Socioeconomic Data from **12 Fishing Villas** Across **Puerto Rico**

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Conservación ConCiencia

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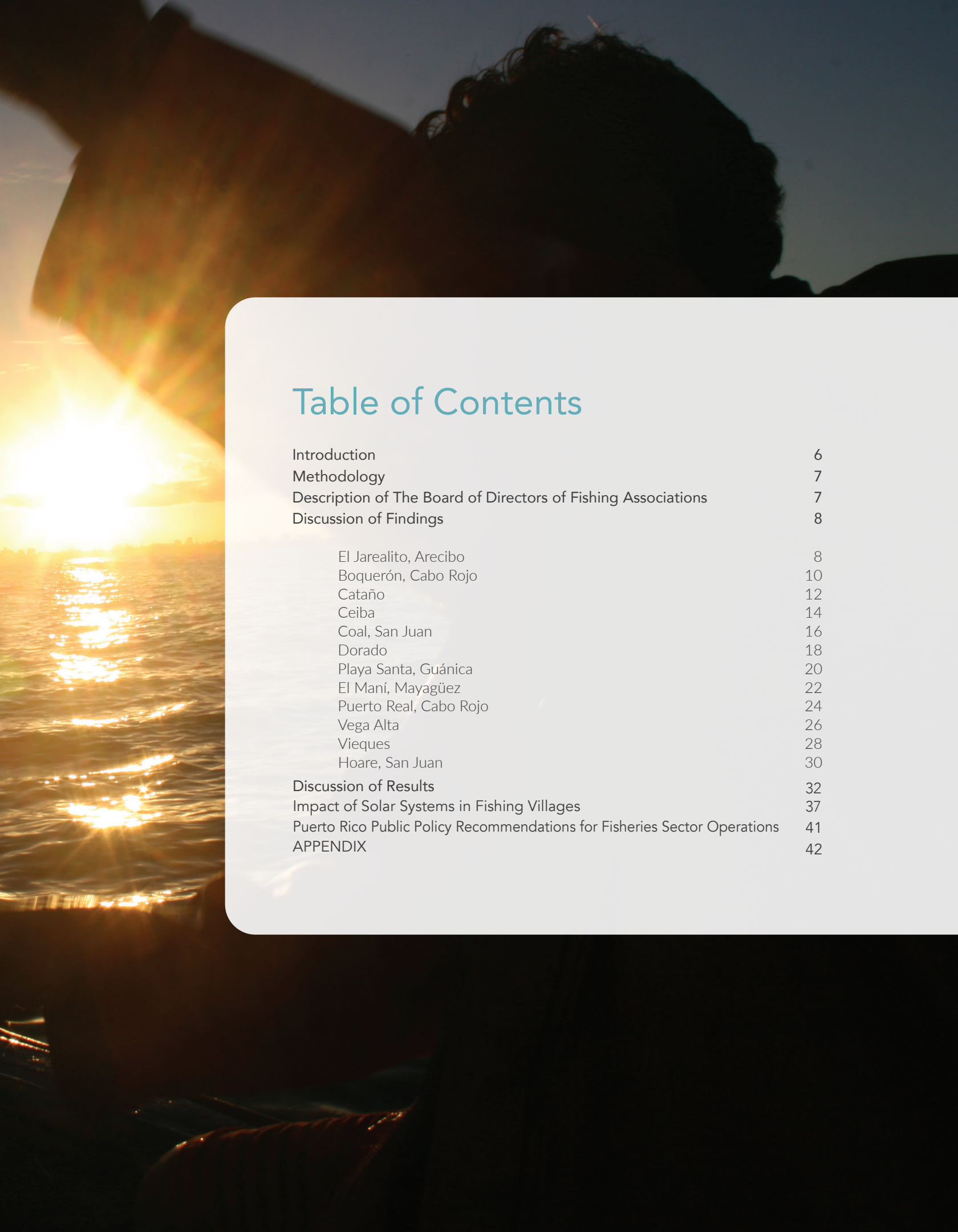

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Introduction

The passage of Hurricane Maria caused millions of dollars in losses to the commercial fishing community of Puerto Rico. In 2018 through funds from the AMANECE grant of the Hispanic Federation (HF), Conservación ConCiencia developed and implemented the concept of supporting commercial fishing villas (associations) with renewable solar power systems to facilitate and promote resilience in the fishing sector's operations. The first effort conducte at the Naguabo Commercial Fishing association provided the proof of concept for the success of this initiative and since then, in partnership with the Hispanic Federation we have continued the effort and installed a total of 21 solar systems. This report covers 12 fishing villas (Table 1, Map 1) across Puerto Rico where we have collaborated installing solar power systems. This installation has provided the necessary energy for the villas to operate, offering the fishing community energy security that enables its operations. Additionally, through this latest collaboration, Conservación ConCiencia has been able to collect data that generated economic and demographic information that has enabled the creation of strategies to promote the economic and energy sustainability of fishing villas.

Table 1. Project Locations

Municipality	Latitude	Longitude
Arecibo, El Jarealito	18.4782N	-66.6931W
Cabo Rojo, Boquerón	18.0240N	-67.1726W
Cataño	18.4418N	-66.1254W
Dorado	18.4761N	-66.2775W
Guánica, Playa Santa	17.9355N	-66.9556W
Mayagüez, El Maní	18.2330N	-67.1730W
San Juan, Hoare	18.4459N	-66.0836W
Vega Alta	18.4807N	-66.3418W
San Juan, Coal	18.4631N	-66.1023W
Cabo Rojo, Puerto Real	18.0762N	-67.1902W
Vieques	18.1534N	-65.4432W
Culebra	18.2704N	-65.6305W

Map 1. Location of the fishing villas that participate in this study.

The project's goal for the fishing villas is to increase their energy resilience and sustainability, generating greater economic stability for their operations. Additionally, this project supports the availability of local food to enhance food security is coastal communities and protect marine and coastal systems by promoting responsible fishing.

Methodology

Through this project, Conservación ConCiencia led the engagement and communications with leadership of the fishing villas to facilitate the development of the project and ensure its proper execution. After an initial identification of the fishing villas, site visits were coordinated for the installation of the solar systems in villas. In addition, Memorandums of Understanding were signed between Conservación ConCiencia, Hispanic Federation and the fishing villas to ensure collaboration and to gather socio-economic data from each villa.

From October 2023 through December 2024, Conservación ConCiencia conducted monthly site visits and communications with the 12 fishing villas throughout Puerto Rico to gather the following socio-economic data:

- Age
- Gender
- Years fishing for individual fishers
- Full-time vs part-time fishing
- Level of education of fishers
- Fishing practice/gear used
- Annual income of fishers
- Monthly revenue of the fishing villa
- Monthly pounds of seafood per villa
- Client's profiles

Description of The Board of Directors of Fishing Associations

In general, fishing villas are incorporated as non-profit corporations which consist of a president, vice president, treasurer, secretary, and members elected by the fishing association, known as vocals (spokespersons). Each association that operates in a fishing Villa, enters a contract with the PR Department of Agriculture for the use of these government owned villas. Recently, the process for renewing these contracts has begun, stipulating a monthly rent of $100, amounting to $1,200 annually. Additionally, it has been accepted that for profit fishing associations may lease the fishing villas for the purpose of selling fish. For example, both Ceiba and Vieques fishing associations leases the facilities to purchase the commercial fisher's catch and sell it to the public.

Picture 1. Arecibo's fishing villa located within the Caño de Tiburones Reserve (red circle).

Discussion of Findings

El Jarealito, Arecibo

Arecibo's fishing villa is located within the Caño de Tiburones Reserve in Barrio Islote in the north coast of Puerto Rico (Picture 1).

Socioeconomic data collected in Arecibo's fishing villa from January 2024 through June 2024 is presented in Table 2. The villa has 11 active members, all male and born in Puerto Rico. The average age of the fishers in this villa is 52 years with ages ranging from 27 to 67 years old. Data from this study shows that Arecibo's villa has an average monthly revenue of $5,767 and that 100% of the fishers have an annual income of less than $15,000. Most of the fishers received a high school education. Three members attended only middle school, and one has been active for 40 years. Among the fishing gears and fishing practices used only attended elementary school. All members reside in the municipality of Arecibo. The most recent member has been active for 2 years, and the longest in this villa are traps, bottom fishing, and hook and line.

Picture 2. Fico's Fish Market

Data gathered showed that Arecibo's fishing villa has an average of 54 clients per fisher of which 50% are restaurants and the other 50% are individuals. The clients mostly come from Arecibo, Hatillo and Barceloneta. Their fishing products include lobster, primera (yellow-tail

snapper, mutton snapper, mackerel), mahi-mahi and deep-water snapper with most of the revenue coming from the sales of deep-water snapper (Table 3).

Picture 3. Dock

Since the installation of the solar panels, the fishing villa of Arecibo has been able to operate without any major problem. Fishers have expressed complete satisfaction with the operation of the system so far.

Table 2. Socioeconomic Data for Arecibo's Fishing Villa

Number of Fishers	11
Average Age	52 (Youngest 27 - Oldest 67)
Gender	100% Male
Full-time Fishers	82%
Level of Education	64% High School 27% Middle School 9% Elementary School
Most Used Fishing Practice	Bottom Fishing
Annual Income of Most Members	< $15,000 (100%)
Pounds of Products Sold	5,535 Pounds
Average Monthly Revenue of Villa	$5,767
Most Sold Product	Deep-water Snapper
Client	50% Restaurants 50% Individuals

Table 3. Products Sold at Arecibo' Fishing Villa

Product	Price/lbs
Lobster	$10.00
Deep-water Snapper	$8.00
Primera (Yellowtail Snapper, Mutton Snapper, Mackerel)	$4.00
Mahi-Mahi	$4.00

Picture 4. Solar System Batteries

Picture 5. Lockers

Picture 6. Products sold at the villa

Boquerón, Cabo Rojo

The fishing villa of Boquerón, Cabo Rojo is located within Boquerón Beach, in the southeast coast of Puerto Rico (Picture 7).

Picture 7. Boquerón's fishing villa in Cabo Rojo (red circle).

Socioeconomic data collected from October 2023 through December 2024 for Boquerón's villa is presented in Table 4. The villa has 16 active members, all men with an average age of 47 years old. All members are from Puerto Rico and live in Cabo Rojo, with the exception of one who did not mention a municipality of residence, and one who lives in Dorado.

The level of education ranges from one member attending only elementary school, 4 attending up to intermediate school, 8 reciving a high school degree, 3 a Bachelor's degree and 2 receiving a Master's degrees. The members of the villa have an average of 9 years actively fishing in Boquerón. Among the fishing gear currently used by fishers are the hook-line, which is the most common, followed by diving, bottom fishing, gillnets, and the least common is pots.

Picture 8. Main Building

Picture 9. Lockers

The average monthly revenue of Boquerón's villa is $19,770 and lobster their most sold product. Other products sold in this villa are deep-water snapper, primera (yellow-tail snapper, mutton snapper, hogfish and lane snapper), queen conch, mahi-mahi and wahoo (Table 5). In general the annual income of fishers in Boqueron's villa is less than $15,000 with the exception of two members who earn between $15,000 and $24,999, and one who earns between $25,000 and $34,999. Each fisher has an average of 10 clients per month. These clients are 88% restaurants and 12% individuals, of which 89% are residents of Cabo Rojo.

Since the installation of the solar panels, the fishing villa of Boquerón has been able to operate without any major problems. Fishers have expressed their complete satisfaction with the operation of the system so far.

