishing gears targeted: bottom trawl, longlines and set nets. The project will promote the use of LED lights on set nets and a modification of bottom trawlers with TEDs (turtle excluder device).

This action will include any possible improvement deriving from lessons learned from project LIFE12 NAT/IT/000937 (TARTALIFE) and LIFE EUROTURTLES. The work methodologies would be inspired by the work published within the framework of these projects and mainly for the TED (trawl) and LEDs set net (Virgili et al., 2018; Lucchetti et al., 2016; Lucchetti et al., 2019). For circular hooks, we follow methodology adopted by (Saidi et al., 2020).

Action D4:

This action aims to assess the effect of the Action C4, which introduces modifications of fishing gears for the reduction of sea turtle bycatch in static nets (gillnets and trammel nets), trawlers and longliners. The Action will assess the reduction of turtle bycatch and the level of target catch in the modified fishing gear in comparison to non-modified fishing gear. This will be pivotal for the further adoption of the modified fishing gear by the fishing fleets of the participating countries and elsewhere after the project. Data on turtle bycatch and catch of target species in modified and non-modified fishing gears will be obtained through collaboration with fishers involved in the monitored Action C4 as well as, whenever possible, though collaboration with fishers involved in Actions C3 and C2.

Previous studies on bycatch related to bottom trawl, setnets and longliners with or without mitigation measures should be considered as baseline for the implementation of the action C4. CPUE for target species and BPUE for turtle species are the main indicators used for the monitoring of this action (Table 1)

Introduction

Bycatch has become a critical issue affecting both national and global fisheries management as well as marine ecology (Andrew and Pepperell, 1992; Hall et al., 2000). It refers to the unintentional capture of non-target species during fishing operations, leading to significant ecological and economic consequences. Numerous studies indicate that bycatch is one of the primary causes of injury and mortality for sea turtles and other marine species. This phenomenon is largely attributed to the types of fishing gear used and the prevailing operational conditions. The mortality rates associated with bycatch are often high enough to threaten certain populations and species.

Data shows that a vast amount of marine life is captured as bycatch annually (Gazo, 2020). In particular, endangered or vulnerable species, such as sea turtles, experience high mortality rates, further intensifying the problem. Fishing gear types where bycatch is most common include gillnets, entangling nets, longlines, purse seines, trawls, and traps (Sacchi, 2021; Carpentieri et al., 2021).

In response to this issue, the European LIFE Medturtles project aims to reduce the incidental capture of sea turtles in the Mediterranean by introducing modifications to fishing gear across five countries. For set nets (gillnets and trammel nets), the modification involved the use of light-emitting diodes (LED) and UV-LED lights, making these nets visible to sea turtles and helping them avoid entanglement (Tunisia, Turkey, Albania, Spain). In Italy, the project promoted the substitution of nets with traps, which do not catch turtles. Turtle Excluder Devices (TEDs) were encouraged for trawl nets in Italy, Spain, Albania and Turkey. Finally, the use of circle hooks was promoted for longlines in Tunisia and Turkey.

Trawl Nets

Results (table 1)

The implementation of TEDs (Turtle Excluder Devices) in trawl nets across the different countries has led to significant reductions in sea turtle bycatch. This reduction has been achieved without causing substantial decreases in the catch rates of target species. While a minor reduction in the catch of commercial species was noted in some instances, the impact was generally negligible and considered acceptable in light of the conservation benefits.

In Albania, Italy, Spain, and Turkey, the introduction of TEDs demonstrated a consistent decrease in sea turtle bycatch. However, challenges in implementation were identified, particularly in adapting the TED grid design to fit the specific characteristics of fishing vessels and dealing with obstructions

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like debris or larger fish escaping with turtles. Nonetheless, TEDs were shown to be effective (for the majority of countries testing the devices), with minimal negative impacts on the catch of target species.

Conclusions

TEDs are a highly effective measure for reducing sea turtle bycatch in trawl fisheries, as demonstrated by the significant decrease in turtle captures across the countries. However, challenges such as grid design adjustments and ensuring ease of use for fishers remain. Additional demonstrations and fine-tuning of the device may be required to achieve optimal performance. Despite these challenges, the benefits of reducing sea turtle mortality far outweigh the minor losses in target species catch.

