ANGEL SHARK PROJECT:
CANARY ISLANDS

GUIDANCE DOCUMENT:
IDENTIFICATION AND PROTECTION OF JUVENILE ANGELSHARK *(SQUATINA SQUATINA)* HABITAT IN THE CANARY ISLANDS

KEY FACTS

STUDY SPECIES: ANGELSHARK *(SQUATINA SQUATINA)*

This Guidance Document has been created by Angel Shark Project: Canary Islands (ASP:CI) to share results of juvenile Angelshark research and identify possible threats to beaches identified as confirmed or potential nursery areas. It has been developed to support the Canary Island and Spanish Governments to help protect important juvenile Angelshark habitat in their unique stronghold and deliver priority actions of the Angelshark Action Plan for the Canary Islands. ASP:CI are committed to continue this line of research over the next 3 years; this document should be treated as an inaugural assessment to which future work will develop.

Not Evaluated NE	Data Deficient DD	Least Concern LC	Near Threatened NT	Vulnerable VU	Endangered EN	Critically Endangered CR	Extinct in the wild EX	Extinct EX

Listed as Critically Endangered on the IUCN Red List of Threatened Species

Legislative measures for Angelshark in the Canary Islands:

• Scheduled to be listed as "En Peligro" under El Catálogo Español de Especies Amenazadas in 2019.

• Prohibited species under the EU Common Fisheries Policy Council Regulation (EC) 43/2009.

• Strictly protected under Appendix I and II of Convention on the Conservation of Migratory Species of Wild Animals (CMS).

This work contributes to five priority Objectives of the Angelshark Action Plan for the Canary Islands.

• **Objective 2.1:** Critical Angelshark Areas are mapped together with the location of known potential threats

• **Objective 2.2:** Ensure that new infrastructure does not detrimentally impact Critical Angelshark Areas

• **Objective 3.2:** The impact of beach users in Critical Angelshark Areas is assessed and minimised by 2022

• **Objective 5.1:** Understand Angelshark abundance and distribution in the Canary Islands

• **Objective 5.3:** Understand Angelshark movement in the Canary Islands and connectivity across the wider Angelshark range

>80%

Angelsharks were once widespread throughout the Eastern Atlantic and Mediterranean Sea but populations have declined by over 80% in the last 50 years

Why survey at night?

All our juvenile Angelshark survey work is completed at night as Angelsharks are more active and their eyes reflect torch-light, making it easier to identify each shark.

Citation:
Barker, J., Meyers, E.K.M., Caro, B., Sealey, M., Jiménez Alvarado, D. (2019). Guidance Document: Identification and Protection of Juvenile Angelshark Habitat in the Canary Islands. Angel Shark Project: Canary Islands

INTRODUCTION TO ANGELSHARKS

Angelsharks *(Squatina squatina)* are flattened sharks that use their broad pectoral fins to bury themselves in soft sediment, from where they ambush unsuspecting fish [1,2]. Angelsharks were once widespread throughout the Eastern Atlantic and Mediterranean Sea but populations have declined by over 80% in the last 50 years [3,4] .

They are particularly susceptible to incidental capture in fisheries and habitat loss due to their coastal preference and biology (slow growth rates and low fecundity)[5,6]. The Canary Islands have been identified as a unique stronghold for the species[7] and provides an important opportunity to complete much-needed research into Angelshark ecology to inform conservation initiatives in the archipelago and range wide.

Angelshark research is in its infancy, in part due to the difficulty of studying a rare, cryptic species, thus little is known about their distribution, location of critical habitats and population structure.

Angel Shark Project: Canary Islands (ASP:CI)

ASP:CI is a collaboration between Universidad de Las Palmas de Gran Canaria (ULPGC), Zoological Research Museum Alexander Koenig (ZMFK) and Zoological Society of London (ZSL). Established in 2014, our aim is to secure the future of the Critically Endangered Angelshark in their unique stronghold. ASP:CI collects ecological and population data whilst engaging with local communities, researchers and government to raise awareness and deliver conservation action.

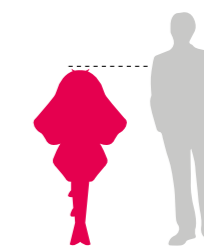Our present understanding of Angelshark reproduction is outlined below:

7-25 PUPS

Angelsharks are ovoviviparous and give birth to between 7 and 25 pups [8,9,10,11]
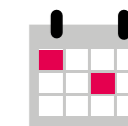
BIANNUAL

Likely to give birth biannually [10]

80-132 CM

Male Angelsharks mature at c. 80 – 132cm [10,11]

126-169 CM

Female Angelsharks mature at c. 128 – 169cm [10,12,13]

20-25 CM

Angelsharks are born at around c. 20-25 cm [8,9,11,14]

ANGELSHARK NURSERY AREAS

Identification and protection of juvenile Angelshark habitat is vital to safeguard the future of this species, as population growth is strongly influenced by juvenile survival [15,16,17]. It is important to use clear definitions of what a nursery area is to ensure clarity between all stakeholders and make sure the most important habitats are protected.

ASP:CI uses the following definition of a **Nursery Area** (NA) proposed by Heupel *et al.* (2007), which has three "NA Criteria":

NA CRITERIA 1:
Juvenile Angelsharks are more commonly encountered in the area than other areas.

NA CRITERIA 2:
Individual juvenile Angelsharks have a tendency to remain or return for extended periods.

NA CRITERIA 3:
The area or habitat is repeatedly used by juvenile Angelsharks across years.

ASP:CI is committed to continue NA research at key sites, specifically focused on testing the NA Criteria. At time of writing, sites that fulfil three NA Criteria are categorised as "Confirmed NAs", two NA Criteria are categorised as "Potential NAs" and 1 NA Criteria are categorised as "Juveniles Observed".

ASP:CI classifies juvenile Angelsharks as those under 60cm total length, with a subcategory of "newborn" for those less than 39cm total length. These size classes were identified following research on Angelshark growth rates at Playa de Las Teresitas, Tenerife [14].

HOW DO YOU STUDY JUVENILE ANGELSHARKS?

ASP:CI have spent five years developing and conducting methods to identify and study juvenile Angelsharks around the Canary Islands.

A five-step approach to juvenile Angelshark research has been created:
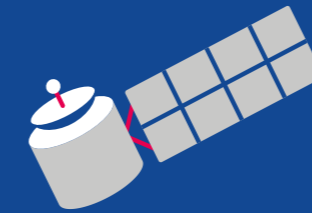
Identification of beaches using satellite imagery and citizen science sightings.

Scoping assessments to verify presence of juvenile Angelsharks and identify whether beach conditions are suitable for survey work.

Seasonal timed surveys of juvenile Angelsharks completed at night to understand density, seasonality and environmental conditions needed for NA's.

Focused mark-recapture study at survey sites with a higher density of Angelsharks to understand abundance, growth rates and residency.

Genetic analysis of tissue samples to understand connectivity, philopatry and mating systems.
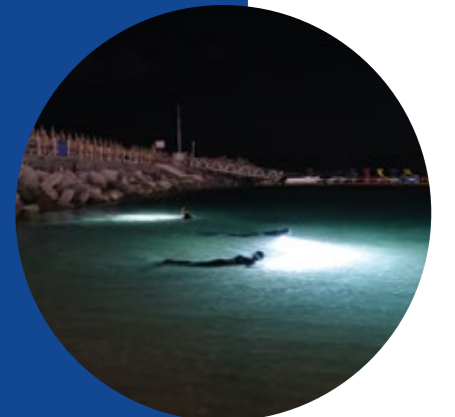
KEY RESULTS

PLAYA DE LAS TERESITAS STUDY

Playa de Las Teresitas is the first confirmed Angelshark NA in the Canary Islands[7,14,18], fulfilling the three NA Criteria.