Table 4. Socioeconomic Data for Boquerón's Fishing Villa (Cabo Rojo)

Number of Fishers	16
Average Age	47 (Youngest 22 – Oldest 65)
Gender	100% Male
Full-time Fishers	83%
Level of Education	50% High School 25% Middle School 6% Elementary School 6% Bachelor's Degree 13% Master's Degree
Most Used Fishing Practice	Hook and Line
Annual Income of Most Members	< $15,000 (81%)
Pounds of Products Sold	34,702 Pounds
Average Monthly Revenue of Villa	$19,770
Most Sold Product	Lobster
Client	88% Restaurants 12% Individuals

Table 5. Products Sold at Boquerón's Fishing Villa (Cabo Rojo)

Product	Price/lbs
Deep-water Snapper	$10.00
Lobster	$10.00
Primera (Yellowtail Snapper, Mutton Snapper, Hogfish and Lane Snapper)	$5.00
Queen Conch	$10.00
Mahi-mahi	$4.00
Wahoo	$8.00

Picture 10. Restaurant

Picture 11. Solar System Batteries

Picture 12. Dock

Cataño

The fishing villa of Cataño is located in the north coast of Puerto Rico, at approximately 6 miles from San Juan (Picture 13).

Picture 13. Cataño's Fishing Villa (red circle).

Socioeconomic data collected for Cataño's villa from October 2023 through December 2024 is presented in Table 6. This villa has 17 active members of which one is a woman.

They have an average age of 52 years old, the youngest is 35 and the oldest 73. The annual income of most members is less than $15,000 except four members; three with incomes between $15,000 and $24,999 and one with incomes between $25,000 and $34,999.

All members are from Puerto Rico and reside in the towns of Vega Alta, Bayamón, Toa Baja, San Juan and Cataño. The level of education of the members varies as follow: one did not answer, one studied up to middle school, six received high school diplomas, one attended vocational school, five have associate degrees and three attended University. Seventy percent of the members have been part of the villa for more than 10 years, including 1 that has been an active member for 42 years. The predominant fishing gear is bottom fishing using an electric reel, but hook and line, traps and diving fishing are also practiced.

Picture 14. Entrance

Cataño's villa has an average monthly revenue of $24,066. The products sold in Cataño include deep-water snappers, lobster, primera (dog, mangrove and cubera snapper, mutton snapper, hogfish and lane snapper), segunda (jacks, mojarra, snook and whitemouth croaker), mahi-mahi, shark, squid, mackerel and wahoo (Table 7). Most of their monthly revenue comes from deep-water snapper. Each fisher has an average of 11 clients per month, which are 40% individuals, 30% restaurants and 30% wholesalers. Most customers come from Cataño and San Juan, with some clients from Cabo Rojo, Bayamón, Vega Alta, Arecibo, Dorado, Carolina, Vega Alta and Salinas.

Since the installation of the solar panels, the fishing villa of Cataño has been able to operate without any major problems. Fishers have expressed their complete satisfaction with the operation of the system so far.

Table 6. Socioeconomic Data for Cataño's Fishing Villa

Number of Fishers	17
Average Age	52 (Youngest 35 – Oldest 73)
Gender	94% Male, 6% Female
Full-time Fishers	76%
Level of Education	38% High School 6% Middle School 19% Bachelor's Degree 31% Associate's Degree 6% Vocational Studies
Most Used Fishing Practice	Bottom Fishing
Annual Income of Most Members	< $15,000 (71%)
Pounds of Products Sold	44,685 Pounds
Average Monthly Revenue of Villa	$24,066
Most Sold Product	Deep-water Snapper
Client	40% Individuals 30% Restaurants 30% Wholesales

Picture 15. Storage Area

Picture 16. President of the villa

Table 7. Products Sold at Cataño's Fishing Villa

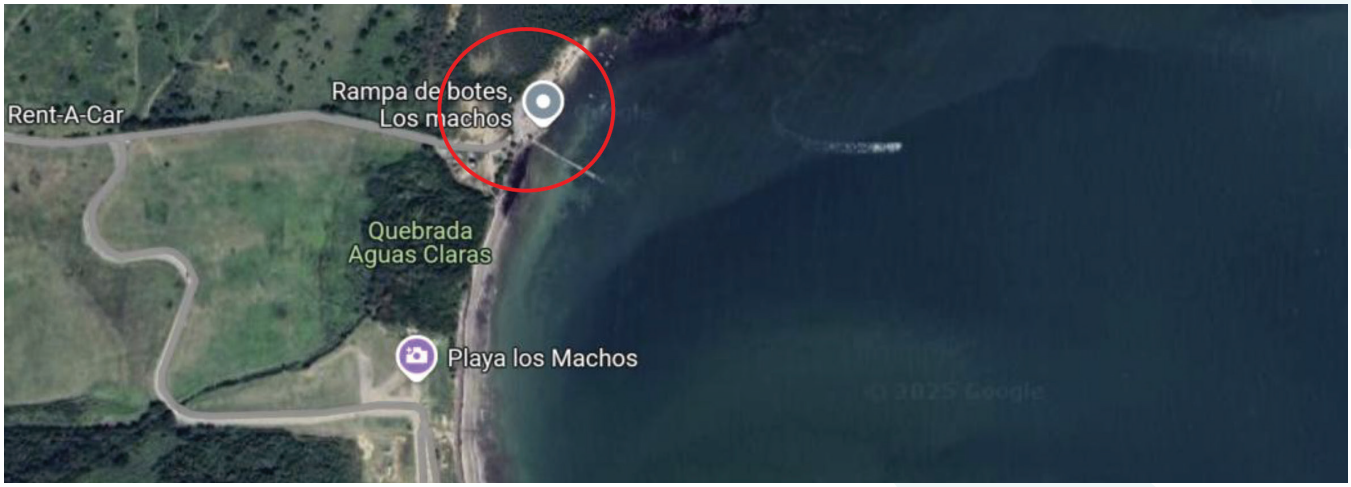
Product	Price/lbs
Deep-water Snapper	$10.00
Lobster	$10.00
Primera (Dog, Mangrove and Cubera Snapper, Mutton Snapper, Hogfish and Lane Snapper)	$6.00
Segunda (Jacks, Mojarra, Snook and Whitemouth Croaker)	$3.00
Mahi-mahi	$8.00
Shark	$4.00
Diamondback Squid	$14.00
Wahoo	$8.00
Mackerel	v$4.00

Picture 17. Lockers

Picture 18. Dock

Ceiba

Los Machos fishing villa in Ceiba is located on the east coast of Puerto Rico (Picture 19).



Picture 19. Los Machos fishing villa in Ceiba (red circle).

Socioeconomic data collected for Ceiba's villa from April 2024 through December 2024 is presented in Table 8. Ceiba's villa has an average monthly revenue of $11,914. Products sold in this villa include queen conch, lobster, primera (mackerel, yellowtail snapper, mutton snapper, hogfish, lane snapper) and segunda (porgy, grunt, parrotfish and triggerfish). Most of their monthly revenue comes from queen conch which is sold 100% to wholesalers.

Since the installation of the solar panels, Ceiba's fishing villa has been able to operate without any major problems. Fishers have expressed their complete satisfaction with the operation of the system so far.

Picture 20. Fish Market

Table 8. Data for Ceiba's Fishing Villa

Pounds of products sold by the villa	12,206 pounds
Average monthly revenue of villa	$11,914
Most sold product	Queen Conch
Type of costumer	100% wholesalers

Table 9. Products Sold at Ceiba's Fishing Villa

Product	Price/lbs
Queen Conch	$14.00
Lobster	$14.00
Primera (Mackerel, Yellowtail Snapper, Mutton Snapper, Hogfish and Lane Snapper)	$7.00
Segunda (Porgy, Grunt, Parrotfish and Triggerfish)	$6.00

Picture 21. Lockers

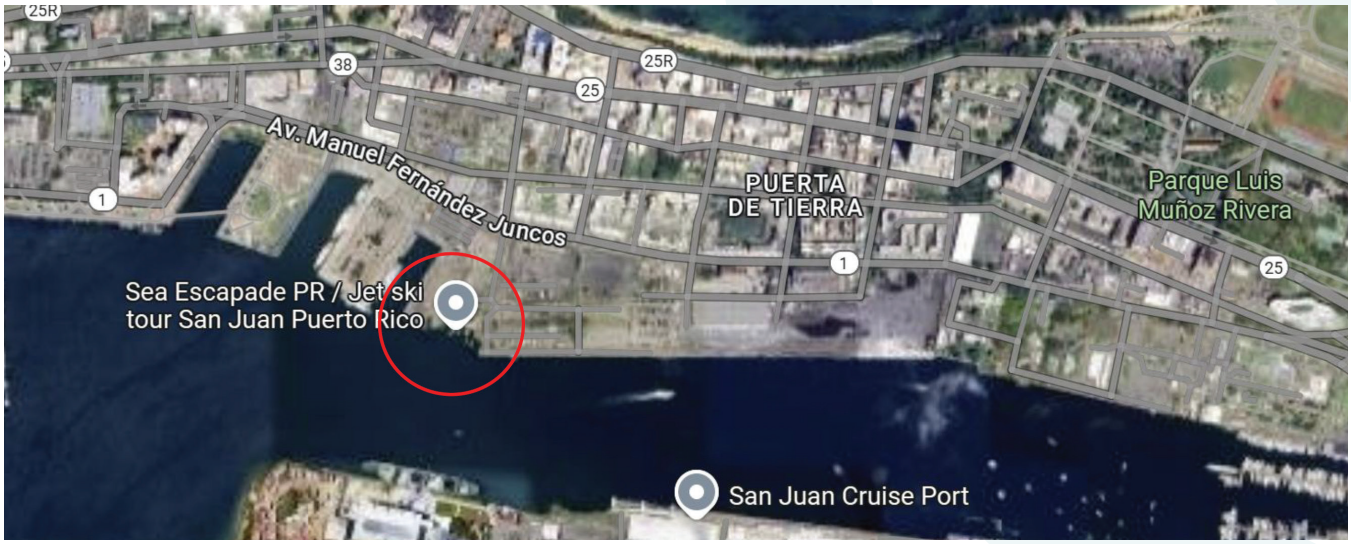
Picture 22. Dock

Picture 23. Product (Queen Conch)

Picture 24. Dock

Coal, San Juan

The fishing villa of Coal is located in Puerta de Tierra, Old San Juan, in the north coast of Puerto Rico (Picture 25).



Picture 25. Fishing villa of Coal, in Old San Juan (red circle).

Socioeconomic data collected from Coal's fishing villa from December 2023 through December 2024 show that the fishing villa has 20 active members, all men. These members have an average age of 61 years with a range that goes from 34 to 77 years. Fourteen of the members were born in Puerto Rico, while 6 of them are from the Dominican Republic. All fishers reside in San Juan except for 2 who live in Carolina. Most of the fishers attended high school except 3, that only attended middle school. Members have been active for an average of 14 years.

Picture 26. Entrance

Coal's villa has an average monthly revenue of $12,239. Products sold in this villa include deep-water snapper, lobster, shark, primera (dog, mangrove and cubera snapper, mutton snapper, hogfish,grouper), segunda (mojarra, blue runner, whitemouth croaker and jacks), mahi-mahi, mackerel, and squid. Most of this revenue comes from lobster (Table 11).

The annual income of the fishers in this villa is less than $15,000 except for one who earns between $50,000 to $74,000. Fishers have an average of 26 consumers, 72% individuals, 22% restaurants and 6% wholesalers. The fishing gear mostly use is hook and line trawling and diving with a smaller amount of gillnet and electric reel.

Since the installation of the solar panels, the fishing villa of Coal has been able to operate without any major problems. Fishers have expressed their complete satisfaction with the operation of the system so far.