Recommendations

Promote the use of TEDs in trawl fisheries to continue protecting sea turtle populations.

Conduct further research to optimize TED designs for various regional conditions and fishing practices and to reduce losses in commercial catch while maintaining conservation goals.

Engage with fishers to ensure the proper use of TEDs and address any concerns regarding their implementation, to promote compliance and collaboration.

Set Nets (Table 1)

The use of LED and UV-LED lights on gillnets and trammel nets was tested across several countries within the LIFE Medturtles project, with overall promising results in reducing sea turtle bycatch. In Albania, the installation of LEDs on gillnets significantly reduced incidental turtle captures without notably affecting commercial species catch rates. In Tunisia, while an increase in BPUE and CPUE was observed, statistical tests did not show significant differences, indicating that the impact of using LEDs requires further investigation.

In Spain, trials revealed that green LEDs had no significant effect on the CPUE of commercial species, but there was some resistance from fishers to adopt these new technologies due to economic concerns. In Turkey, the use of UV-LED illuminated nets reduced the biomass of commercial species caught while notably increasing the bycatch of vulnerable species such as elasmobranchs and sea turtles. These results suggest that the effectiveness of LEDs varies depending on species and local conditions.

Overall, the trials demonstrate that LED and UV-LED lights can help reduce sea turtle bycatch, but adjustments are necessary to minimize their impact on vulnerable species and maximize acceptance among fishers.

The use of traps, in order to substitute the set nets, have proven effective in capturing commercial species, with a very low discard rate and no incidental catches of protected species. However, improvements are needed, particularly to optimize the practicality and design of the traps, in order to adapt them for broader use in fisheries.

Recommendations:

Promote the use of LEDs in gillnet fisheries where reductions in turtle bycatch have been observed.

Continue trials and research to fine-tune LED technology for specific regional conditions.

Work closely with fishers to address economic concerns and encourage the adoption of these conservation-friendly practices.

Longlines (Table 1)

Trials on longlines yielded interesting but contrasting results between Tunisia and Turkey. In Tunisia, there was a 74% reduction in BPUE and a 36% increase in CPUE for commercial species, although statistical tests revealed no significant differences. Most of the catch consisted of vulnerable elasmobranch species, while a few loggerhead turtles were caught but none were found dead. The use of circle hooks did not lead to a notable reduction in turtle bycatch compared to J-hooks, unlike in industrial tuna fisheries, where larger circle hooks have proven more effective.

In Turkey, circle hooks reduced the biomass of commercial species by 77% compared to J-hooks. However, these hooks also increased the bycatch of vulnerable species, including sharks and rays, which made up 51.8% of the total biomass caught. These results highlight that circle hooks can have varying effects depending on local conditions and target species.

The longline trials emphasize the need for harmonizing experimental practices, such as using the same number and size of hooks, as well as standardizing bait and fishing areas, to better evaluate the impact of gear modifications.

Recommendations:

Harmonize the use of circle and J-hooks in experiments to obtain more comparable results.

Continue trials with standardized bait and harmonized fishing areas to control environmental variables.

Further research is needed in areas and periods where target and vulnerable species interact more frequently to better understand the impact of circle hooks on bycatch.

General conclusion

The studies and efforts to reduce sea turtle bycatch through the LIFE Medturtles project have yielded mixed but promising results across different fishing gear types and countries. The introduction of Turtle Excluder Devices (TEDs) in trawl fisheries proved highly effective in reducing sea turtle bycatch with minimal impact on commercial catches. LED lights and traps, tested in set nets, demonstrated varying degrees of success in reducing bycatch while maintaining acceptable catch rates of target species, though further refinements are needed to optimize these tools.

For longlines, trials with circular hooks in Tunisia and Turkey presented contrasting outcomes. In Tunisia, the use of circular hooks did not significantly reduce sea turtle bycatch compared to J-hooks, and the statistical differences in bycatch and catch rates were not significant. However, the trials highlighted the vulnerability of elasmobranch species, which comprised a significant portion of the bycatch. In Turkey, circular hooks significantly reduced the biomass of commercial species but inadvertently led to higher catches of vulnerable elasmobranch species, raising concerns about the balance between conservation and fishery productivity.