NA CRITERIA 1:
Juvenile Angelsharks have been encountered at Playa de Las Teresitas more commonly than in any other area so far investigated by ASP:CI. Since 2014, we have been monitoring this beach by tagging juvenile Angelsharks, taking measurements and genetic samples. So far, we have caught 511 juvenile Angelsharks in Playa de Las Teresitas and tagged 424 individuals with visual ID Tags[14].

NA CRITERIA 2:
Data from 87 recaptured Angelsharks (20.5% recapture rate) indicates that juvenile Angelsharks have a tendency to remain in Playa de Las Teresitas up to 15 months until they reach a total length of approximately 50cm and leave this NA[14].

NA CRITERIA 3:
Our results confirm that Playa de Las Teresitas is repeatedly used by juvenile Angelsharks across years. However, in 2018 almost 50% fewer individuals have been recorded compared to previous years[14].

Key:

FV = Fuerteventura
GC = Gran Canaria
LN = Lanzarote
TN = Tenerife

JUVENILE ANGELSHARKS TAGGED AND RECAPTURED IN PLAYA DE LAS TERESITAS

■ Tagged ■ Recaptured
From Meyers *et al.* in prep
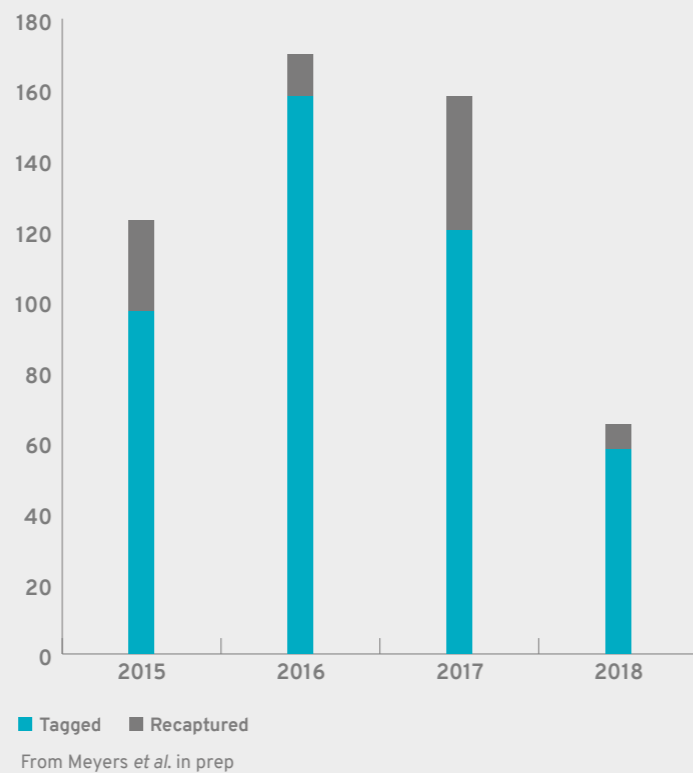
IDENTIFICATION OF NAs

Shark NAs are shown to have at least one of the following characteristics:

• Lower rates of predation than in other areas

• Greater abundance or density of prey than in other areas

• Environmental conditions to allow juvenile sharks to grow quicker than in other areas

Shark species born at relatively small body sizes and slow growth rates, like the Angelshark, tend to use protected shallow coastal habitats as NAs primarily to avoid predation[15]. To identify Angelshark NAs in the Canary Islands, we used the following techniques:

1. Citizen science data: 110 newborn Angelshark sightings were submitted to the Angel Shark Sightings Map, ePoseidon and RedPromar between January 2014 and December 2018. 83% of sightings occurred in coastal habitats shallower than 10m depth.

2. Satellite telemetry: Satellite imagery from across the Canary Islands were used to identify sheltered beaches which could provide the conditions needed for Angelshark NAs. 191 priority beaches were identified for study: 21 with 1 side protected by a breakwater; 32 with 2 sides protected by a breakwater; 22 with 3 or more sides protected by a breakwater; and 116 naturally sheltered beaches.

LOCATION OF CITIZEN SCIENCE SIGHTINGS OF NEWBORN ANGELSHARKS

511
So far, we have caught 511 juvenile Angelsharks in Playa de Las Teresitas and tagged 424 individuals with visual ID Tags[14].

15 MONTHS
Angelsharks have a tendency to remain in Playa de Las Teresitas up to 15 months until they reach a total length of approximately 50cm and leave this NA[14].

50%
In 2018 almost 50% fewer individuals have been recorded compared to previous years[14].

SEASONAL TIMED SURVEYS

Timed snorkel surveys, completed at night at least three times a year, were completed at 15 beaches identified as highest priority using citizen science data and satellite telemetry (6 in GC; 3 in TN; 6 in FV). Any juvenile Angelsharks identified were tagged with a visual ID tag. The results were highly variable:

• 29 juvenile Angelsharks were identified across nine of the study beaches and were categorised as Juveniles Observed.

• On nine occasions, surveys were abandoned due to storms, which caused poor underwater visibility or pollution events. This highlights the difficulty of surveying in spring or autumn, and these data gaps impacted our analyses.

• None of the tagged juvenile Angelsharks were resighted, possibly due to mortality or movement outside of the ASP:CI survey area, so we were unable to test NA Criteria 2 yet.

• Surveys were initially completed across one year at each study beach, so NA Criteria 3 could not be tested by survey data alone.

COMBINING CITIZEN SCIENCE SIGHTINGS WITH ASP:CI SURVEYS

Completing juvenile Angelshark surveys is labour intensive; with limited resources you can only survey a small number of beaches multiple times each year. However, survey data can be complemented with citizen science sightings of juvenile Angelsharks, to enable robust assessment of NA Criteria. Annex 1 provides a table with the combined dataset and categorisation of beaches:

2 CONFIRMED NAs

Two Confirmed NAs – Playa de Las Teresitas in Tenerife and Playa del Castillo in Fuerteventura, where tagged Angelsharks were recaptured after at least 6 months at liberty.
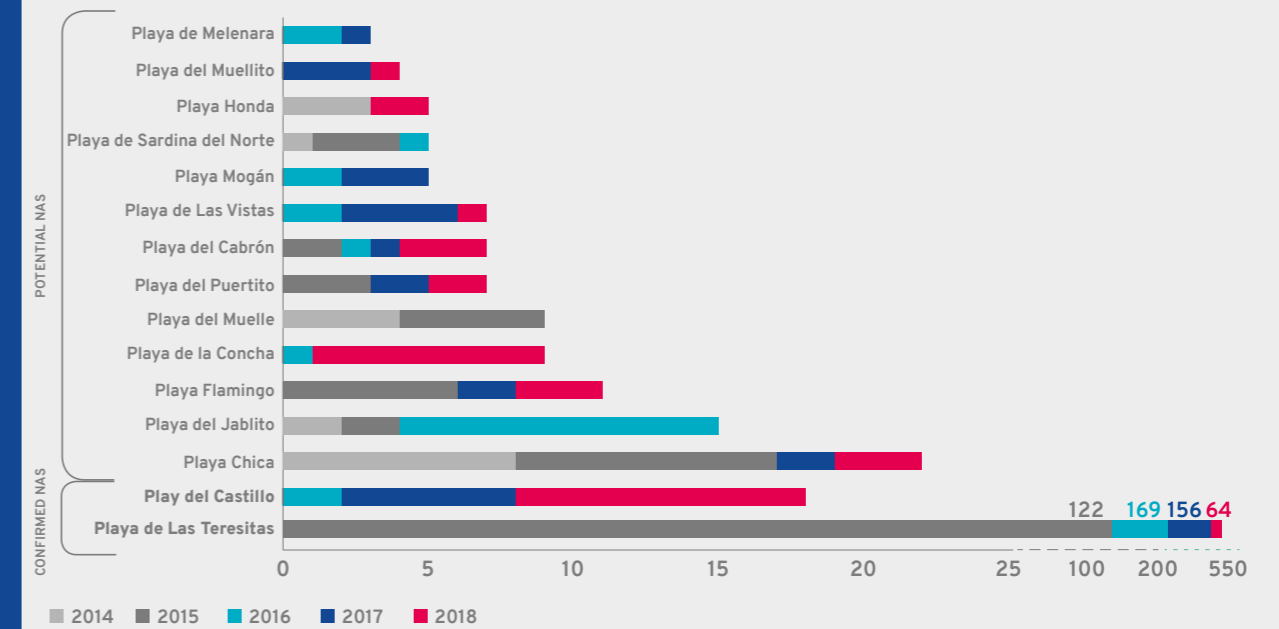
13 POTENTIAL NAs

Thirteen Potential NAs in Fuerteventura, Gran Canaria, Lanzarote and Tenerife.

21 BEACHES

21 beaches categorised as Juveniles Observed, but further investigation is needed to confirm if they are a Potential NAs or Confirmed NAs

15

Confirmed NAs and Potential NAs should be prioritised for further research and protection.

NUMBER OF JUVENILE ANGELSHARKS IDENTIFIED IN ASP:CI SURVEYS AND CITIZEN SCIENCE SIGHTINGS

POTENTIAL NAs
- Playa de Melenara
- Playa del Muellito
- Playa Honda
- Playa de Sardina del Norte
- Playa Mogán
- Playa de Las Vistas
- Playa del Cabrón
- Playa del Puertito
- Playa del Muelle
- Playa de la Concha
- Playa Flamingo
- Playa del Jablito
- Playa Chica

CONFIRMED NAs
- Play del Castillo
- Playa de Las Teresitas

122 169 156 64

0   5   10   15   20   25   100 200 550

■ 2014 ■ 2015 ■ 2016 ■ 2017 ■ 2018

ENVIRONMENTAL FACTORS

Habitat analysis

The Confirmed NAs and Potential NAs are located at a variety of beaches across the Canary Islands. Some are highly modified, for example Playa de Las Vistas in Tenerife, created following breakwater development in 1995. Others remain completely unmodified, for example Playa del Cabrón in Gran Canaria.

Annex 2 provides habitat maps of all Confirmed NAs or Potential NAs and highlight the following features:

• Sand composition identified through sediment sampling.

• Habitat structure identified through visual observations prior to ASP:CI survey work.

• Identification of potential threats, including outfalls, possible pollution sources, beach nourishment programmes and human disturbance.

• Habitat notes focusing on breakwater development, proximity to harbours, identification as an EU Bathing Water or located in a Special Area of Conservation.

Prey species

During each seasonal timed survey, three 500m² belt prey transect surveys were conducted to identify the diversity and number of prey species at each site. The majority of fish observed were juvenile specimens and there was no significant difference in the Diversity Index score between Confirmed NAs, Potential NAs and Juveniles Observed. Sand smelt *(Atherina presbyter)* was the most abundant species in 13 of the 15 sites and four species of sea bream *(Sparidae)* were part of the eight most abundant species.

DIVERSITY OF PREY SPECIES AT EACH SITE

POTENTIAL NA   JUVENILES OBSERVED   UNLIKELY NA

Chart x-axis labels: Playa del Cabrón, Playa de la Concha, Playa de Melenara, Playa de Sardina del Norte, Playa Mogán, Playa de Las Vistas, Playa de Puerto Rico, Playa del Pozo, Playa Corralejo, Playa de La Lajita, Playa de Amadores, Playa Poris de Abona, Playa de las Caletillas, Playa de Puerto Morro Jable, Playa Abama

— Equitability
— Shannon Diversity Index

AVERAGE NUMBER OF PREY SPECIES AT EACH SITE SURVEYED BY ASP:CI IN 2016 & 2017

Y-axis categories: Other species, Gobies, Two-banded seabream, Saddled seabream, Striped seabream, Bastard grunt, Saupe, Moroccan white seabream, Sand smelt
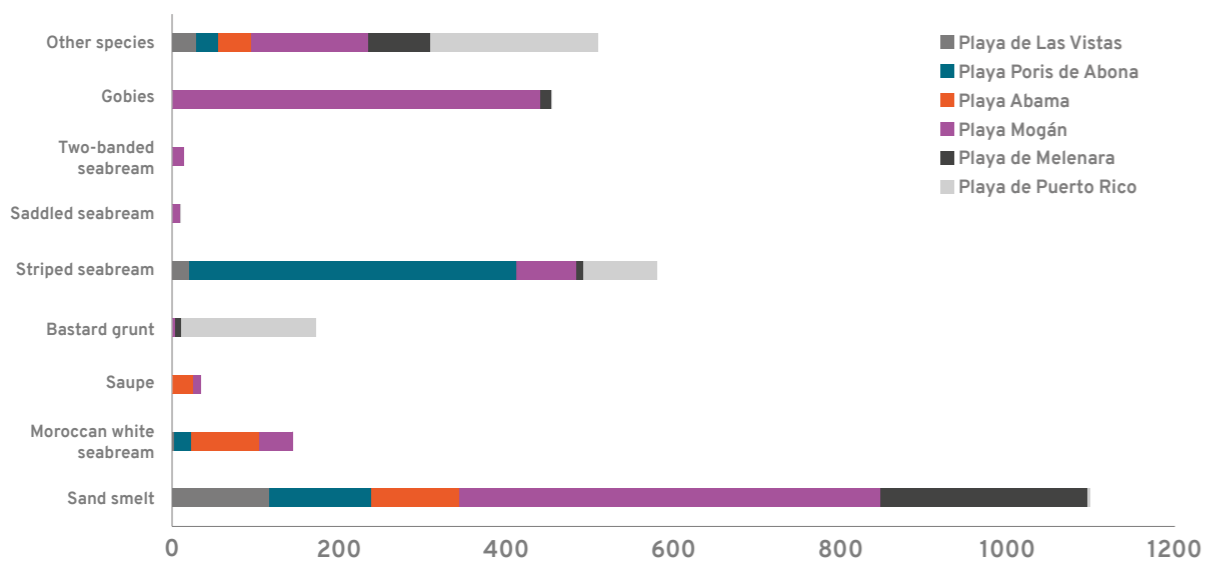
Legend:
- Playa de Las Vistas
- Playa Poris de Abona
- Playa Abama
- Playa Mogán
- Playa de Melenara
- Playa de Puerto Rico