Table 10. Socioeconomic Data for Coal's Fishing Villa (San Juan)

Number of Fishers	20
Average Age	61 (Youngest 34 – Oldest 78)
Gender	100% Male
Full-time Fishers	30%
Level of Education	84% High School
	16% Middle School
Most Used Fishing Practice	Trawling and Diving
Annual Income of Most Members	< $15,000 (95%)
Pounds of Products Sold	22,500 Pounds
Average Monthly Revenue of Villa	$12,239
Most Sold Product	Lobster
Client	72% Individuals 22% Restaurants 6% Wholesalers

Table 11. Products Sold at Coal's Fishing Villa (San Juan)

Product	Price/lbs
Deep-water Snapper	$10.00
Lobster	$15.00
Primera (Dog, Mangrove, Cubera Snapper, Mutton Snapper, Hogfish and Grouper)	$7.00
Segunda (Mojarra, Blue Runner, Whitemouth Croaker and Jacks)	$5.00
Mahi-mahi	$5.00
Mackerel	$5.00
Squid	$10.00

Picture 27. Storage

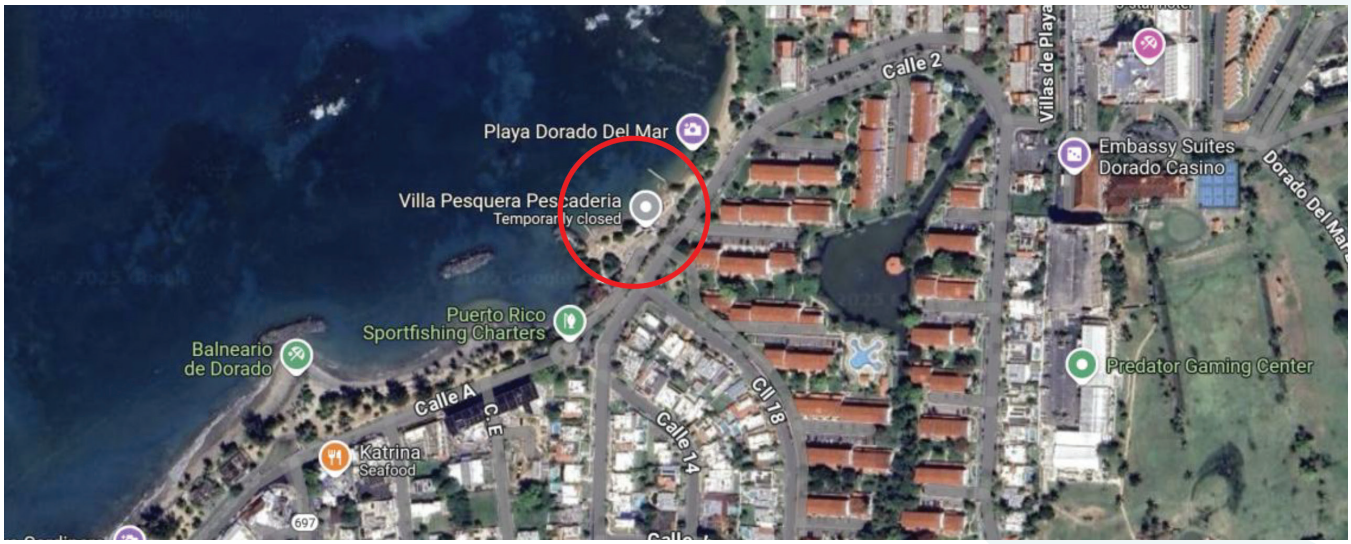
Picture 28. Boat Parking

Picture 29. Boat Area

Picture 30. Dock

Dorado

The fishing villa of Dorado is located in the north coast of Puerto Rico, at approximately 37 miles from San Juan (Picture 31).



Picture 31. Fishing villa of Dorado (red circle).

Socioeconomic data for Dorado collected from December 2023 through December 2024 is presented in Table 12. This villa has 25 active members, all men with an average age of 54 years old. The youngest member is 32 and the oldest is 80 years old. The members' level of education ranges from elementary school, high school, and associate's degree. Most of the members reside in the municipality of Dorado, except for 4 who reside in Vega Alta. They are mostly from Puerto Rico except one, who is from Cuba. These fishers have been active members of the villa for an average of 15 years and practice diving, gillnet, hook and line, longline and the most common, bottom fishing using an electric reel.

Dorado's fishing villa has an average monthly revenue of $15,017. Products sold include lobster, primera (dog, mangrove and cubera snapper, mutton snapper, hogfish and lane snapper), segunda (jacks, mojarra, snook and whitemouth croaker), queen conch and deep-water snapper (Table 13). The most sold product is the deep-water snapper. The annual income of the fishers in the villa varies from less than $15,000 to up to $25,000-34,999. Each fisher has an average of 16 consumers of which 60% are restaurants and 40% are individuals. The clients come regularly from Dorado but also from Toa Baja, Vega Alta, Vega Baja, Bayamón, San Juan and Cataño.

Picture 32. Entrance

Picture 33. Product

Since the installation of the solar panels, the fishing villa of Dorado has been able to operate without any major problems. Fishers have expressed their complete satisfaction with the operation of the system so far.

Picture 34. Lockers

Table 12. Socioeconomic Data for Dorado's Fishing Villa

Number of Fishers	25
Average Age	54 (Youngest 32 – Oldest 80)
Gender	100% Male
Full-time Fishers	84%
Level of Education	8% Associate's Degree 84% High School 8% Middle School
Most Used Fishing Practice	Bottom Fishing
Annual Income of Most Members	< $15,000 (44%)
Pounds of Products Sold	23,386 Pounds
Average Monthly Revenue of Villa	$15,017
Most Sold Product	Deep-water Snapper
Client	60% Restaurants
	40% Individuals

Table 13. Products Sold at Dorado's Fishing Villa

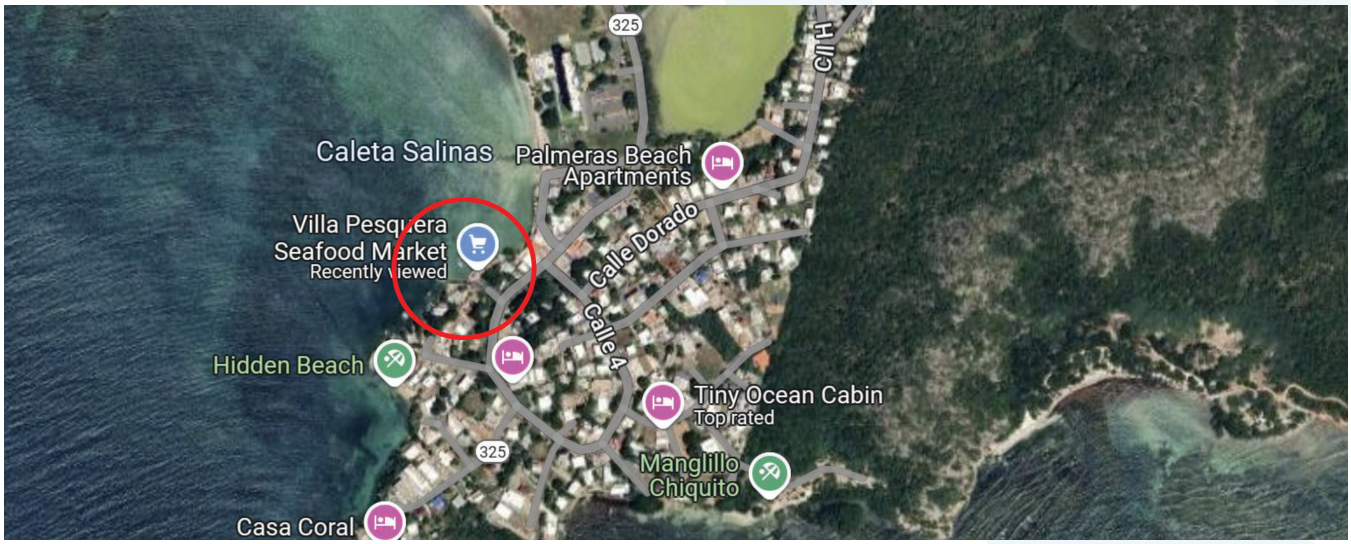
Product	Price/lbs
Deep-water Snapper	$10.00
Lobster	$10.00
Primera (Dog, Mangrove, Cubera Snapper, Mutton Snapper, Hogfish and Lane Snapper)	$6.00
Segunda (Jacks, Mojarra, Snook and Whitemouth Croaker)	$5.00
Queen Conch	$10.00

Picture 35. Solar System Batteries

Picture 36. Dock

Playa Santa, Guánica

The fishing villa of Guánica is located south of the Playa Santa resort on the south coast of Puerto Rico (Picture 37).



Picture 37. Fishing villa of Guánica (red circle).

Socioeconomic data collected for Guánica's villa from December 2023 through December 2024 is presented in Table 14. The fishing villa has 10 active members, all of them male with an average age of 48 years, the youngest is 25, and the oldest is 78 years old. The level of education of all 10 members is high school and are they are all from Puerto Rico. Most fishers have been active members of the villa for 9 to 45 years.

Picture 38. Entrance

Products sold in the villa include deep-water snappers, lobster, queen conch, primera (yellowtail snapper), segunda (parrotfish), mahi-mahi, octopus and mackerel (Table 15).

The most sold product is queen conch. The fishing villa has an average monthly revenue of $17,851.

Picture 39. Freezers

The annual income of the members of Guánica's fishing villa varies from less than $15,000 to in between $25,000 to $34,999 with an average 50 consumers per month per fisher. These clients are 60% individuals and 40% restaurants from Guayanilla, Cabo Rojo and Yauco. Finally, the fishing gear used are hook and line, bottom fishing with electric reels, the last two being the most common.

Picture 40. Solar Panels

Since the installation of the solar panels, Guanica's villa has been able to operate without any major problems. Fishers have expressed their complete satisfaction with the operation of the system so far.

Table 14. Socioeconomic Data for Guánica's Fishing Villa

Number of Fishers	10
Average Age	48 Years Old (Youngest 24 –
Oldest 78)	
Gender	100% Male
Full-time Fishers	100%
Level of Education	100% High School
Most Used Fishing Practice	Bottom Fishing
Annual Income of Most Members	$15,000-24,999 (50%)
Pounds of Products Sold	27,654 Pounds
Average Monthly Revenue of Villa	$17,851
Most Sold Product	Queen Conch
Client	60% Individuals
	40% Restaurants

Table 15. Products Sold at Guánica's Fishing Villa

Product	Price/lbs
Deep-water Snapper	$11.00
Lobster	$10.00
Queen Conch	$11.00
Primera (Yellowtail Snapper)	$6.00
Segunda (Parrotfish)	$5.00
Mahi-mahi	$6.00
Octopus	$9.00
Mackerel	$5.00

Picture 41. Lockers

Picture 42 & 43 Product

El Maní, Mayagüez

The fishing villa in Mayagüez is located on Highway 64 in El Maní neighborhood on the west coast of Puerto Rico (Picture 44).

Picture 44. Fishing villa in El Maní, Mayagüez (red circle).

Socioeconomic data for the Mayagüez fishing villa collected from January 2024 through December 2024 is presented in Table 16. This fishing villa has 9 active members, 7 men and 2 women. The average age of members is 50 years, with a range that goes from 29 to 74 years old. The members' level of education is divided into 5 who attended high school and 4 who attended middle school.

All fishers in this villa are from Puerto Rico, and the majority reside in Mayagüez, except for three, two of who lives in Cabo Rojo and one in Añasco. Members in this villa have been active on an average of 10 years.

The El Maní fishing villa of Mayagüez has an average monthly revenue of $41,322.

The annual income for all members is less than $15,000. Products sold in this villa include deep-water snappers, lobsters, queen conch, primera (lane snapper, mutton snapper and yellowtail snapper), and mackerel (Table 17). Most fishers here practice bottom fishing, except for one who scuba dives and another who uses hook and line. Fishers in the Maní villa have an average of 34 clients per month, mostly from Mayagüez, Cabo Rojo, and Añasco. These clients are 50% individuals, and 50% restaurants.