Overall, the project emphasizes the importance of continued experimentation, particularly in standardizing gear types, hook sizes, baits, and fishing zones to better assess the effectiveness of these bycatch mitigation strategies. More extensive trials in different seasons and areas, combined with greater involvement of local fishers, will be critical to ensuring that these modifications can achieve broader adoption and long-term success in protecting sea turtle populations and vulnerable marine species.

Although much remains to be done, the LIFE Medturtles project has had the merit of launching discussions and experiments with fishers on a crucial subject dealing with bycatch mitigating.

Collective actions for improving the conservation status
of the EU sea turtle population (**LIFE18 NAT/IT/000103**)
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Collective actions for improving the conservation status of the EU sea turtle population (**LIFE18 NAT/IT/000103**) Project is carried out with the assistance of LIFE financial instruments of the European Union

Table 1: Action D4 (monitoring action C4), Indicators and changes

Beneficiary		Albania (HAS)	Italia (FC)	Italia (UNIPI)	Spain (UVEG)	Tunisia (FSS)	Turkey (PSCA)
Baseline and protocols							
Previous Studies on bycatch (Yes/No)	Trawl		Yes		Yes		No
	Set Net		Yes		Yes	Yes	No
	Longline					Yes	No
Applied protocols	Trawl	For the demonstration of TED, 3 boats have been cooperated, from the three ports, in the port of Shengjin, in the port of Durres, and in the port of Vlora. In order to provide the most coherent data, data from trawl nets equipped with TED and from trawl nets without TED (control) were	Given the high mortality of sea turtles due to bycatch, it is important to promote tools that can reduce their capture in trawl nets. The protocols and instruments used during the demonstrations are those employed in the	TED model FLEXIGRID (Lucchetti et al. 2016). Two protocols: (a) TED hauls vs control hauls (b) hauls with TED and external sac (direct assessment of potential catch loss). For protocol (a) only data of 1	As the number of estimated loggerhead turtles bycaught per year (~91) is high the implementation of TEDs would help the conservation of this species. However, more tests are necessary as the situation of this fishery is difficult. We used the protocols shown in Luchetti et al. (2016)		Data was collected by a 44mm diamond knotted Polyethylene codend attached to the trawl with a 600 mesh at foot rope level. Aluminum and plastic grids were used with dimensions of 1414x900mm with 95mm

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		obtained and compared afterwards. The grid bars and other critical components were made of stainless steel, as it offers high strength and excellent corrosion resistance and its dimensions are a diameter of 1.3 meters, and grid sides of around 32 centimeters. The grid was mounted on a net tube of 3 m, with a specific tilt angle around 45º to facilitate its assembling on the net. The TED opening was placed on the upper part of the net.	Tartalife Project.	vessels with both CT and TED hauls were used for calculating the CPUEs.			spacing between the 20 mm bar thickness.

	Set Net	Part of this action is illumination of nets (set nets) by light-emitting diodes (LED) to increase the gear visibility in order to increase the capability of turtles to detect and avoid the net. There were 10 boats using LED lights in their nets. There are 500 units of LED diodes used. Sea turtle bycatch per unit effort (BPUE) was determined as: BPUE = number of turtles captured / (net length [km]) × (soak time of net [12 h]) (Wang et al., 2013). Static net bycatch data for the study was grouped by month	Given the high mortality of sea turtles due to bycatch, it is important to promote tools that can reduce their capture in set nets. The protocols used during the demonstrations are those employed in the Tartalife Project.	Traps as substitute of set nets	As the number of estimated loggerhead turtles bycaught per year (~75) is high the implementation of LEDs would help the conservation of this species. More tests are necessary to develop protocols	A broad diffusion of these bycatch reducer devices (BRDs) would provide a significant contribution to the conservation of loggerhead turtles	To examine the LED illumination of deters effect on vulnerable species, 54 pairs of nets were deployed, each consisting of standard (control-CTRL) and illuminated (UV) nets. To ensure comparability, the biomass caught at different net lengths was calculated based on the standardization of net length to 1000 m. This standardization allowed us to

		in order to derive monthly stratified BPUE estimates. The same procedure was used to calculate the CPUE of the target species					have a fair comparison of CPUE.
	Longline					Difficult to promote the adoption of the use of circle hooks as a management measure. Protocol difficult to apply.	3 hooks of different size were used (3, 3.5, and 4 cm in length). Tested C-hooks and control J-hooks. Longlines were set up at depths of 65 m from the shore. In each trial there was a J-hook used as control and C-hook was used for testing. There were a total of 300 hooks in each trial.

