

Review of the ¡Viva Vaquita! Campaign; Is it too late for the World's smallest cetacean?

By Laura Roberts

1.0. The ¡Viva Vaquita! Campaign

In September 2009 a coalition of concerned researchers and educators came together to form the ¡Viva Vaquita! Campaign (¡Viva Vaquita!, 2018). The Cetos Research Organization, Save the Whales Organization, and the American Cetacean Society is a collective of organizations committed to preventing the further demise and looming extinction of the vaquita porpoise (*Phocoena sinus*) (¡Viva Vaquita!, 2018). The campaign mission is to increase attention given to the vaquita by conducting research and educational activities which aim to generate awareness of the vaquita, protecting them from extinction (Table 1) (¡Viva Vaquita! 2018). The vaquita porpoise is a very small cetacean endemic to the Sea of Cortez (Gulf of California) which is home to approximately 100,000 people who live around its coastline (Barlow et al. 2010). The vaquita was declared as Critically Endangered in 1996 by the IUCN Red List; the vast decline in numbers (Appendix 1 & 2) is mainly due to accidental bycatch in gillnets meant for totoaba (*Totoaba macdonaldi*) and other fish species (American Cetacean Society, 2018; Bobadilla et al. 2011). There are currently 18 mature individuals left in the wild (IUCN Red List, 2017).

¡Viva Vaquita! collaborators coordinated with the Mexican government which recognised the vaquita as a species in danger of extinction in 1994; they conduct research to promote the development of alternative “vaquita-safe” fishing gear (American Cetacean Society, 2018; Bobadilla et al. 2011). This involves reward and compensation schemes for fishermen who give up gillnet fishing in the vaquitas range which can be considered as a landscape conservation approach to this issue. The Cetos Research Organization work mainly to develop a long-term photo-identification catalogue of vaquitas to better understand the social organization, movements and habitat requirements of the species linking to a population management approach (Cetos Research Organization, 2018). Research also investigates the feasibility of investigating the occurrence of dermal disease nutritional condition, and any injuries inflicted by anthropogenic factors (Cetos Research Organization, 2018). In addition, there has been an attempt at rescuing the vaquitas from the wild and holding them in safe sea pens, so they may reproduce in safety, however this was carried out by a separate organization (Vaquita CPR) and

unfortunately failed when one female died from stress leading the team to abandon their efforts (Vaquita CPR, 2018).

Table 1. All organizations and collaborators involved with the ¡Viva Vaquita! campaign including information about each associate and their contribution towards the campaign.

Organization	Overview	Contribution to the ¡Viva Vaquita! Campaign	Conservation Type
Cetos Research Organization	A non-profit organization conducting marine wildlife research, supporting educational efforts in conservation in the marine environment.	Education, community awareness and field research. Photographic identification (ID) research is led by Dr. Tom Jefferson. The photo ID research aims to learn more about the life history, movements, social organization and health status of the remaining vaquita porpoises.	Landscape scale and population management.
Save the Whales Organization	An organization with a mission to preserve and protect the ocean and its inhabitants with focus on rescue efforts for cetaceans caught in fishing nets and ending whaling for good.	Photo identification research led by Dr. Tom Jefferson. It is believed that the attempt to build awareness of the vaquita and its demise is due to a lack of photographic imagery of the porpoises in the wild.	Population management.
American Cetacean Society	A non-profit organization recognized as the first cetacean conservation group dedicated to the education, research and conservation issues concerning cetaceans.	Collaborating as part of the ¡Viva Vaquita! campaign with the aim to provide long-term quality of life benefits to fishing communities and local residents to the Sea of Cortez and coordinating with the Mexican Government and researchers to promote the development of alternative fishing gear.	Landscape scale.
Muskwa Club	A non-profit California corporation with a mission to advance technological, environmental, and social progression.	Collaborating as part of the ¡Viva Vaquita! campaign, providing petitions formed to protect the vaquita and general information for the public to spread awareness.	Landscape scale.

Table 1 continued.