Picture 45. Entrance

Picture 46. Lockers

Picture 47. Boat Area

Table 16. Socioeconomic Data for Mayagüez's Fishing Villa

Number of Fishers	9
Average Age	50 (Youngest 29 – Oldest 74)
Gender	78% Male, 22% Female
Full-time Fishers	56%
Level of Education	56% High School 44% Middle School
Most Used Fishing Practice	Bottom Fishing
Annual Income of Most Members	< $15,000 (100%)
Pounds of Products Sold	53,850 Pounds
Average Monthly Revenue of Villa	$41,422
Most Sold Product	Deep-water Snapper
Client	50% Individuals
	50% Restaurants

Table 17. Products Sold at Mayagüez's Fishing Villa

Product	Price/lbs
Deep-water snapper	$12.50
Lobster	$12.00
Queen Conch	$13.50
Primera (Lane Snapper, Mutton Snapper and Yellowtail Snapper)	$6.00
Mackerel	$6.00

Picture 48 & 49 Product

Puerto Real, Cabo Rojo

The fishing villa of Puerto Real is located in Cabo Rojo on the west coast of Puerto Rico (Picture 50).

Picture 50. Fishing villa at Puerto Real, Cabo Rojo (red circle).

Socioeconomic data gathered for Puerto Real's fishing villa from February 2024 through December 2024 is presented in Table 18. There are 23 active members in Puerto Real, mostly men, except for one woman. The average age is 53, with the youngest member being 21 and the oldest 69. All are from Puerto Rico, residents of Cabo Rojo and Mayagüez. The level of education of fishers in Puerto Real's villa varies from elementary school, middle school, high school, university, and associate's degree. Fishers have an average of 10 years as active members of the villa, with a range of 1 to 40 years.

The average monthly revenue of the villa during the study period was of $49,028. The annual income of all members is less than $15,000, except for one who earns between $15,000-$24,999. Products sold include deep-water snapper, lobster, queen conch, hogfish, trunk fish, and primera (mackerel, yellowtail snapper, mutton snapper and lane snapper) (Table 19). The most used fishing practice is bottom fishing, although electric reel and traps are also used. Clients for these products are 64% restaurants, 31% individuals and 5% wholesalers.

Picture 51. Entrance

Picture 52. Storage

Since the installation of the solar panels, Puerto Real's villa has been able to operate without any major problems. Fishers have expressed their complete satisfaction with the operation of the system so far.

Picture 53. Lockers

Table 18. Socioeconomic Data for Puerto Real's Fishing Villa (Cabo Rojo)

Number of Fishers	10
Average Age	53 (Youngest 21 – Oldest 69)
Gender	Male 94%, Female 6%
Full-time Fishers	96%
Level of Education	78% High School
	4% Middle School
	4% Elementary School
	9% Bachelor's Degree
	4% Associate's Degree
Most Used Fishing Practice	Bottom Fishing
Annual Income of Most Members	< $15,000 (95%)
Pounds of Products Sold	58,265 Pounds
Average Monthly Revenue of Villa	$49,028
Most Sold Product	Queen Conch
Client	64% Restaurants 31% Individuals 5% Wholesalers

Table 19. Products Dold at Puerto Real's Fishing Villa (Cabo Rojo)

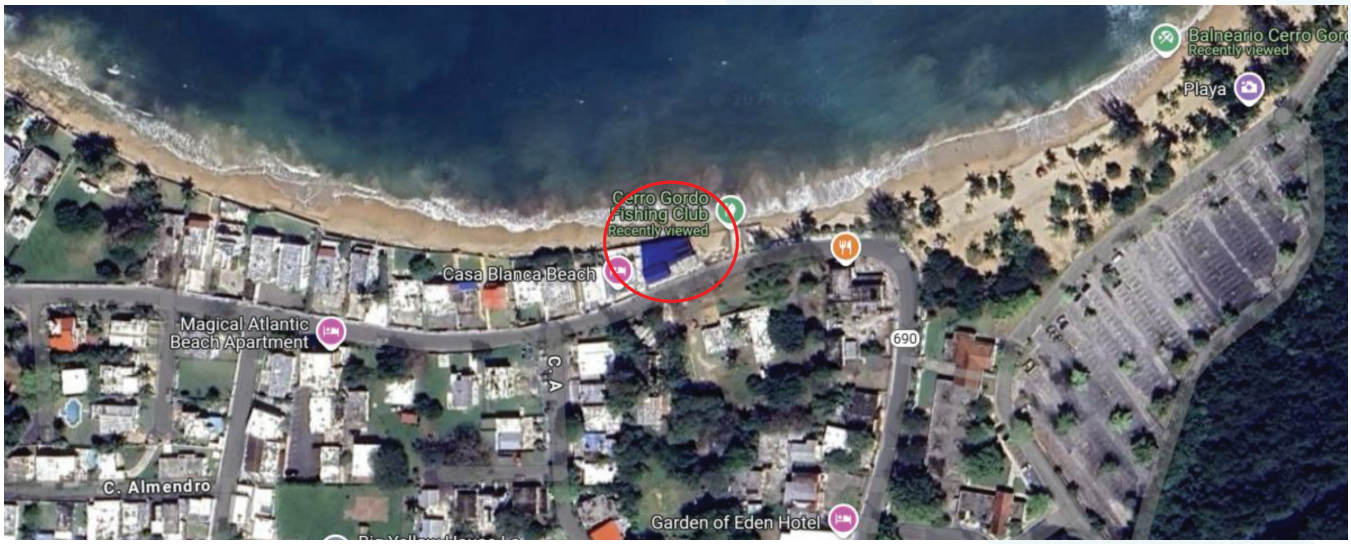
Product	Price/lbs
Deep-water Snapper	$11.50
Lobster	$10.50
Queen Conch	$11.50
Hogfish	$8.00
Trunk Fish	$5.00
Primera (Mackerel, Yellowtail Snapper, Mutton Snapper and Lane Snapper)	$5.50

Picture 54. Fishing Market

Picture 55. Ramp Area

Vega Alta

The fishing villa of Vega Alta is located on the main road of Cerro Gordo, within the Cerro Gordo Resort in the north coast of Puerto Rico (Picture 56).



Picture 56. Fishing villa in Vega Alta (red circle).

Socioeconomic data collected from January 2024 through December 2024 period for Vega Baja's villa is presented on Table 20. This villa currently has 13 active members, all men, with an average age of 62 and a range of ages from 28 to 83 years old. All members are from Puerto Rico and reside in Vega Alta, except for one member who is a resident of Dorado and another, who is a resident of Vega Baja. Of the 13 members, 8 attended high school and 5 attended middle school. Most fishers have been active members for an average 22 years, with the longest- serving members have reached 40 years of membership. The most common fishing methods are hook and line bottom fishing with an electric reel.

Picture 57. Entrance

Other fishing practices include cast net, gillnet, diving, and longlining. The average monthly revenue for Vega Alta's villa is of $7,908 and comes from deep-water snapper, lobster, primera (dog, mangrove and cubera snapper, mutton snapper, hogfish and lane snapper), segunda (white mullet), queen conch. Deep-water snapper being the most sold product (Table 21). The annual income for most fishers in this villa is less than $15,000, except for one who earns between $35,000-$50,000 per year.

Active members average 18 clients per month, all individuals from Vega Alta, Vega Baja, Dorado and San Juan.

Since the installation of the solar panels, Vega Alta's villa has been able to operate without any major problems. Fishers have expressed their complete satisfaction with the operation of the system so far.

Picture 58. Storage

Picture 59. Ramp

Table 20. Socioeconomic Data for Vega Alta's Fishing Villa

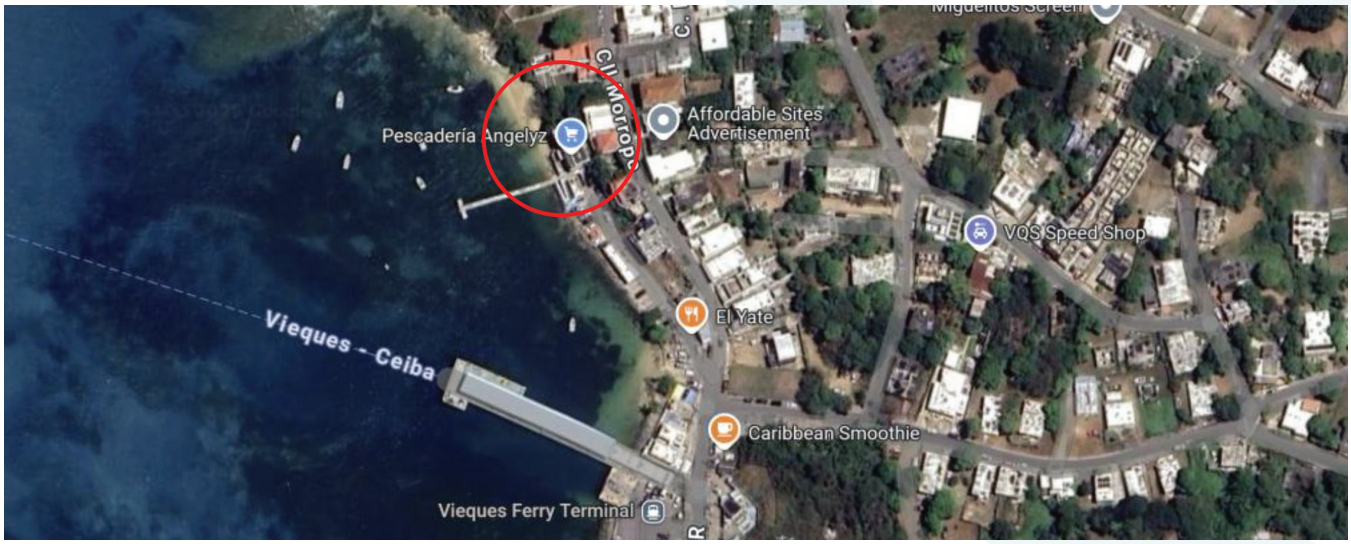
Number of Fishers	13
Average Age	62 (Youngest 28 – Oldest 83)
Gender	100% Male
Full-time Fishers	77%
Level of Education	62% High School 38% Middle School
Most Used Fishing Practice	Bottom Fishing
Annual Income of Most Members	< 15,000 (92%)
Pounds of Products Sold	42,810 Pounds
Average Monthly Revenue of Villa	$7,908
Most Sold Product	Lobster
Client	100% Individuals

Table 21. Products Sold at Vega Alta's Fishing Villa

Product	Price/lbs
Deep-water Snapper	$10.00
Lobster	$10.00
Primera (Dog, Mangrove and Cubera Snapper, Mutton Snapper, Hogfish and Lane Snapper)	$6.00
Segunda (Jacks, Mojarra, Snook and Whitemouth Croaker)	$5.00
Queen Conch	$10.00

Vieques

The fishing villa at the island of Vieques is located is located on Morropo Street north of the boat terminal (Picture 60).



Picture 60. Fishing villa at Vieques (red circle).

Socioeconomic data collected from April 2024 through December 2024 period for Vieques's villa is presented on Table 22. The average monthly revenue for this villa is of $41,246, which comes from lobsters, queen conch and primera (grouper, mutton snapper, hogfish, and yellowtail snapper) (Table 23). The most sold product is lobster. Clients for Vieques includes 50% to restaurants and 50% to individuals.

Since the installation of the solar panels, Vieques villa has been able to operate without any major problems. Fishers have expressed their complete satisfaction with the operation of the system so far.