Notes/recommendations	Trawl	TED has been an innovation for fishermen, which was introduced for the first time in Albania through the Life Medturtles project. Implementation that resulted in very promising results, significantly reducing the number of sea turtles stuck in trawl nets. Few peso losses and the capture of the targeted species, but they are not significant.	From a preliminary analysis based on collected data and experiences of involved fishermen, TEDs appear to be functional. However, further modifications may be needed for greater optimization. During demonstration days, fluctuations in catches with slight losses that gradually decreased were observed. The only concern arises in the	Both the results (in terms of potential catch loss) and the activities showed that implementing TEDs in the GoM is more complex than originally assumed on the basis of previous projects. The great heterogeneity of vessels and nets makes more difficult the adoption of TEDs. Probably a phase of technical adjustment is needed and fishers should	Preliminary results show that different TED models should be manufactured adapted to each type of fishing vessel. It is difficult to implement in the Valencia region due to potential economic loss, but more tests would help with that issue.		We tested 45 degree and 135 degree angles. For the 45 degrees, losses were quite high for commercial species, but this was low for 135 degrees. The number of vulnerable species excluded in all TED designs varied between 1 and 5 individuals. Grid designs successfully eliminated 41% of the total vulnerable species. The plastic grids offered several advantages,

			presence of obstructions (e.g., nylon, wood, or plastic), which could lead to increased catch losses. Additionally, large-sized fish could also escape along with turtles. Therefore, additional demonstrations and modifications will be necessary to achieve optimal performance of the tool.	play an active role. In this respect, the interest of the collaborating fishers in finding technical solutions is promising.			mainly their flexibility. But the Aluminum grids with 135 degree angles led to higher percentages of excluded marketed species.
	Set Net	The use of LED lights in static nets significantly reduced sea turtle bycatch over the	The results from traps sostutition suggest that while traps can	Results were ambiguous. Fishers suggested that	Preliminary results do not show economic loss for fishers while using LEDs. However,	Preliminary results don't allow to promote the use of	Use of LED and UV lights in gillnets and trammel nets

		three years of the study. The bycatch per unit effort (BPUE) showed a noticeable decrease	be highly effective for certain species, their design and practicality need further optimization to improve their overall utility and acceptance among fishermen.	traps could be a good option but only for certain target species, periods and other circumstances.	more tests would be crucial to study if these devices increase negative interactions between the bottlenose dolphins and this fishery.	LED light as a management measure	differed from previous studies. The presence of these illuminations reduced the abundance and biomass of commercial species while increasing the catch of endangered and vulnerable species. The turbidity and location of testing these light are very important in obtaining meaningful results.
	Longline					Difficult to promote the adoption of the use of circle hooks as a management measure.	Circular hooks in the longline resulted in the

						Circle hooks should not be considered as a management measure	capture of non-target vulnerable species. The availability of C-hooks was not always available compared to the locally used J-hook.
Monitoring of Action C4							
Non modified gears							
Bycatch Per Unit Effort (BPUE) (Turtles)	Trawl	0.152 **(turtle/km*hour)**	**-Vessel 1:** - **-Vessel 2**: 12,26 ± 5,21 kg/h **-Vessel 3:** - **-Vessel 4:** -	0.044 Turtles/hr (in 159.9 hrs)			A total of 3029.1 kg catch was caught in 40 trawl hauls. The percentage of marketed discarded and vulnerable species passing through the bar spacings of the grid designs and excluded by the grid designs were 2.5 and