AVERAGE NUMBER OF PREY SPECIES AT EACH SITE SURVEYED BY ASP:CI IN 2018

Y-axis categories: Other species, Gobies, Two-banded seabream, Saddled seabream, Striped seabream, Bastard grunt, Saupe, Moroccan white seabream, Sand smelt

Legend:
- Playa de Amadores
- Playa del Cabrón
- Playa de Sardina del Norte
- Playa de las Caletillas
- Playa Corralejo
- Playa de la Concha
- Playa de La Lajita
- Playa de Puerto Morro Jable
- Playa del Pozo

## GENETIC ANALYSIS AND EDNA SCOPING WORK

Together with partners, genetic analyses have been completed on tissue samples taken from tagged juvenile Angelsharks. The results will be published at the end of 2019, exploring relatedness between juveniles at each beach and philopatry (whether female Angelsharks return to the same beaches to give birth). In addition, ASP:CI survey work enabled the first eDNA study on Angelsharks and confirmed this technique is suitable to identify whether Angelsharks are present at the different beaches (but it does not differentiate between juveniles or adult sharks).

CONCLUSION

• Juvenile Angelsharks are likely present in a large number of sheltered beaches across the Canary Islands, more than those presented in this Guidance Document. Further exploratory research is needed to fully assess juvenile Angelshark distribution and relative importance of each site.

• Playa de Las Teresitas has a unique density and abundance of juvenile Angelsharks and is of principle importance to safeguard the future of Angelsharks in the Canary Islands. It also provides a vital opportunity to complete detailed, multidisciplinary research into juvenile Angelshark ecology, which benefits conservation measures across their natural range.

• Citizen Science sightings data have been vital to complement focused survey work to better understand location of Potential NAs and Confirmed NAs. This dual approach to species research should be continued, with ASP:CI survey work focused on better understanding Potential NAs and Confirmed NAs, as well as identifying new beaches important for juvenile Angelshark.
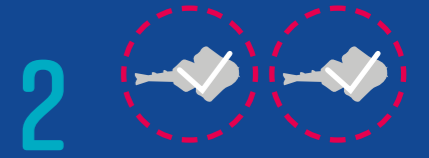
2 Angelshark NA's identified

13 Potential Angelshark NA's identified
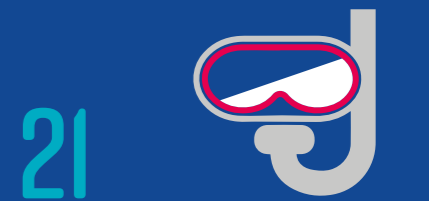
21 beaches where juveniles were observed.

424 juvenile Angelsharks tagged in Playa de Las Teresitas

87 juvenile Angelsharks recaptured in Playa de Las Teresitas

X15

UP TO 15 MONTHS residency times in Playa de Las Teresitas

RECOMMENDATIONS TO GOVERNMENT:

INCLUSION IN COASTAL & MARINE PLANS

Coastal and marine spatial planning strategies must consider juvenile Angelshark presence in sheltered beaches across the Canary Islands. We strongly recommend that a precautionary approach is adopted to reduce chances of any negative impact from development. Initially, this should be prioritised in the Confirmed NAs and Potential NAs. We recommend that Playa de Las Teresitas and Playa del Castillo should be considered for designation as marine protected areas.

MITIGATION OF BEACH NOURISHMENT

33% of the Confirmed NAs and Potential NAs occur in artificial beaches where sand is added through beach nourishment. Beach nourishment programmes could prevent pregnant female Angelsharks giving birth in favourable habitat or affect the sediment structure needed for juvenile Angelsharks to camouflage. Beach nourishment programmes in Confirmed NAs and Potential NAs need to develop clear mitigation measures for Angelsharks, including no beach nourishment activity during the Angelshark breeding period (April to October) (Meyers *et al.* 2017).

ANGLING ASSESSMENT

Seven of the Confirmed NAs and Potential NAs are also popular angling locations and interaction between anglers and juvenile Angelsharks needs immediate assessment. Location of Confirmed NAs and Potential NAs need to be included in updates to fisheries legislation.

REMOVE OUTFALLS

70% of Confirmed NAs and Potential NAs have one or more outfall within 1km of the beach entrance, which are likely to negatively impact water quality at these sites. This includes 18 non-authorised outfalls, which should be prioritised for removal.

INFORMATION PANELS

80% of Confirmed NAs and Potential NAs are located in EU Bathing Waters. These beaches are used by a large number of people, increasing likelihood of interaction between bathers and Angelsharks. Information panels should be installed to let people know about the presence of Angelsharks, how to reduce chances of interaction, and information about their biology, status and ecological importance.

SAC MANAGEMENT PLANS

Eight of the Confirmed NAs and Potential NAs are located in a Special Area of Conservation and Angelsharks should be considered as a species of interest when SAC management plans are developed for each site, with specific mitigation measures identified to reduce threats.

BEST PRACTICE GUIDANCE

Develop best practice guides for recreational diving and snorkelling activities, to comply with minimum disturbance and distance to the animals and reporting in citizen science databases.

SUPPORT RESEARCH

Continued Government support of long-term juvenile Angelshark research is fundamental to inform conservation and management measures into the future.

ASP:CI NEXT STEPS:

ASP:CI are committed to complete the following research on Angelshark NAs over the next three years, funded by Shark Conservation Fund and Disney Conservation Fund:

Objective: Key Angelshark nursery areas are identified and monitored; data are used to prioritise spatial management and minimise threats via input to marine planning.

- NA survey programme completed at 15 beaches across three years, including seasonal timed surveys, collecting environmental data, prey analysis and predator assessments.

- Habitat surrounding 15 beaches assessed through dive surveys to identify pregnant adult Angelsharks, possible predators and other suitable juvenile habitat.

- Spatial management and protection options identified through workshop with Government Officials, planners and developers.

- Genetic analysis of tissue samples used to determine relationship between juvenile Angelsharks, number of adult females using each site and connectivity between beaches.

- Relative importance of 15 beaches assessed through analysis of survey results and comparison with this Guidance Document to update key parameters for NAs.

References:

1. Capape, C., Seck,A.A., Gueye-ndiaye, A., Diatta, Y.,Diop, M. 2002. Reproductive biology of the smoothback angelshark, Squatina oculata (Elasmobranchii: Squatinidae), from the coast of Senegal (eastern tropical Atlantic). J. Mar. Biol. Ass. U. K., 82: 635-640.

2. Ferretti, F., Morey, G., Serena, F., Mancusi, C., Fowler, S.L, Dipper, F., & Ellis, J. 2015. Squatina squatina. The IUCN Red List of Threatened Species 2015: e.T39332A48933059. http://dx.doi.org/10.2305/IUCN.UK.2015-1.RLTS. T39332A48933059.en

3. Morey, G., Serena, F., Mancusi, C., Coelho, R., Seisay, M., Litvinov, F. & Dulvy, N. 2007a. Squatina aculeata. The IUCN Red List of Threatened Species 2007: e.T61417A12477164.

4. Morey, G., Serena, F., Mancusi, C., Coelho, R., Seisay, M., Litvinov, F. & Dulvy, N. (IUCN SSG Mediterranean Workshop, San Marino, 2003) 2007b. Squatina oculata. The IUCN Red List of Threatened Species 2007: e.T61418A12477553.