Picture 61. Entrance

Table 22. Socioeconomic Data for Vieques' Fishing Villa

Pounds of Products Sold by the Villa	42,810 Pounds
Average Monthly Revenue of Villa	$41,246
Most Sold Product	Queen Conch
Client	50% Restaurants
	50% Individuals

Table 23. Products sold at Vieques' Fishing Villa

Product	Price/lbs
Queen Conch	$10.00
Lobster	$10.00
Primera (Grouper, Mutton Snapper, Hogfish and Yellowtail Snapper)	$6.00

Picture 62. Main Building

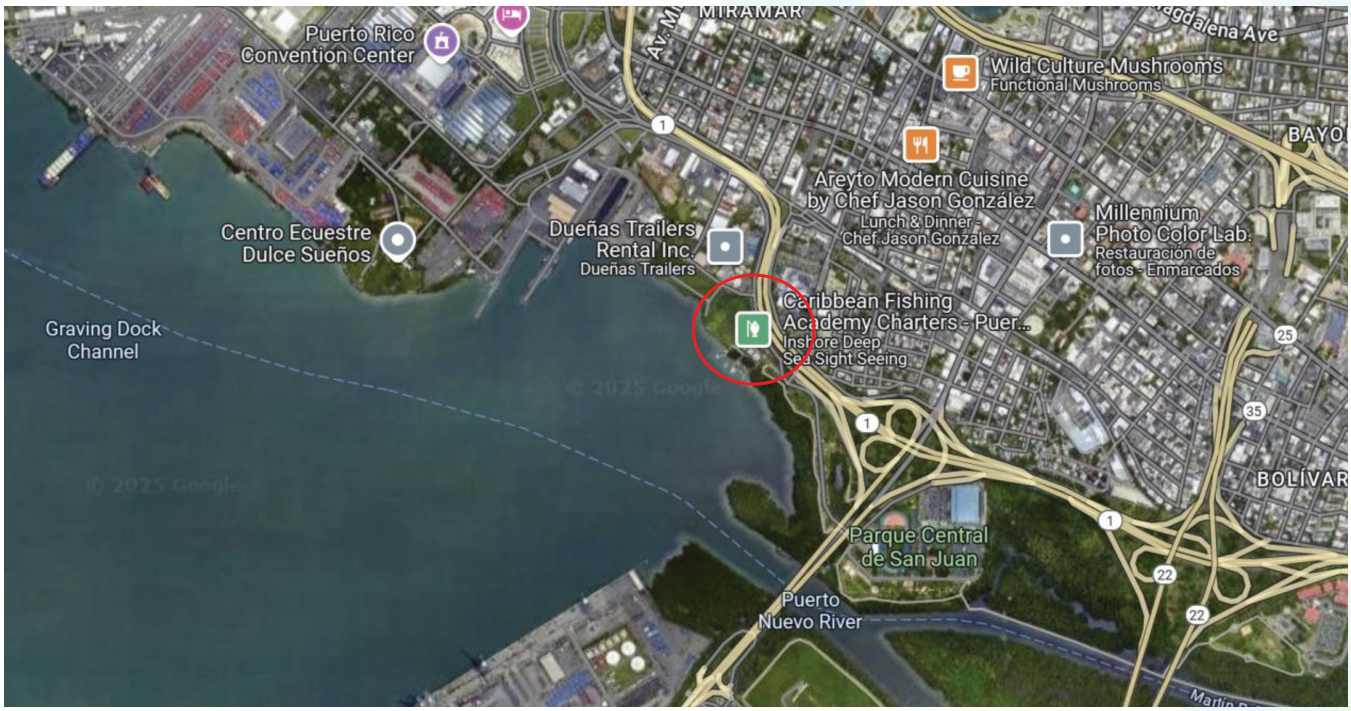
Picture 63. Dock

Picture 64. Batteries

Picture 65. Product

Hoare, San Juan

The fishing villa Hoare is located in San Juan's Central Park on the north coast of Puerto Rico (Picture 66).



Picture 66. Fishing villa Hoare, San Juan (red circle)

Socioeconomic data collected from December 2023 through December 2024 period for Hoare's villa is presented on Table 24. The fishing villa has 12 members, all men, with an average age of 61, the youngest being 32, and the oldest 76. Seven of the members reside in San Juan, while the rest reside in Cataño, Caguas, Río Grande, Vega Alta, and Bayamón. The members' educational level is divided into eight members who attended high school, one who attended middle school, two who attended university, and one who earned an associate's degree. All members are from Puerto Rico, except for one who is Cuban. Fishers in Hoare have been active members of the villa for an average 15 years.

Hoare fishing villa has an average monthly revenue of $7,916, which comes from sales of deep-water snappers, primera (yellowtail snapper), segunda (grunt and blue runner), mackerel and mahi-mahi (Table 25). The most sold product is primera. The annual income of fishers in this villa varies as follows: four members earn less than $15,000; four more earn between $15,000-$24,999; three members earn between $25,000-$34,999; and finally, one earns between $35,000-$50,000. The 12 members engage in hook and line bottom fishing; two of them use an electric reel. Additionally, one uses traps.

Picture 67. Entrance

Since the installation of the solar panels, Hoare villa has been able to operate without any major problems. Fishers have expressed their complete satisfaction with the operation of the system so far.

Picture 68. Interior

Table 24. Socioeconomic Data for Hoare's Fishing Villa (San Juan)

Number of Fishers	12
Average Age	61 (Youngest 32- Oldest 76)
Gender	100% Male
Full-time Fishers	67%
Level of Education	67% High School 8% Middle School 17% Bachelor's Degree 8% Associate's Degree
Most Used Fishing Practice	Bottom Fishing
Annual Income of Most Members	< $15,000 (33%)
Pounds of Products Sold	14,065 Pounds
Average Monthly Revenue of Villa	$7,916
Most Sold Product	Primera (Yellowtail Snapper)
Client	100% Individuals

Table 25. Products sold at Hoare's Fishing Villa (San Juan)

Product	Price/lbs
Deep-water snapper	$10.00
Primera (yellow-tail)	$6.00
Segunda (grunt and blue runner)	$3.00
Mackerel	$4.50
Mahi-mahi	$7.00

Picture 69. Selling Area

Picture 70. Product

Picture 71. Dock

Discussion of Results

The data collected during the study period was used to compare social and economic profiles from all the fishing villas that participated in the study. Table 24 presents average values and percentages of combined socioeconomic data for all fishers in the participating fishing villas.

Table 26. Socioeconomic Data for All the Fishing Villas

Average Number of Fishers	16
Average Age	54 Years Old
Gender	97% Male, 3% Female
Full-time Fishers	75%
Level of Education	68% High School 18% Middle School 2% Elementary School 5% Bachelor's Degree 5% Associate's Degree 1% Vocational Studies
Annual Income of Most Members	(75%) < $15,000 (17%) $15,000-$24,999 (6%) $25,000-$34,999 (2%) $35,000-50,000 (1%) $50,000-$74,999
Type of Client	40% Restaurants 55% Individuals 4% Wholesalers

Figures 1 through 8 show the comparisons of socioeconomic data between fishing villas. In general, fishers in this study have an average age of 54 years (Figure1) and 97% are male (Figure 2). Only 3 villas have female fishers, Puerto Real, Mayagüez and Cataño.

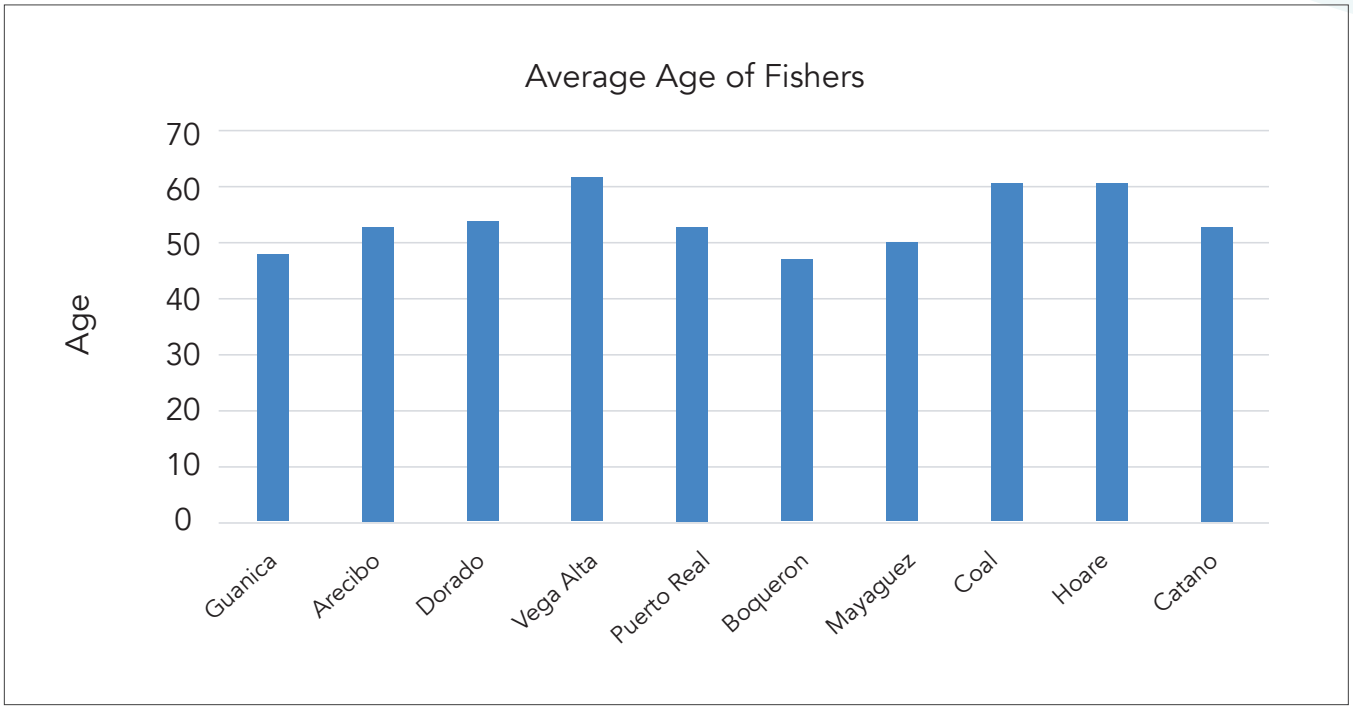


Figure 1. Average age of members of the fishing villas in this study.

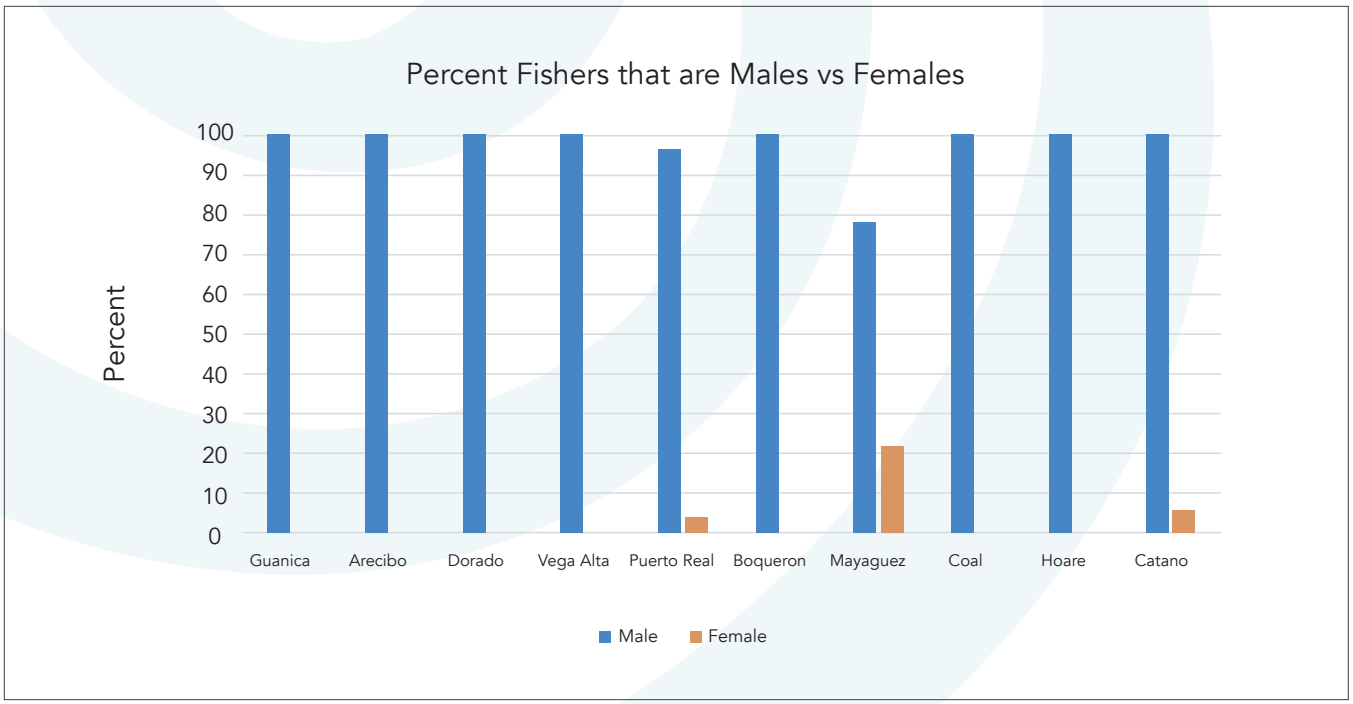


Figure 2. Percent of fishe rs that are male vs females in the fishing villas in this study.