Organization	Overview	Contribution to the ¡Viva Vaquita! Campaign	Conservation Type
Oceanographic Environmental Research Society (OERS)	A society committed to responding to catastrophes and conserve and protect marine life and natural habitats via research, education, rescue and rehabilitation.	OERS have funded research about the vaquita to increase knowledge and awareness of the species. Papers include: 'Vaquita (<i>Phocoena sinus</i>) – The little known porpoise' and 'Saving the Vaquita: Are we doing all we can? Workshop Report Summary'.	Landscape scale.
V-Log	A blog ran by Aidan Bodeo-Lomicky providing updates, artwork, facts and poetry about the vaquita porpoise.	Bodeo-Lomicky spread awareness by sharing news, petitions, videos and photographs relating to the vaquita. He also spread awareness about "International Save the Vaquita Day".	Landscape scale.

Adapted from: ¹American Cetacean Society, 2018; ²American Cetacean Society, 2018; ¹Cetos Research Organization, 2018; ²Cetos Research Organization, 2018; ³Cetos Research Organization, 2018; Jefferson, 2018; Save the Whales, 2018; V-log, 2018; OERS, 2017; ¹Muskwa Club, 2016; ²Muskwa Club, 2016; Belanger, Askin & Wittnich, 2015; Jefferson, 2011.



Plate 1. A photograph of a vaquita porpoise in the wild; one of many contributing to the photo-identification research led by Dr. Tom Jefferson (2018). Individual vaquitas can be identified using the shape of their dorsal fins.

2.0. Appraisal

2.1. *International Save the Vaquita Day*

¡Viva Vaquita! hosted the first International Save the Vaquita Day (ISTVD) in July 2016. ISTVD is a major annual event which focuses on raising awareness of the vaquita with a primary goal to encourage people to act by getting involved with petitions, education, conservation and by making donations towards conservation efforts (¡Viva Vaquita!, 2018). The main event usually involves booths, life-size models of vaquitas, games, music, free prizes, educational brochures and inspirational talks. Each year has a theme with the ISTVD 2018 focusing on the permanent ban of gillnets in the Sea of Cortez. ISTVD can be considered a conservation education program; conservation education programs involve a variety of methods including presentations of conservation issues, practices and concerns with many initiatives combining outdoor activities with creative and emotional involvement which may have successful results in achieving pro-conservation behaviour from targeted individuals (Shwartz et al. 2012). Since ISTVD was first implemented, a petition for the ban of gillnet use in the Sea of Cortez was put to Mexican Government officials and the motion passed. This highlights the importance of generating public awareness for conservation issues such as the pressures facing the vaquita porpoise. If ISTVD was not in action, it may be likely that far fewer people would have been reached to sign the petition and it may not have been passed to government. However, a gillnet ban does not necessarily mean the end of gillnet use or true protection of the vaquita porpoise.

2.2. *The Gillnet Ban*

¡Viva Vaquita! proposed and achieved a permanent gillnet ban in the vaquitas natural range in 2017 to aid in the species recovery (Bessesen, 2018), however, the enforced abandoning of one fishing method will likely result in the increased use of others such as trawl-based fishing; fishing income is critical to the economy of the adjacent villages to the Sea of Cortez (Jaramillo-Legorreta et al. 2016). Once gillnets were banned, shrimp trawling became the main fishery in the Sea of Cortez; a species targeted for consumption in the USA (Bessesen, 2018). Shrimp are commonly caught using trawl-nets. Trawl-based fisheries are known to damage seafloors, and if used as a replacement for gillnets, may threaten the integrity of the ecosystem in other ways, thus, upsetting the balance further (Aburto-Oropeza et al. 2017; Schratzberger et al. 2002). In