5. Gordon, C.A., Hood, A.R., Barker, J., Bartolí, À., Dulvy, N.K., Jiménez Alvarado, D., Lawson, J.M., & Meyers, E.K.M. 2017. Eastern Atlantic and Mediterranean Angel Shark Conservation Strategy. The Shark Trust, UK.

6. Barker, J., Bartoli, A., Clark, M., Dulvy, N.K., Gordon, C., Hood, A., Alvarado, D.J., Lawson, J. & Meyers,E. 2016. Angelshark Action Plan for the Canary Islands. ZSL.

7. Meyers, E.K., Tuya, F., Barker, J., Jiménez Alvarado, D., Castro-Hernández, J.J., Haroun, R., Rödder, D., 2017. Population structure, distribution and habitat use of the Critically Endangered Angelshark, Squatina Squatina, in the Canary Islands. Aquatic Conservation: Marine and Freshwater Ecosystems

8. Tortonese, E. 1956. Leptocardia, Ciclostomata, Selachii, Fauna d'Italia. Vol. II. Ed. Calderini, Bologna.

9. Bini, G. 1967. Atlante dei pesci delle coste Italiane, vol. I. Leptocardi, Ciclostomi, Selaci. Mondo Sommerso Editrice

10. Capapé, C., Quignard, J.P. and Mellinger, J. 1990. Reproduction and development of two angel sharks, Squatina squatina and S. oculata (Pisces: Squatinidae), of Tunisian coasts: semi-delayed vitellogenesis, lack of egg capsules, and lecithotrophy. Journal of Fish Biology 37: 347–356.

11. Ebert, D.A. and Compagno, L.J.V. 2013 . Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Volume 1. Cow, frilled, dogfish, saw, and angel sharks (Hexanchiformes, Squaliformes, Pristiophoriformes, and Squatiniformes). FAO, Rome.

12. Lipej, L., De Maddalena, A. and Soldo, A. 2004. Sharks of the Adriatic Sea. Knjižnica Annales Majora, Koper.

13. Osaer, F., Narváez, K., Pajuelo, J.G and Lorenzo, J. M. 2015. Sexual development and maturity scale for the angel shark Squatina squatina (Elasmobranchii: Squatinidae), with comments on the adequacy of general maturity scales. Sexuality and Early Development in Aquatic Organisms. 1:117-132

14. Meyers E.K.M., Jiménez-Alvarado, D., Barker, J., Saramiento, L.A., Reich, A., Caro, B., Sealey, M.J., Castro, J.J. in prep. Catching angels: Assessing residency time, population structure and growth rates of juvenile Angelsharks (Squatina squatina) in a nursery habitat

15. Heithaus M.R. 2007. Nursery areas as essential shark habitats: a theoretical perspective. In: McCandless CT, Pratt HL Jr, Kohler NE (eds) Shark nursery grounds of the Gulf of Mexico and east coast waters of the United States. American Fisheries Society Symposium, Bethesda, MD

16. Ward-Paige C.A., Britten G.L., Bethea D.M., Carlson J.K. 2014. Characterizing and predicting essential habitat features for juvenile coastal sharks. Marine Ecology Progress Series

17. Kinney M.J. and Simpfendorfer C.A. 2009. Reassessing the value of nursery areas to shark conservation and management. Conservation Letters. 2:53–60

18. Escánez Pérez, A., Crespo Torres, A., Rodríguez Ramallo, S., Oñate, M., Marrero Pérez, M. 2016. Estudio del primer área de cría del Angelote (Squatina squatina) descubierta en Canarias. Chronica Naturae. 6:50-62

JUVENILE ANGELSHARK DATA GATHERED BY CITIZEN SCIENCE SIGHTINGS OR ASP:CI SURVEY WORK USED TO IDENTIFY CONFIRMED NAS AND POTENTIAL NAS IN THE CANARY ISLANDS

■ = ASP:CI survey data
■ = citizen science sightings data
■ = citizen science & ASP:CI data

Beach name	Island	Total juvenile Angelshark	NA criteria 1	NA criteria 2	NA criteria 3	Category
Playa del Castillo	FV	18	Y	Y	Y	CONFIRMED NA
Playa de Las Teresitas	TN	520	Y	Y	Y	CONFIRMED NA
Playa del Jablito	FV	15	Y	N	Y	POTENTIAL NA
Playa del Puertito	FV	7	Y	N	Y	POTENTIAL NA
Playa de la Concha	FV	9	Y	N	Y	POTENTIAL NA
Playa del Muellito	FV	4	Y	N	Y	POTENTIAL NA
Playa del Cabrón	GC	7	Y	N	Y	POTENTIAL NA
Playa de Melenara	GC	3	Y	N	Y	POTENTIAL NA
Playa Mogán	GC	5	Y	N	Y	POTENTIAL NA
Playa del Muelle	GC	9	Y	N	Y	POTENTIAL NA
Playa de Sardina del Norte	GC	5	Y	N	Y	POTENTIAL NA
Playa Chica	LN	22	Y	N	Y	POTENTIAL NA
Playa Flamingo	LN	11	Y	N	Y	POTENTIAL NA
Playa Honda	LN	5	Y	N	Y	POTENTIAL NA
Playa de Las Vistas	TN	7	Y	N	Y	POTENTIAL NA
Playa Corralejo	FV	3	Y	N	N	JUVENILES OBSERVED
Playa Giniginamar	FV	2	Y	N	N	JUVENILES OBSERVED
Playa de La Lajita	FV	2	Y	N	N	JUVENILES OBSERVED
Playa de Las Playitas	FV	1	Y	N	N	JUVENILES OBSERVED
Playa del Pozo	FV	17	Y	N	N	JUVENILES OBSERVED
Playa de Amadores	GC	3	Y	N	N	JUVENILES OBSERVED
Playa de Anfi Del Mar	GC	2	Y	N	N	JUVENILES OBSERVED
Playa de Las Canteras	GC	1	Y	N	N	JUVENILES OBSERVED
Playa de Puerto Rico	GC	1	Y	N	N	JUVENILES OBSERVED
Playa de San Sebastián	LG	1	Y	N	N	JUVENILES OBSERVED
Playa del Reducto	LN	5	Y	N	N	JUVENILES OBSERVED
Museo de Atlantico	LN	1	Y	N	N	JUVENILES OBSERVED
Playa de Fariones	LN	4	Y	N	N	JUVENILES OBSERVED
Playa del Jabillio	LN	1	Y	N	N	JUVENILES OBSERVED
El Balito	TN	1	Y	N	N	JUVENILES OBSERVED
Playa Poris de Abona	TN	11	Y	N	N	JUVENILES OBSERVED
Playa de Fañabe	TN	1	Y	N	N	JUVENILES OBSERVED
Playa de Los Cristianos	TN	3	Y	N	N	JUVENILES OBSERVED
Playa de San Juan	TN	1	Y	N	N	JUVENILES OBSERVED
Puerto de Granadilla	TN	2	Y	N	N	JUVENILES OBSERVED
Puerto de Santa Cruz	TN	1	Y	N	N	JUVENILES OBSERVED
Playa de las Caletillas	FV	0	N	N	N	UNLIKELY NA
Playa de Puerto Morro Jable	FV	0	N	N	N	UNLIKELY NA
Playa Abama	TN	0	N	N	N	UNLIKELY NA

Monthly sighting data (J F M A M J J A S O N D) for years 2014, 2015, 2016, 2017 and 2018 are recorded per beach in the original chart.