Fishing is a full-time job for 75% of the fishers who are active members of the studied fishing villas, while only 25% do it part-time. The only fishing villa where the majority of the fishers were part- time fishers was La Coal in San Juan, while in Guánica all members fish full- time (Figure 3). Fishers in this study have been fishing for an average of 26 years (Figure 4).

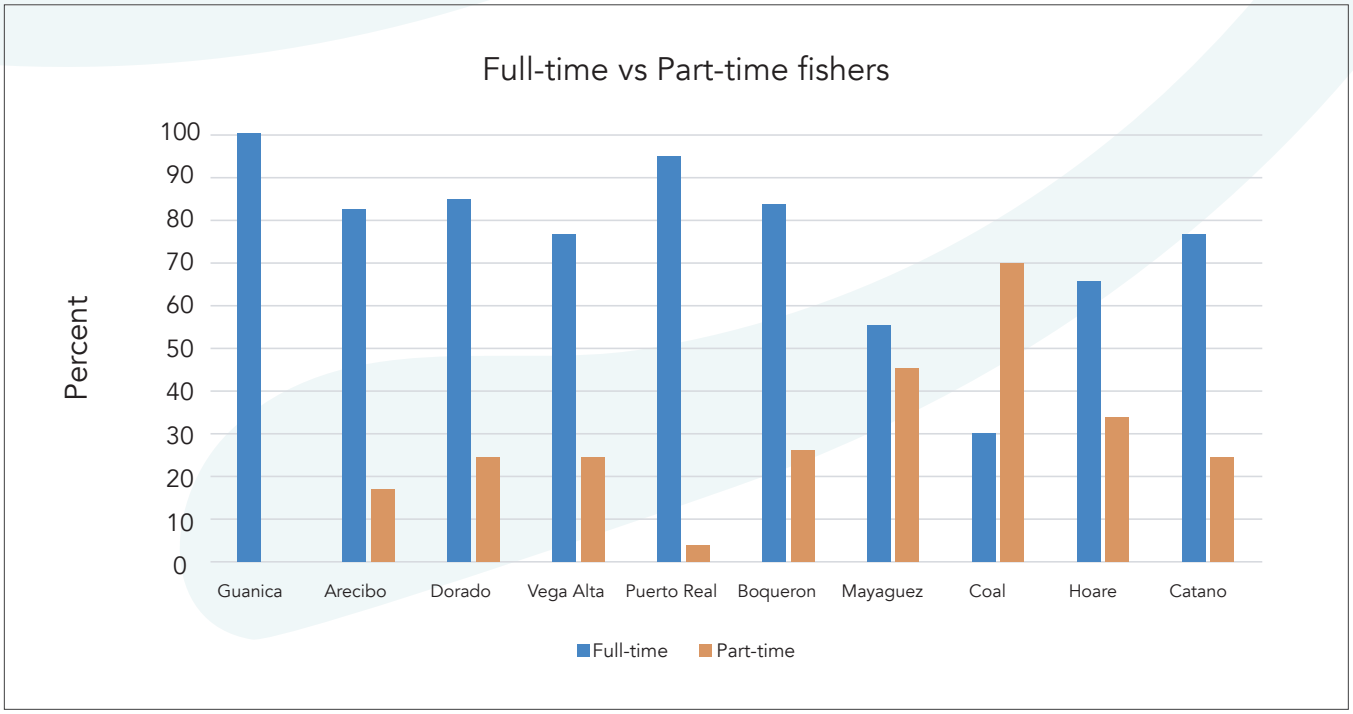


Figure 3. Percent of fishers that are full-time vs part-time fishers.

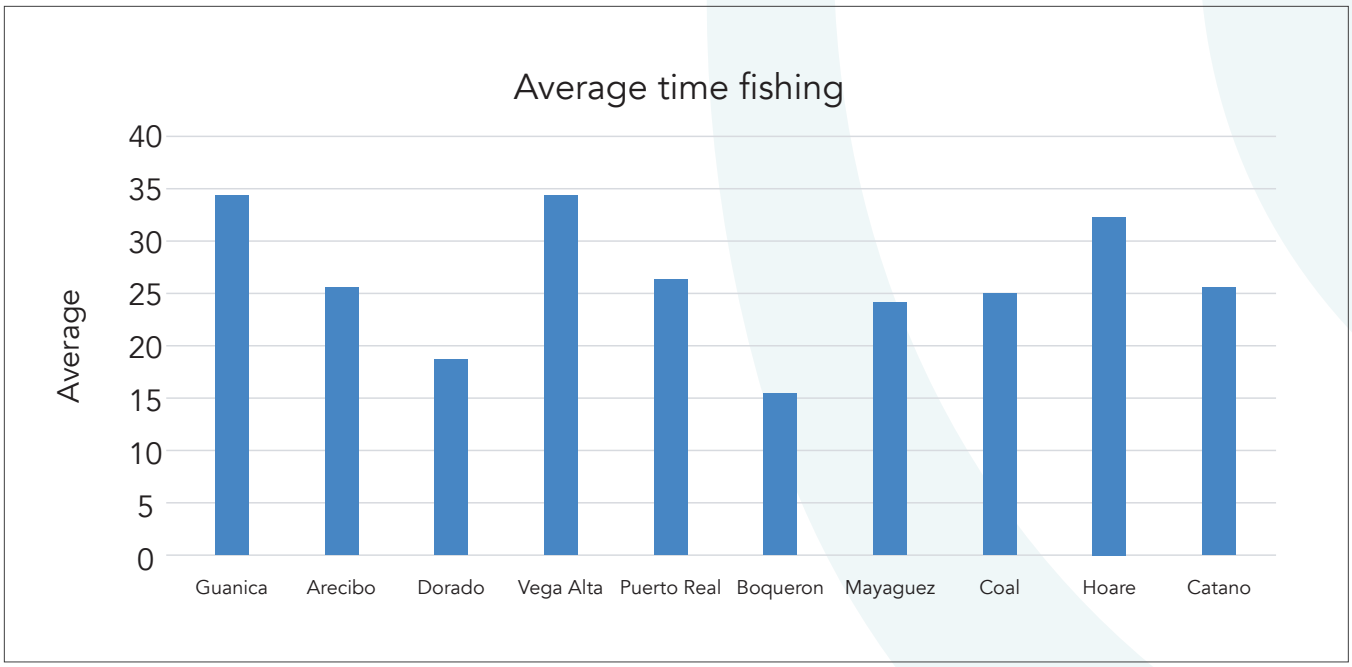


Figure 4. Average time that fishers in the studied fishing villas have been fishing.

Figure 5 compares the level of education of all fishers in the participating villas. Even though the level of education varies, 68% of the fishers obtained a high school degree, while 6% went to the university. Cataño and Boquerón were the 2 villas with the most members attending universities. On the other hand, 17% of the fishers attended only middle school.

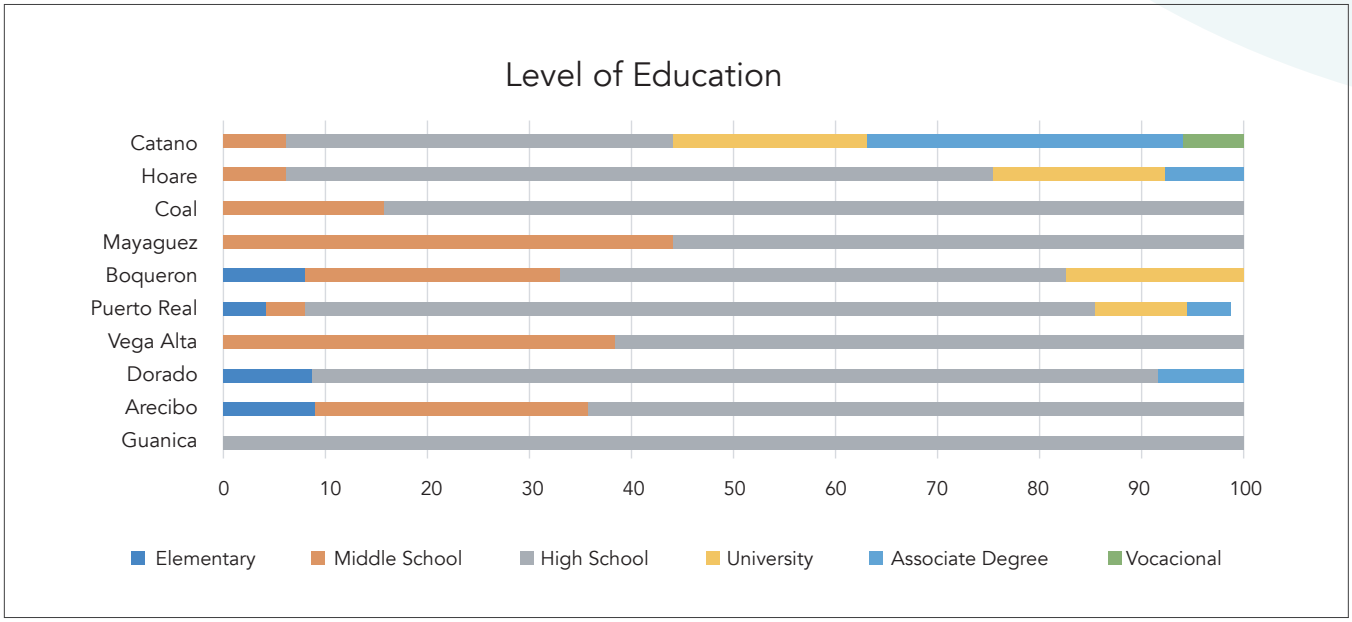


Figure 5. Level of education of fishers in the studied fishing villas.

The annual income of 75% of the fishers in the villas that participated of the study is less than $15,000 (Figure 6). Seventeen percent of the fishers had annual incomes between $15,000-$24,999 and only 1% had an income of more than $50,000 per year. The study showed that, although fishing is a full-time job for 75% of the fishers, many fishers fall under the

poverty limit for Puerto Rico. In fiscal year 2025, according to the Center for Budget and Policy Priorities, the poverty index used to calculate federal benefits, for a family of 3 was approximately $33,576 (gross annual income). Fifty-five percent (55%) of the fishers have families of 3 or more members and incomes below the $33,576 threshold.