							1.8 % for vulnerable species, 11.1 and 1.8% for discarded species, and 71.1% and 11.8% for the discarded species.
	Set Net	0.176 **(turtle/km*hour)**	-	No control fishing with set nets, because comparing BPUE based on different fishing effort units is meaningless.		0.39 T/Km* ST (ST=soak time/24)	
	Longline					0.23 T/1000H	
Capture Per Unit Effort (CPUE) (Target species)	Trawl	0.176 **(turtle/km*hour)**	**-Vessel 1:** 13,07± 4.46 kg/h **-Vessel 2:** 7,23 ± 2,63 kg/h **-Vessel 3:** 7,09 ± 1,58 kg/h **-Vessel 4:** 9,37 ± 6,98 kg/h	Median = 12 kg/h (IQR=3.3)	**-Vessel 1:** 56.32 ± 4.59 kg/h **-Vessel 2:** 33.25 ± 1.65 kg/h **-Vessel 3:** 28.47 ± 9.70 kg/h **-Vessel 4:** 18.49 ± 1.82 kg/h		

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	Set Net	0.176 **(turtle/km*hour)**	-	No control fishing with set nets, because comparing CPUE based on different fishing effort units is meaningless.	**-Vessel 1:** 3.24 ± 4.36 kg/km*ST **-Vessel 2:** 2.22 ± 4.17 kg/km*ST **-Vessel 3:** 3.9 ± 8.1 kg/km*ST **-Vessel 4:** 14.29 ± 8.66 kg/km*ST	1.34 I/Km* ST (ST=soak time/24)	CPUE for loggerhead turtles: the abundance was 0.03 individual and 1.099kg for the biomass. Green turtles CPUE: 0.03 for the abundance and 0.151kg for the biomass per day. Gillnet: 12.9 ± 13.5 kg per kilometer per 24 hours Trammel net: 13.0 ± 20.4 kg per kilometer per 24 hours
	Longline					5.89 I/1000H	control J-hooks: 12.4 ± 5.6 kg for

							3.0 cm in length, 18.1 ± 11.9 kg for 3.5 cm in length, 8.7 ± 8.6 kg 4.0 cm in length, and 14.0 ± 9.8 for combined per 1000 hooks per 24 hours
Mortality rate (Turtles)	Trawl	-	50%	0%	-		
	Set Net	-	-	n/a	-	39%	
	Longline					0%	
Notes	Trawl		BPUE was calculated only for Vessel No. 2, as it was the only one that captured sea turtles using the traditional fishing net.		No by-catch events of loggerhead turtles happened during control trials. CPUE results are detached per vessel as each vessel had different target species and worked in different fishing areas.		
	Set Net		CPUE and BPUE were not calculated for		No by-catch events of loggerhead turtles happened during control	Mortality rate is high but one trip with many	20% of green turtles as 2 individuals

Collective actions for improving the conservation status of the EU sea turtle population (**LIFE18 NAT/IT/000103**) Project is carried out with the assistance of LIFE financial instruments of the European Union

			set nets because the aim of the action was to demonstrate the effectiveness of the instrument to fishermen. No scientific data were collected. No bycatches were reported.		trials. CPUE results are detached per vessel as each vessel worked in different fishing areas.	captured alive turtles reduce this rate	were caught, however,they were not dead
	Longline						
Modified or substituted gears (If mitigation trial applied)							
Bycatch Per Unity Effort (BPUE) (Turtles)	Trawl	0.0096		0 T/h (in 222.3 hrs)	-		
	Set Net	0.14		Traps: 0 (traps cannot catch turtles)	-	0.55 T/Km* ST (ST=soak time/24)	
	Longline					0.06 T/1000H	
Capture Per Unit Effort (CPUE) (Target species)	Trawl	228.26	**-Vessel 1:** 11,73 ± 2,65 kg/h **-Vessel 2:** 8,13 ± 3,78 kg/h	Median=13 kg/h (IQR: 5.4)	**-Vessel 1:** 73.51 ± 14.76 kg/h **-Vessel 2:** 19.33 ± 6.04 kg/h		

			-Vessel 3: 5,99 ± 0,98 kg/h **-Vessel 4:** 6,97 ± 1,99 kg/h		**-Vessel 3:** 17.170 ± 2.18 kg/h **-Vessel 4:** 18.97 ± 1.305 kg/h		
	Set Net	21.46	-	No CPUE calculated, because comparing CPUE based on different fishing effort units is meaningless.	**-Vessel 1:** 5.3 ± 6.07 kg/km*ST **-Vessel 2:** 2.02 ± 3.82 kg/km*ST **-Vessel 3:** 5.32 ± 11.27 kg/km*ST **-Vessel 4:** 15.32 ± 11.71 kg/km*ST	2.12 I/Km* ST (ST=soak time/24)	CPUE for green turtles in trammel nets with LED lights: 0.07 individuals and 0.053kg biomass. Gillnet with LED: 4.9 ± 5.6 kg per kilometer per 24 hours Trammel net with LED: 5.1 ± 10.4 kg per kilometer per 24 hours
	Longline					8.00 I/1000H	tested C-hooks:

Collective actions for improving the conservation status of the EU sea turtle population (**LIFE18 NAT/IT/000103**) Project is carried out with the assistance of LIFE financial instruments of the European Union

							3.3 ± 3.8 kg for 3.0 cm in length, 11.4 ± 23.9 kg for 3.5 cm in length, 3.7 ± 5.4 kg 4.0 cm in length, and 6.8 ± 16.1 for combined per 1000 hooks per 24 hours
Mortality rate (Turtles)	Trawl			n/a (no turtles caught)	-		
	Set Net			n/a (no turtles caught in traps)	-	80%	
	Longline					0%	
Notes	Trawl		No Bycatches were observed during the TED demonstrations.		No by-catch events of loggerhead turtles happened during LED trials. CPUE results are detached per vessel as each vessel worked in different fishing areas.		no mortality

Collective actions for improving the conservation status of the EU sea turtle population (**LIFE18 NAT/IT/000103**) Project is carried out with the assistance of LIFE financial instruments of the European Union

					Fishermen also claim the loss of large individuals of non-target but commercial species when TEDs were used.		
	Set Net		CPUE and BPUE were not calculated for set nets because the aim of the action was to demonstrate the effectiveness of the instrument to fishermen. No scientific data were collected. No bycatches were reported.		No by-catch events of loggerhead turtles happened during TED trials. CPUE results are detached per vessel as each vessel worked in different fishing areas.	No significant difference between use or not of LED	no mortality
	Longline					NO significant difference between J hooks and C hooks	no mortality
Impact of Action C4							

% change of BPUE	Trawl	Decrease of 36.8 %	**-Vessel 1:** - **-Vessel 2:** decrease of 100% **-Vessel 3:** - **-Vessel 4:** -	Decrease of 100%	-		
	Set Net	Decrease of 18.2 %	-	Decrease of 100% (no turtles can be caught by traps)	-	Increase of 41%	
	Longline					Decrease of 74%	
% of change CPUE	Trawl	Decrease of 3.3 %	**-Vessel 1:** decrease of 10% **-Vessel 2:** increase of 12% **-Vessel 3:** decrease of 15% **-Vessel 4:** decrease of 25%	TED vs Control: +8.3% increase (not significant) Median proportion of catch in the external sac (potential loss): 17.6%	Decrease of 12 %		
	Set Net	Decrease of 1.8%	-	n/a (No CPUE calculated, because comparing	Increase of 24%	Increase of 58%	Compared to the control net the UV-LED illuminated

Collective actions for improving the conservation status of the EU sea turtle population (**LIFE18 NAT/IT/000103**) Project is carried out with the assistance of LIFE financial instruments of the European Union

				CPUE based on different fishing effort units is meaningless)			gillnet reduced the biomass of commercial species by 62% and 44% for the trammel UV-LED compared to the control net.
	Longline					Increase of 36%	see note below and refer to figure 5 of the report.
Notes	Trawl	As for BPUE, a significant decrease in its values is observed, while for CPUE the difference is almost negligible.	BPUE was calculated only for Vessel No. 2, as it was the only one that captured sea turtles using the traditional fishing net.		-		
	Set Net	Regarding BPUE, an acceptable decrease in its values is observed, we	CPUE and BPUE were not calculated for set nets because the aim		-	Even we note an increase in both BPUE and CPUE, the statistical test show	

		hoped that the difference would be greater, while for CPUE the difference is almost negligible	of the action was to demonstrate the effectiveness of the instrument to fishermen. No scientific data were collected. No bycatches were reported.			no significant differences	
	Longline					Even we note an decrease in BPUE and an increase in CPUE, the statistical test show no significant differences	There is a statistical difference between the C-hook and J-hook CPUE