PLAYA DEL CASTILLO (FV)

Confirmed NA
3 juvenile Angelsharks in ASP:CI Surveys; 15 citizen science sightings

Potential Threats:
1 authorised & 2 non authorised outfalls within 1km
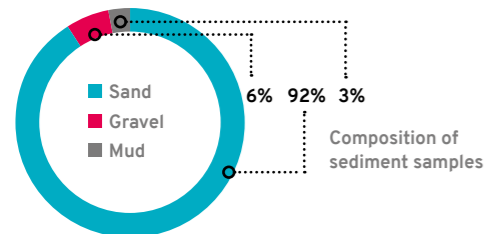
Beach nourishment
(last deposition 2017)

Pollution:	☑ from recreational harbour
	☐ from nearby industry
Run-off:	☑ from urban area
	☐ from agricultural area
Disturbance:	☐ Popular for recreational angling
	☑ Large number of bathers
	☑ Popular diving site

Habitat Notes:
• Imported grey-golden sand
• 1 breakwater constructed before 2000
• Recreational harbour in site (potential impact from anchors/moorings)
• Identified as EU Bathing Water

■ Sand ■ Gravel ■ Mud
6% 92% 3%
Composition of sediment samples

PLAYA DEL JABLITO (FV)

Potential NA
10 juvenile Angelsharks in ASP:CI Surveys; 5 citizen science sightings

Potential Threats:

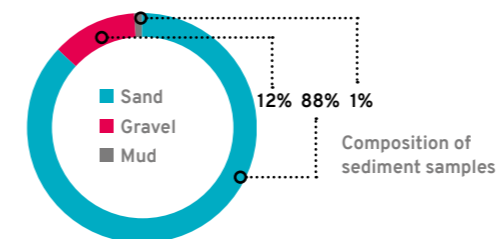|	
Pollution:	☑ from recreational harbour
	☐ from nearby industry
Run-off:	☐ from urban area
	☐ from agricultural area
Disturbance:	☑ Popular for recreational angling
	☐ Large number of bathers
	☑ Popular diving site

Habitat Notes:
• Natural grey-golden sand
• Harbour in site (potential impact from anchors/moorings)

■ Sand ■ Gravel ■ Mud
12% 88% 1%
Composition of sediment samples

PLAYA DE LAS TERESITAS (TN)

Confirmed NA
511 juvenile Angelsharks in ASP:CI Surveys; 9 citizen science sightings

Potential Threats:
2 outfalls in process within 1km

Beach nourishment
(1973 = 270,000 tons,1999, 2004)
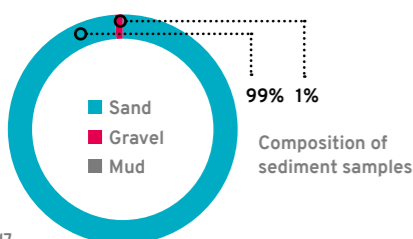
Pollution:	☑ from recreational harbour
	☑ from nearby industry (oil rigs & port)
Run-off:	☐ from urban area
	☐ from agricultural area
Disturbance:	☑ Popular for recreational angling
	☑ Large number of bathers
	☑ Popular diving site

Habitat Notes:
• Imported grey-golden sand
• 3 breakwaters constructed in 1973
• Harbour in site (potential impact from anchors/moorings) and close to industrial harbour
• Identified as EU Bathing Water
• Within SAC No. 69_TF= Sebadal de San Andrés

■ Sand ■ Gravel ■ Mud
99% 1%
Composition of sediment samples

■ unauthorised outfall
■ authorised outfall
■ unauthorised outfall in process

PLAYA DEL PUERTITO (FV)

Potential NA
0 juvenile Angelsharks in ASP:CI Surveys; 7 citizen science sightings

Potential Threats:

Pollution:	☐ from recreational harbour
	☑ from nearby industry
Run-off:	☐ from urban area
	☐ from agricultural area
Disturbance:	☐ Popular for recreational angling
	☐ Large number of bathers
	☐ Popular diving site

Habitat Notes:
• Natural black-brown sand
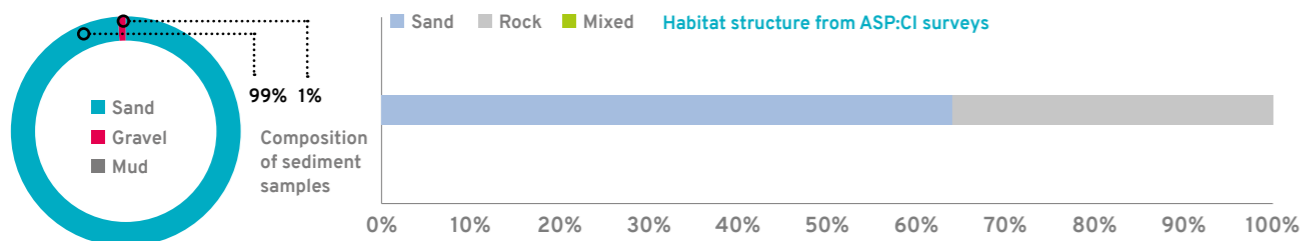• Within SAC No. 16_FV = Playas de sotavento de Jandía

PLAYA DE LA CONCHA (FV)

Potential NA
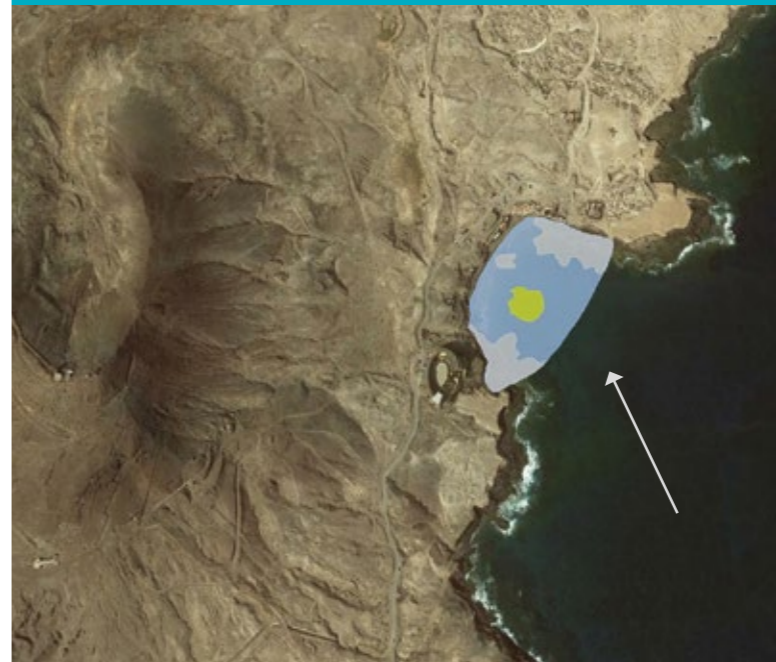8 juvenile Angelsharks in ASP:CI Surveys; 1 citizen science sightings

Potential Threats:

Pollution:	☐ from recreational harbour
	☐ from nearby industry
Run-off:	☐ from urban area
	☐ from agricultural area
Disturbance:	☐ Popular for recreational angling
	☑ Large number of bathers
	☐ Popular diving site