addition, trawl-based fisheries have been found to be less efficient regarding total catch and will cost fishermen more money in fuel to run (Aburto-Oropeza et al. 2017). On the contrary, trawl-nets are regularly monitored, unlike gillnets which can be left for days at a time, resulting in the deaths of many species (Geoffrey & Fiorenza, 2011). This paradigm will likely result in the illegal use of gillnets to save fishermen money, making the ban futile. To combat this issue, lobbied governments could provide subsidies to support the fishermen, however, long-term government support is seldom guaranteed (Aburto-Oropeza et al. 2017). This undoubtedly is an irresistible offer to fishers with low-incomes with families to feed. In theory a gillnet ban is the answer to the vaquitas problems however, for it to be successful, all parties and stakeholders need to support and abide by it. The Mexican Fishing Authorities, commonly known as Pesca, refused to support the gillnet ban and thus would not allow the permits for alternative fishing gear for fishers to use, leaving them at a loss (Bessesen, 2018). Pesca claims that gillnets are in fact not responsible for the vast decline in vaquita numbers; their motivation to deny this scientific fact is because if they acknowledge that gillnets are killing vaquitas, they will have to acknowledge every other species caught accidentally in gillnets as bycatch and therefore be held responsible (Bessesen, 2018). The alternative livelihoods for fisherman are few, however, if governments invest in superior education training around the Sea of Cortez, livelihood options would increase; alternative livelihoods include sports fishing tourism and other service industry activities.

2.3. Working with the Mexican Government

¡Viva Vaquita! work with the Mexican Government to aid in the vaquitas recovery, however, the Mexican Government has been criticized for forming methods of conservation on inadequate information which were designed to fail (Cantu-Guzman, Oliver-Bonilla & Sanchez-Saldana, 2015). For example, totoaba fisheries were banned in 1975, however, according to Cantu-Guzman, Oliver-Bonilla & Sanchez-Saldana (2015), it took the Fishery Ministry another 18 years to ban the gillnets associated with this fishery. It is also stated that a fishing ban was implemented in the core area of the Sea of Cortez to protect the vaquita when in fact the vaquita is rarely sighted here and are mainly distributed in the buffer zone which is not a protected area (Cantu-Guzman, Oliver-Bonilla & Sanchez-Saldana, 2015). The Mexican Government implemented three zones to protect the vaquitas: 1) the Biosphere Reserve in

1993, 2) the Vaquita Refuge in 2005 and 3) the Gillnet Exclusion Zone in 2015 (Fig 1). The Biosphere Reserve was the first effort implemented to protect the vaquitas by restricting fishing within its range, however this zone had no enforcement by the authorities (Bessesen, 2018), thereby making it a 'paper park' (Blackman, Pfaff & Robalino, 2004). Therefore, those breaking the law by fishing in this restricted zone may not feel threatened by law and fear no consequences for their actions. It is also important to state that the majority of the Vaquita Refuge area is situated outside of the Gillnet Exclusion Zone (made permanent in 2017). All these points considered, it is unlikely that these zones are as successful in action as they seem on paper.