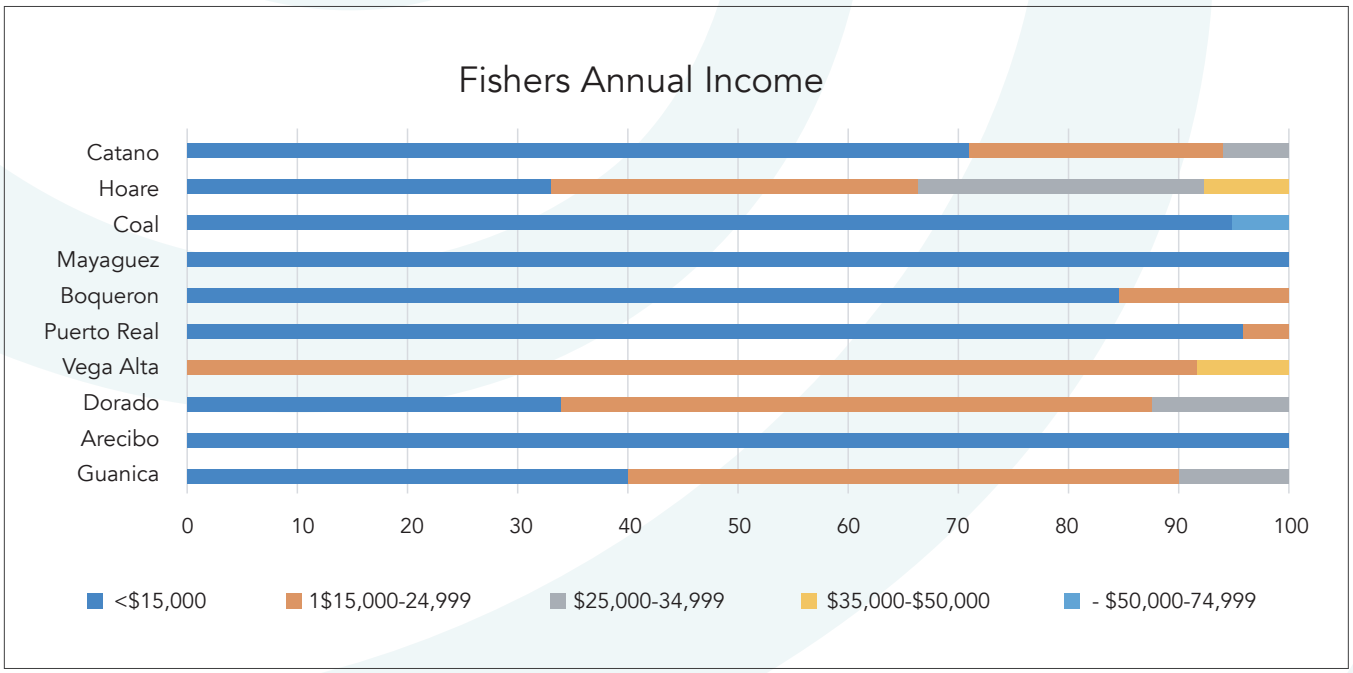


Figure 6. Annual income of fishers in the studied fishing villas.

Finally, figure 7 compares the average monthly revenue of all the fishing villas that participated in the study. Puerto Real (Cabo Rojo) and Mayagüez have the highest average monthly revenue, with Puerto Real reaching $49,280.00 per month and Mayagüez $41,322 monthly. On the other hand, Arecibo, Vega Alta, and Hoare have the lowest monthly revenue, all 3 earning less $10,000 per month.

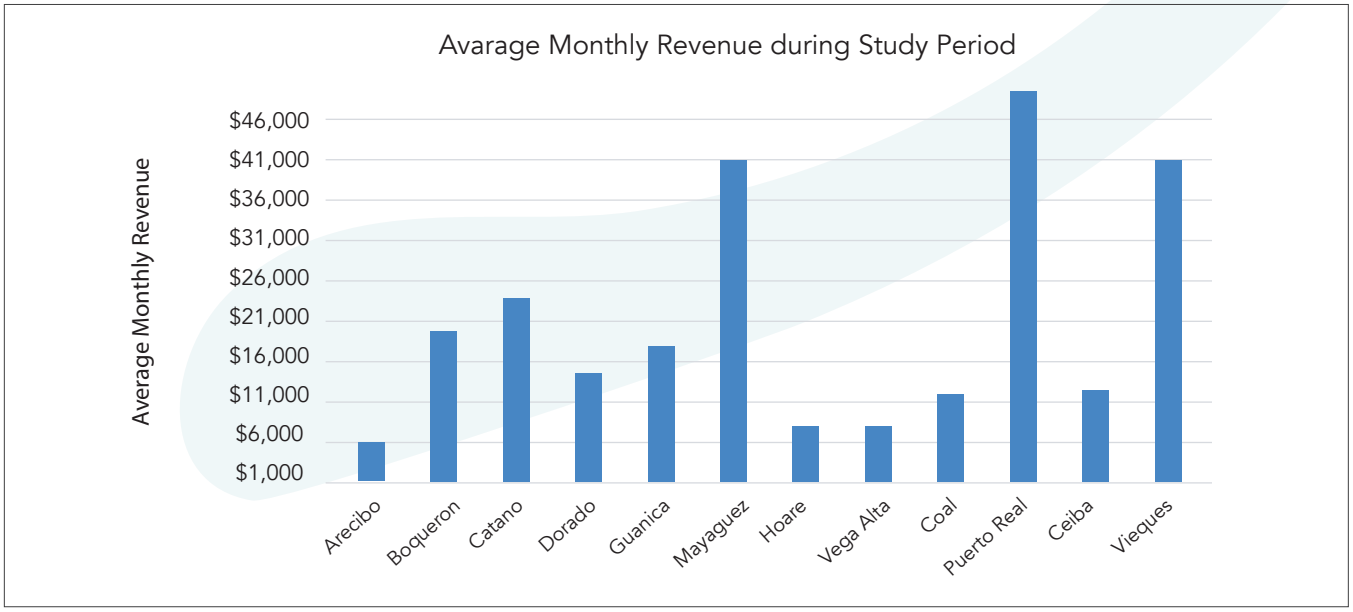


Figure 7. Monthly annual revenue of all fishing villas.

Figure 8 presents the total amount of seafood produced by each villa during the study period. Both, Puerto Real and Mayagüez reported the largest quantity of seafood produced, reporting an average monthly quantity of 4,855 and 4,142 pounds respectively. Arecibo, Vega Alta, Hoare and Ceiba reported the least number of pounds during this period. These villas reported an average monthly quantity of 923, 1,114, 1082 and 1357 pounds respectively.

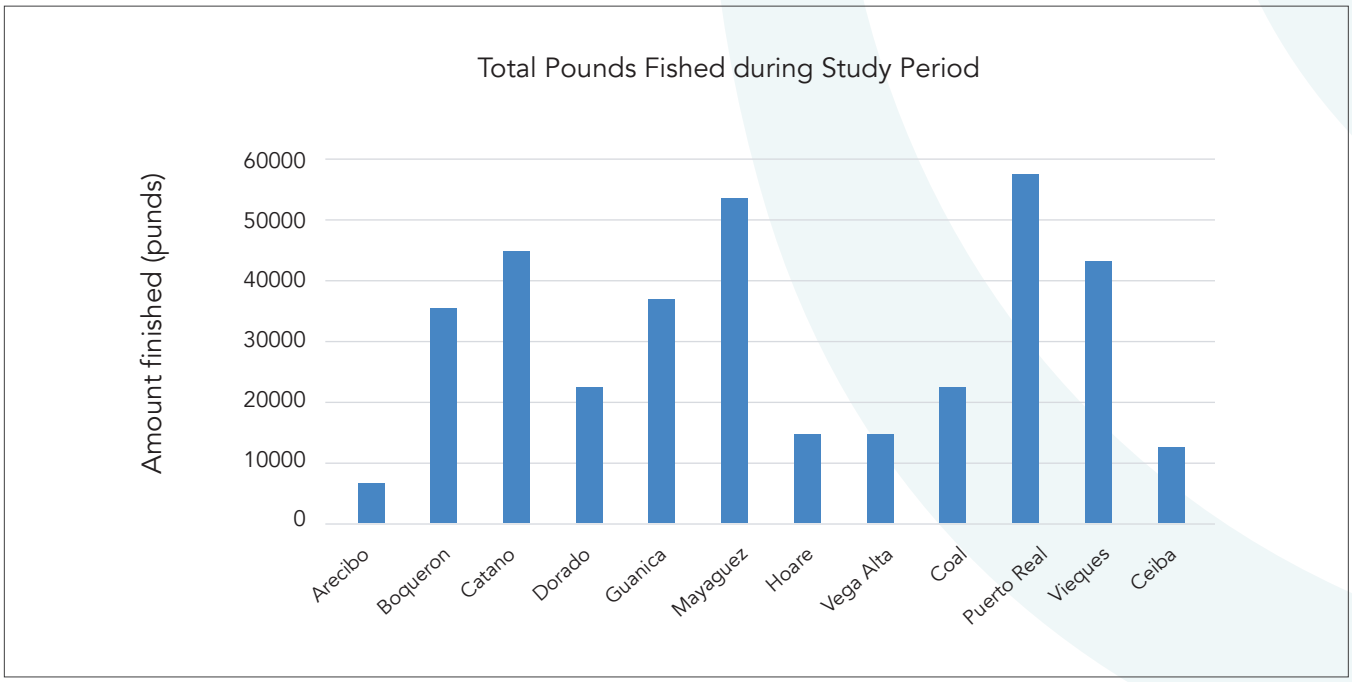


Figure 8. Pounds of fishing reported during the study period.

The revenue reported by each fishing villa is directly related to the amount of seafood produced at each villa. These amounts are presented in table 27. It was observed that the total pounds of seafood reported by all fishing villas during the study period was 351,813 for a total revenue of $3,121,532.00.

Table 27. Total Amount of Product and Revenue reported during the study period

Fishing Villa	Total Pounds	Total Revenue
Arecibo	5,535	$34,600.00
Boquerón	34,702	$296,544.00
Cataño	44,685	$360,991.00
Dorado	22,386	$195,222.00
Guánica	27,654	$232,058.50
Mayagüez	53,850	$537,185.50
Hoare	14,065	$102,909.00
Vega Alta	13,155	$94,900.00
Coal	22,500	$159,107.00
Puerto Real	58,265	$588,330.00
Vieques	42,810	$412,460.00
Ceiba	12,206	$107,225.00
Total	351,813	$3,121,532.00

Impact of Solar Systems in Fishing Villas

This initiative has been proven to guarantee a constant energy supply for critical fishing operations such as catch refrigeration, and to reduce overall operational costs. Overall, the initiative has been key to promoting local economic development and environmental sustainability in the coastal communities of Puerto Rico. By ensuring stable and uninterrupted power, and independence from the unreliable central energy grid, this initiative increases the food security and sustainability of surrounding communities and contributes to economic resiliency in case of future climate-caused events.

Small-scale fishing operations in Puerto Rico, particularly those located in rural coastal areas, face multiple challenges that hinder their ability to sustain ongoing activities, affecting the economic sustainability of the agricultural operation and the food security of the surrounding communities.

As an example, Puerto Rico's fishing communities in the Puerta Del Sol region faced economic hardship and massive product losses due to the energy crisis in Puerto Rico after Hurricane Maria in 2017. With compounded losses created by the disasters, the fishing communities were consistently losing income and discarding spoiled seafood due to interruptions in refrigeration. Specifically, the fishing association of Naguabo experienced a loss of hundreds of thousands of dollars after María's landfall due to the lack of electricity to operate refrigeration equipment. In addition to the direct hit to their artisanal fishing enterprises, it also impacted the fishermen's families, restaurants, and wider communities neighboring the villa that buy the fish.

After Conservación ConCiencia and Hispanic Federation collaborated on the installation of a solar energy system with storage, the Naguabo fishing association was able to operate without losses during the subsequent power outages in the years since and has saved on the high costs of electricity required to run multiple refrigerators. In September of 2022, another devastating hurricane hit Puerto Rico, again plunging it into an island-wide blackout. However, fishing villas which had installed solar systems were saved losses previously experienced after Maria. Solarization not only keeps refrigeration active, but also reduces operational costs, eliminates diesel expenses, and allows operations to continue normally even during emergencies such as storms and hurricanes that frequently threaten the archipelago. Fishing villas represent an energy oasis for families and neighbors during emergencies, ensuring access to electricity to power medical equipment, refrigerate medications and food, and charge other electronic devices such as cell phones, among other essential needs.

Successful implementation of this initiative promotes food security, protect natural resources, and create transformative impact for fishers in Puerto Rico – while promoting economic and environmental justice for all.

The following data shows the energy, environmental, and economic impact of the photovoltaic systems installed in 12 Puerto Rico's Fishing Villas.