Habitat Notes:
• Natural white-golden sand
• Identified as EU Bathing Water

99% 1%

Composition of sediment samples

Sand Gravel Mud

Sand ▮ Rock ▮ Mixed ▮ **Habitat structure from ASP:CI surveys**

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

PLAYA DEL MUELLITO (FV)

Potential NA
0 juvenile Angelsharks in ASP:CI Surveys; 4 citizen science sightings

Potential Threats:

Pollution:	☐ from recreational harbour
	☐ from nearby industry (oil rigs & port)
Run-off:	☐ from urban area
	☑ from agricultural area
Disturbance:	☐ Popular for recreational angling
	☐ Large number of bathers
	☐ Popular diving site

Habitat Notes:
• Natural grey-golden sand
• Identified as EU Bathing Water

▮ unauthorised outfall
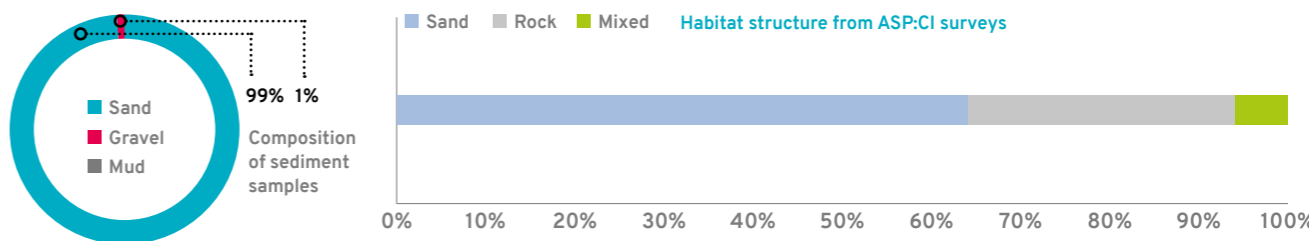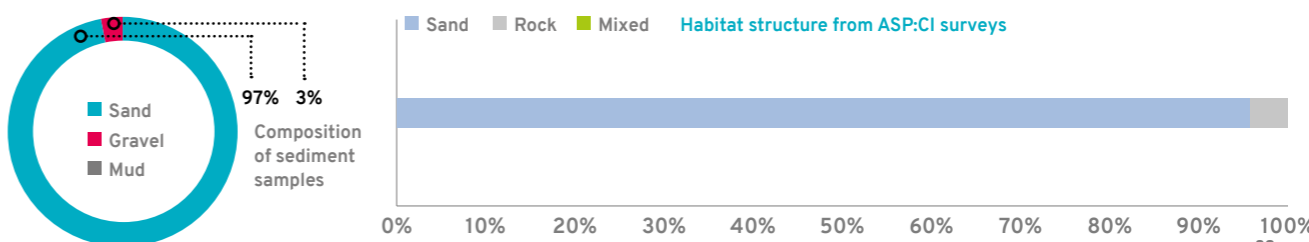▮ authorised outfall
▮ unauthorised outfall in process

PLAYA DEL CABRÓN (GC)

Potential NA
3 juvenile Angelsharks in ASP:CI Surveys; 4 citizen science sightings

Potential Threats:

Pollution:	☐ from recreational harbour
	☐ from nearby industry
Run-off:	☐ from urban area
	☐ from agricultural area
Disturbance:	☑ Popular for recreational angling
	☐ Large number of bathers
	☑ Popular diving site

Habitat Notes:
• Natural grey-golden sand
• Harbour in site (potential impact from anchors/moorings)
• Within SAC No. 34_GC = Playa del Cabrón

99% 1%

Composition of sediment samples

Sand Gravel Mud

Sand ▮ Rock ▮ Mixed ▮ **Habitat structure from ASP:CI surveys**

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

PLAYA DE MELENARA (GC)

Potential NA
3 juvenile Angelsharks in ASP:CI Surveys; 0 citizen science sightings

Potential Threats:
2 non-authorised outfalls within 1km

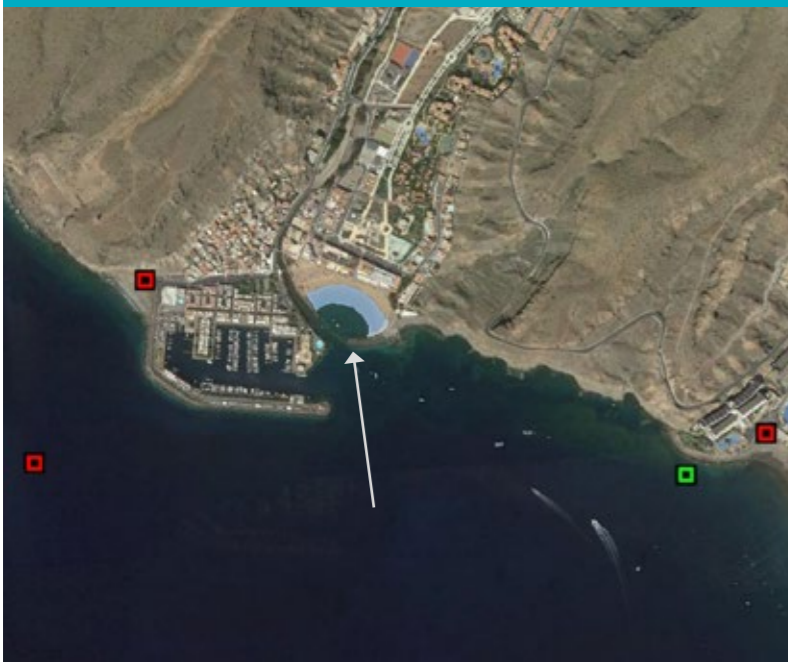|	
Pollution:	☑ from recreational harbour
	☑ from nearby industry
Run-off:	☑ from urban area
	☑ from agricultural area
Disturbance:	☑ Popular for recreational angling
	☑ Large number of bathers
	☐ Popular diving site

Habitat Notes:
• Natural black-brown sand
• 1 breakwater constructed before 2000
• Close to harbour
• Identified as EU Bathing Water

▮ unauthorised outfall
▮ authorised outfall
▮ unauthorised outfall in process

97% 3%

Composition of sediment samples

Sand Gravel Mud

Sand ▮ Rock ▮ Mixed ▮ **Habitat structure from ASP:CI surveys**

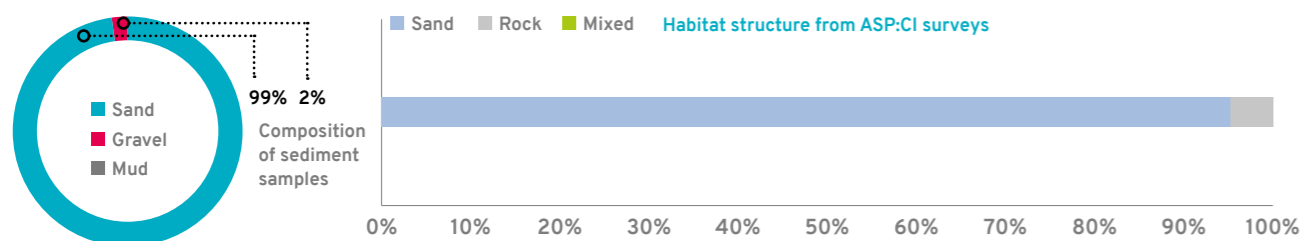0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