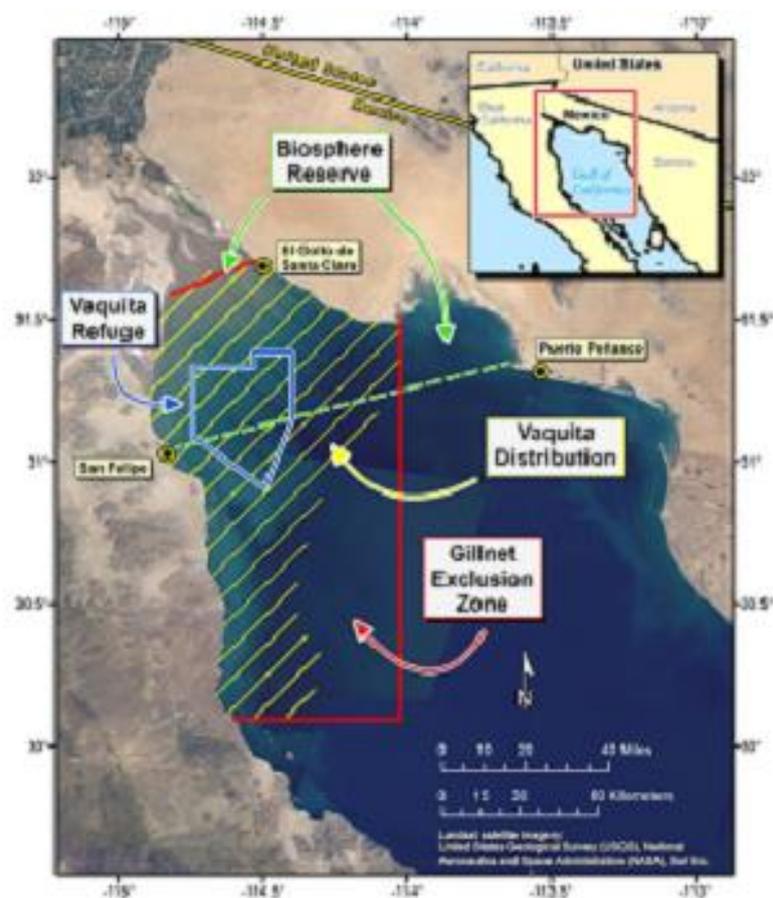


Figure 1. Satellite view of the Sea of Cortez (National Oceanic and Atmospheric Administration (NOAA) Fisheries, 2017). Vaquita distribution is illustrated by yellow crosshatching. The gillnet exclusion zone is within the area bordered by the red line. The Vaquita Refuge is outlined in blue.

2.4. *The Illegal Totoaba Trade*

Illegal gillnet fishing is mainly driven by the Chinese market for totoaba swim bladders (alleged medicinal benefits), with reports of fishers receiving US\$4,000 per lb. of totoaba swim bladder on the black market; a high price in comparison to the \$9 per lb. earned for jumbo shrimp (*Caridea*) (Bessesen, 2018; Jaramillo-Legorreta et al. 2016; (Tuuli, et al. 2016). The dried seafood is smuggled from Mexico to Asia through the USA and is a multi-billion-dollar market; the same market which trades ivory, rhino horn, tiger bone and pangolin scales) (Bessen, 2018). Although the permanent banning of gillnets in the vaquitas range is a positive step, while the lucrative demand for totoaba swim bladder remains, the vaquita will surely remain under threat. Promises made by the Mexican Government to increase penalties and make illegal wildlife trade a felony have not materialized (Taylor et al. 2016). It is speculated by locals that even the armed forces are corrupt and hold stakes in the totoaba market (Bessesen, 2018). Therefore, until the demand for totoaba is reduced or eradicated and the Mexican Government enforces strict punishment for the fishing, sale and possession of totoaba, and the gillnets associated, the vaquita will remain in danger. The lucrative trade of totoaba fish remains a defining issue related to the demise of the vaquita porpoise and is certainly a factor which will decide the fate of the most endangered cetacean if not eradicate. This is something which cannot be tackled within the vaquitas range or by Mexican Government alone. With the Chinese Black Market offering such high prices for one swim bladder, it seems unlikely that conservationists and government officials could offer fishers anything of the same value to stop the illegal market.

3.0. **Recommendations**

An action that can be taken by ¡Viva Vaquita! is to expand their campaign efforts to China and target populations likely to buy totoaba swim bladders. The ¡Viva Vaquita! campaign should focus on educating totoaba bladder buyers of the negative impacts this trade is having on not one, but two endangered species in the Sea of Cortez. Using celebrity status as a driving force in conservation campaigns has worked in the past. Yao Ming (famous NBA star) spoke publicly about the impacts shark fin soup were having on shark populations around the world resulting in a decrease in demand for the soup (Appendix 4) (Wild Aid, 2017). Viva Vaquita can follow suit and recruit another Chinese star to help influence

consumers of totoaba to its effects in the Sea of Cortez and on the vaquita porpoise. The Mexican Government need to police airports and harbours.; shipments leaving Mexico and entering China need to be monitored, and anyone caught with totoaba swim bladders in their possession must be prosecuted; training should be provided for airport and harbour workers to learn to correctly identify totoaba swim bladders in transit (Bessesen, 2018).