1. Global results

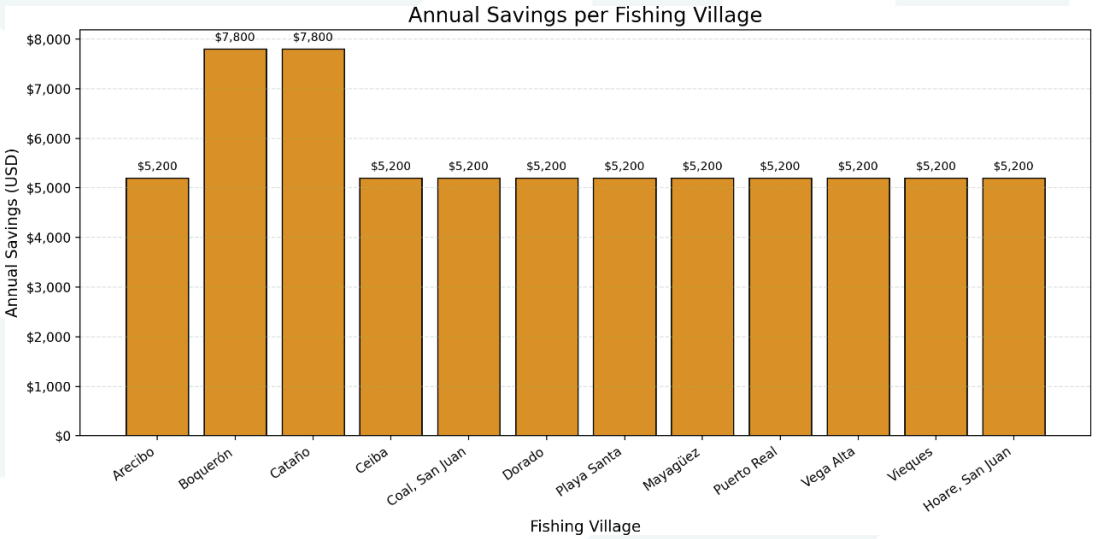
Based on the analyzed information:

Metric	Value
Installed Solar Capacity	78 kW
CO_2 Avoided Annually	183.32 tons
Estimated Equivalent in Household Energy	49.8 homes
Estimated Annual Economic Savings	$67,756

Summary of the energy impact of solar systems in 12 fishing villages:

Site	kW	CO_2 (ton/año)	Homes eq.	Annual savings ($)
Arecibo	6	14.1	3.83	$5,212
Boquerón	9	21.16	5.75	$7,818
Cataño	9	21.16	5.75	$7,818
Ceiba	6	14.1	3.83	$5,212
Coal, San Juan	6	14.1	3.83	$5,212
Dorado	6	14.1	3.83	$5,212
Playa Santa	6	14.1	3.83	$5,212
Mayagüez	6	14.1	3.83	$5,212
Puerto Real	6	14.1	3.83	$5,212
Vega Alta	6	14.1	3.83	$5,212
Vieques	6	14.1	3.83	$5,212
Hoare, San Juan	6	14.1	3.83	$5,212
	78kW	**183.32**	**49.8**	**$67,756**

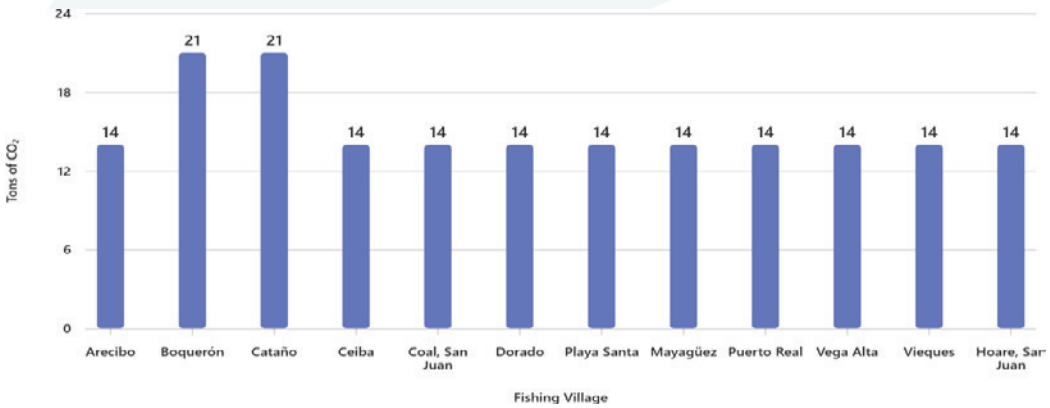
2. Economic Savings per Fishing Villa



The chart highlights the annual energy savings achieved by each Fishing Villa through the implementation of solar systems. Boquerón and Cataño emerge as the most economically benefited sites, each saving approximately $7,800 per year. This level of savings significantly reduces operational costs for critical activities such as refrigeration and equipment maintenance, which are essential for sustaining fishing operations. Other villas, including Arecibo, Ceiba, and Vieques, maintain consistent savings of around $5,200 annually, demonstrating that even smaller reductions contribute meaningfully to financial stability. Overall, these savings not only improve the profitability of local fisheries but also strengthen the economic resilience of coastal communities, enabling reinvestment in infrastructure and supporting longterm sustainability goals.

3. CO_2 Avoided per Fishing Villa

The following chart illustrates the annual tons of CO_2 emissions avoided by each Fishing Villa thanks to the installation of solar systems. Boquerón and Cataño stand out as the top contributors, each preventing over 21 tons of CO_2 per year, which represents a significant reduction in greenhouse gas emissions compared to other sites. The remaining villas, including Arecibo, Ceiba, and Vieques, consistently achieve reductions of around 14 tons annually. This pattern highlights the dual benefit of renewable energy adoption: not only does it lower operational costs, but it also plays a critical role in mitigating climate change impacts in coastal areas.



4. Key Conclusions

The implementation of this project generates the following results:

- Promote solar energy access to fishing facilities to maintain constant and uninterrupted supply of electricity needed to freeze fish and other business activities.
- Increase use of appropriate solar energy technology to secure food security for the surrounding communities.
- Strengthen productivity by reducing operation costs and promoting local economic development to ensure quality of life and dignity to coastal communities.
- Reduce the environmental impact of fishing activities towards a carbon neutral footprint.

Puerto Rico Public Policy Recommendations for Fisheries Sector Operations

The commercial fisheries sector in Puerto Rico in general is one that lacks attention from the local government. Fisheries in Puerto Rico are regulated by both US federal and local Puerto Rico governments. The following recommendations will only address key aspects of public policy for the Puerto Rico government as a starting point.

Fishers

At the time of this study, there wasn't current baseline information on Puerto Rico's commercial fisheries sector demographics. Information regarding who makes up the fisheries sector such as: age, gender, income, level of education or housing to name a few. While most of this information is available because it's provided by fishers on their commercial license applications it has not been quantified to be useful to provide insight into the sector. One key recommendation is that socio-economic data and demographic data be collected to facilitate insights into the fisheries workforce.

Fish Markets

Beyond the catch data that commercial fishers are required to report to the Department of Naturaland Environmental Resources very little to no information is available regarding locally caught fisheries products and supply chains. A key recommendation to understand local fish markets and demand is for fisheries supply chains to be traced within Puerto Rico. Additionally, the need to prevent seafood fraud is critical as many seafood products are being sold as local but are imported goods and even worse many times not even the advertised product. Existing laws and agencies like DACO and the Department of Agriculture can address these issues without any new regulations.

Fishing Associations (Villas)

Currently, there isn't an official list of how many Fishing Villas are operating. This lack of information prevents proper promotion or awareness for the public to know where to purchase locally caught seafood. In general, more attention needs to be given to the Puerto Rico-based commercial fishing sector. In the US there are an estimated 39,000 commercial fishers. In Puerto Rico, there are 1,200 commercial fishers. This means that while the population of Puerto Rico (residing in Puerto Rico) is less than 1% (0.94) of the population of the US, Puerto Rican based commercial fishers represent 3% of the commercial fishers in the US. More attention does not mean that Puerto Rico's commercial fishing needs to be industrialized. Our recommendation calling for more attention to the local commercial fishing sector is to improve conditions for fishers, invest in value adding operations that do require overfishing such as local fish processing and packaging, facilitating health insurance for the fishery sector workforce and further access to promote local seafood products.

APPENDIX

Appendix A. Map of all fishing associations in Puerto Rico.

Site	Municipality	Latitude	Longitude
1	Villas del Ojo, Aguadilla	18.45927	-67.164263
2	Tamarindo, Aguadilla	18.43617	-67.15564
3	Espinar, Aguada	18.407758	-67.171836
4	Ensenada, Rincón	18.344534	-67.260794
5	Estela, Rincón	18.322833	-67.248186
6	Barrero, Rincón	18.305110	-67.238315
7	Tres Hermanos, Añasco	18.283276	-67.190405
8	El Maní, Mayagüez	18.233049	-67.172769
9	El Seco, Mayagüez	18.208787	-67.154543
10	Dockey, Mayagüez	18.204312	-67.152869
11	Puerto Real, Cabo Rojo	18.076963	-67.190094
12	Cabo Rojo, Boquerón	18.024786	-67.17279
13	El Combate, Cabo Rojo	17.981711	-67.214061
14	Bahía Sucia, Cabo Rojo	17.966122	-67.176781
15	La Parguera, Lajas	17.97412	-67.052063
16	El Papayo, Lajas	17.972886	-67.027826
17	Salinas-Fortuna, Lajas	17.95846	-66.981803
18	Playa Santa, Guánica	17.935191	-66.954913
19	Bahía de Guánica	17.963882	-66.905299
20	Bahía de Guayanilla	18.006211	-66.768906

Site	Municipality	Latitude	Longitude
21	Tallaboa, Peñuelas	17.98981	-66.716239
22	Playa, Ponce	17.981542	-66.623063
23	La Guancha, Ponce	17.963943	-66.613582
24	Pastillo, Juana Diaz	17.990252	-66.483094
25	Cortada, Santa Isabel	17.976394	-66.441654
26	Playa, Salinas	17.959828	-66.297966
27	Playita, Salinas	17.946767	-66.264377
28	Jobos, Salinas	17.951458	-66.182839
29	Pozuelo, Guayama	17.938104	-66.185287
30	El Faro, Maunabo	17.991317	-65.888586
31	Puerto de Yabucoa, Yabucoa	18.049501	-65.833937
32	Guayanés, Yabucoa	18.063493	-65.816325
33	Punta Santiago, Humacao	18.164735	-65.743858
34	Playa Húcares, Naguabo	18.186901	-65.710823
35	El Corcho, Naguabo	18.203358	-65.669297
36	Morropo – Isabel II, Vieques	18.153052	-65.44289
37	Los Machos, Ceiba	18.270588	-65.630263
38	Puerto del Rey, Fajardo	18.284874	-65.631532
39	Maternillo, Fajardo	18.332193	-65.627508
40	Sardinera, Fajardo	18.346159	-65.636362
41	Las Croabas, Fajardo	18.36449	-65.625804
42	Boca de Herrera, Loiza	18.423138	-65.82982
43	Torrecillas, Carolina	18.453768	-65.98402
44	La Puntilla, San Juan	18.463161	-66.118669
45	Coal, San Juan	18.462183	-66.102235
46	Hoare, San Juan	18.445745	-66.083512
47	Vietnam, Cataño	18.441647	-66.112359
48	Villa Pesquera Cataño	18.441909	-66.12563
49	Palo Seco, Toa Baja	18.464611	-66.139144
50	Playa Dorado, Dorado	18.476194	-66.277437
51	Cerro Gordo, Vega Alta	18.480797	-66.341514
52	Puerto Nuevo, Vega Baja	18.486268	-66.386334
53	Los Tubos, Manatí	18.470314	-66.448858
54	Palmas, Barceloneta	18.4882	-66.560597
55	El Jarealito, Arecibo	18.478407	-66.693269
56	Peñon Amador, Camuy	18.490796	-66.866731
57	Bajura, Isabela	18.507797	-67.02255
58	Asociación de Pesca de Culebra	18.301075	-65.300598

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