PLAYA MOGÁN (GC)

Potential NA
5 juvenile Angelsharks in ASP:CI Surveys; 0 citizen science sightings

Potential Threats:
1 authorised & 3 non-authorised outfalls within 1km

Beach nourishment

Pollution:	☑ from recreational harbour
	☐ from nearby industry
Run-off:	☑ from urban area
	☐ from agricultural area
Disturbance:	☑ Popular for recreational angling
	☑ Large number of bathers
	☑ Popular diving site

Habitat Notes:
• Imported grey-golden sand
• 3 breakwaters constructed <2000
• Close to two harbours
• Identified as EU Bathing Water

Sand
Gravel
Mud

99% 2%
Composition of sediment samples

Sand Rock Mixed   Habitat structure from ASP:CI surveys

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

PLAYA DEL MUELLE (GC)

Potential NA
0 juvenile Angelsharks in ASP:CI Surveys; 9 citizen science sightings

Potential Threats:
1 non authorised outfall within 1km

Pollution:	☐ from recreational harbour
	☐ from nearby industry
Run-off:	☐ from urban area
	☑ from agricultural area
Disturbance:	☑ Popular for recreational angling
	☑ Large number of bathers
	☑ Popular diving site

Habitat Notes:
• Natural black-brown sand
• 2 breakwaters constructed before 2000
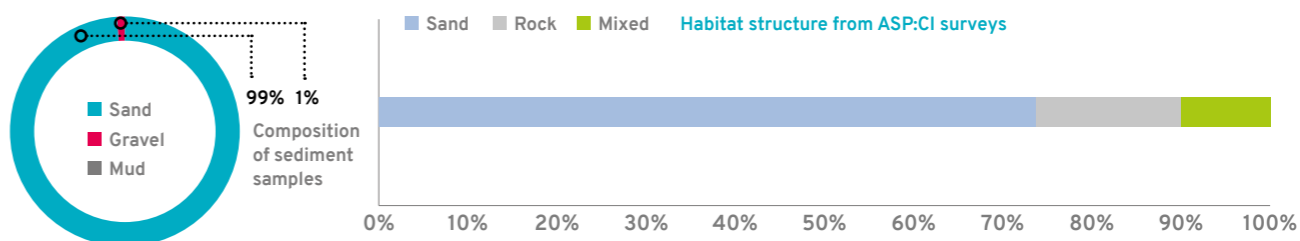• Within SAC No. 61_GC = Costa de Sardina del Norte

PLAYA DE SARDINA DEL NORTE (GC)

Potential NA
3 juvenile Angelsharks in ASP:CI Surveys; 2 citizen science sightings

Potential Threats:
1 non authorised outfall within 1km

Pollution:	☐ from recreational harbour
	☐ from nearby industry
Run-off:	☑ from urban area
	☑ from agricultural area
Disturbance:	☑ Popular for recreational angling
	☑ Large number of bathers
	☑ Popular diving site

Habitat Notes:
• Natural black-brown sand
• 1 breakwater constructed before 2000
• Identified as EU Bathing Water
• Within SAC No. 61_GC = Costa de Sardina del Norte

Sand
Gravel
Mud

99% 1%
Composition of sediment samples

Sand Rock Mixed   Habitat structure from ASP:CI surveys

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

PLAYA CHICA (LN)

Potential NA
5 juvenile Angelsharks in ASP:CI Surveys; 17 citizen science sightings

Potential Threats:
2 outfalls in process & 5 non-authorised outfalls within 1km

Pollution:	☐ from recreational harbour
	☐ from nearby industry
Run-off:	☑ from urban area
	☐ from agricultural area
Disturbance:	☐ Popular for recreational angling
	☑ Large number of bathers
	☑ Popular diving site

Habitat Notes:
• Natural grey-golden sand
• 2 breakwaters constructed before 2000
• Close to recreational harbour
• Identified as EU Bathing Water
• Within SAC No.1_LZ = Cagafrecho

■ unauthorised outfall
■ authorised outfall
■ unauthorised outfall in process

PLAYA FLAMINGO (LN)

Potential NA
6 juvenile Angelsharks in ASP:CI Surveys; 5 citizen science sightings

Potential Threats:
1 authorised outfall within 1km
Beach nourishment

Pollution: ☐ from recreational harbour
☐ from nearby industry

Run-off: ☑ from urban area
☐ from agricultural area

Disturbance: ☐ Popular for recreational angling
☑ Large number of bathers
☐ Popular diving site

Habitat Notes:
• Imported white-golden sand
• 2 breakwaters constructed before 2000
• Identified as EU Bathing Water

PLAYA HONDA (LN)

Potential NA
0 juvenile Angelsharks in ASP:CI Surveys; 5 citizen science sightings

Potential Threats:
1 authorised outfall, 2 outfalls in process & 2 non-authorised outfalls within 1km

Pollution: ☐ from recreational harbour
☑ from nearby industry (airport)

Run-off: ☑ from urban area
☐ from agricultural area

Disturbance: ☐ Popular for recreational angling
☑ Large number of bathers
☐ Popular diving site

Habitat Notes:
• Natural grey-golden sand
• Identified as EU Bathing Water
• Within SAC No. 2_LZ = Sebadales de Guasimeta

■ unauthorised outfall
■ authorised outfall
■ unauthorised outfall in process

PLAYA DE LAS VISTAS (TN)

Potential NA
3 juvenile Angelsharks in ASP:CI Surveys; 4 citizen science sightings

Potential Threats:
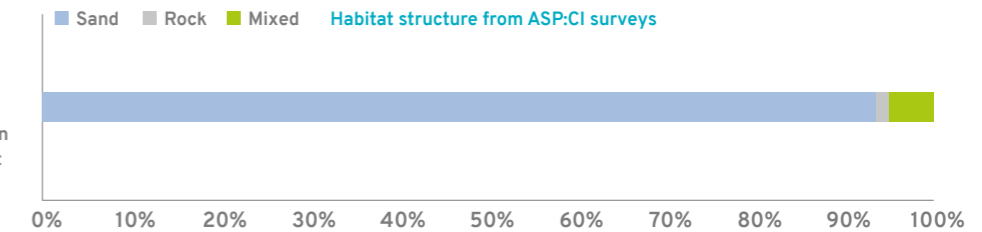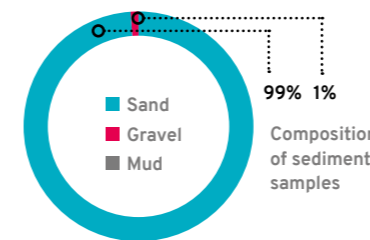2 authorised & 2 non-authorised outfalls within 1km
Beach nourishment

Pollution: ☐ from recreational harbour
☐ from nearby industry

Run-off: ☑ from urban area
☐ from agricultural area

Disturbance: ☐ Popular for recreational angling
☑ Large number of bathers
☑ Popular diving site

Habitat Notes:
• Imported grey-golden sand
• 2 breakwaters constructed in 1995
• Close to recreational harbour
• Identified as EU Bathing Water
• Within SAC No. 103_TF = Franja marina Teno - Rasca

■ Sand
■ Gravel
■ Mud

Composition of sediment samples

99% 1%

■ Sand ■ Rock ■ Mixed   Habitat structure from ASP:CI surveys

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

ANGEL SHARK PROJECT:
CANARY ISLANDS