An economic strategy to stop the illegal totoaba trade with many benefits is the creation of a legal and regulated totoaba trade (Juarez, Konietzko & Schwarz, 2016). Totoaba conservationists have been breeding this species in captivity and releasing it into the wild, resulting in population booms This was seen by cartels as a business opportunity which led to a spike in illegal totoaba fishing, therefore making the breeding effort fruitless. If an aquaculture program is created to farm totoaba for meat and swim bladders, the demand for fishers to poach from the wild would reduce, if not disappear. Additionally, totoaba poachers will be provided new jobs working on totoaba farms, and the demand from the black market will be satisfied with no wild species harmed in the process (Bessesen, 2018). The problem with this theory is that it cannot be acted upon due to the totoabas' status as Critically Endangered under CITES and the IUCN Red List (IUCN Red List, 2007). For totoaba farming to occur CITES must down-list totoaba (Bessesen, 2018). Viva Vaquita can expand their efforts to campaign for this solution to come into action and gather supporters to enforce it.

Even with a collaboration of 6 organizations ran by passionate people, associated dedicated researchers, and the Mexican Government, the vaquita porpoise remains in decline with the most recent population count at just 18 individuals (IUCN Red List, 2017). Gillnets have been banned, however totoaba fishing continues in the Sea of Cortez. The Chinese appetite for illegal totoaba swim bladders is ferocious as ever, and local Mexican fishermen remain desperate for money despite government buy-out schemes. It seems, considering all ¡Viva Vaquitas! efforts, the future of the vaquita porpoise remains in jeopardy, and without drastic action across nations, the extinction of the world's smallest cetaceans is likely to come to fruition.

4.0. References

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5.0. Appendices

Appendix 1. Timeline of the key events of the conservation of vaquita porpoises.

Appendix 2. Graph illustrating population numbers of vaquita porpoises.

Appendix 3. Stakeholders affected by the conservation of the vaquita porpoise in the Sea of Cortez.

Appendix 4. Celebrity campaign used to educate shark-fin soup consumers and prevent further consumption.

Appendix 1.

Timeline of the key events of the conservation of vaquita porpoises.

Date	Key Events
1940's	<p>The first recorded entanglement of vaquitas in gillnets.</p> <p>Totoaba resources were in decline resulting in the increased use of artisanal gillnets and shrimp-trawling; these are the main threats to vaquitas. Although vaquitas were not known by science at this time, the current threats existed within the area.</p> <p>Totoaba fisheries were at the route of fishing communities with seaside fishing camps forming specifically to harvest totoaba swim bladders for the Chinese market</p>
1950's	<p>The vaquita was first discovered by scientists. A bleached skull was found on a beach in the North of Punta San Felipe in Baja California, Mexico.</p> <p>Vaquita mortality by gillnets have been documented since at least the 1950's.</p>
1970's	Sease in the trade of totoaba meat shipped and sold in the USA.
1975	Totoaba fisheries were officially closed due to their endangered status.
1980's	The demise of the vaquita was recognized however, very little efforts were made by government officials to implement conservation measures.
1986-1988	Aerial surveys were conducted to estimate the vaquita population by Barlow, Silber & Gerrodette (1997) who concluded a population decline of 18% per year.
1992	The Mexican 100-peso commemorative coin shows early political support of vaquita conservation.
1993	The first fishing restrictions to protect the vaquita were implemented by establishing the Biosphere Reserve however, this has little enforcement.
1994	The Mexican Government recognises the vaquita as a species in danger of extinction.
1995-2004	Twenty-two vaquitas were reported dead by fishers and government field personnel and 11 carcasses were recovered.
1996	Declared as Critically Endangered by the IUCN Red List.
1997-2007	<p>Acoustic monitoring was carried out for 10 years of the vaquitas echolocation clicks which revealed a population decline of 8.7% per year during this period.</p> <p>Population count of 567 vaquitas with a mortality rate at 39-84 per year.</p>
2005	The Vaquita Refuge which (800 square miles of core vaquita habitat) was established which includes a gillnet ban within the zone.
2006	The extinction of the baiji river dolphin (<i>Lipotes vexillifer</i>) was announced making the vaquita the most endangered cetacean in the world.
2007	Vaquita population estimated at 150 individuals.

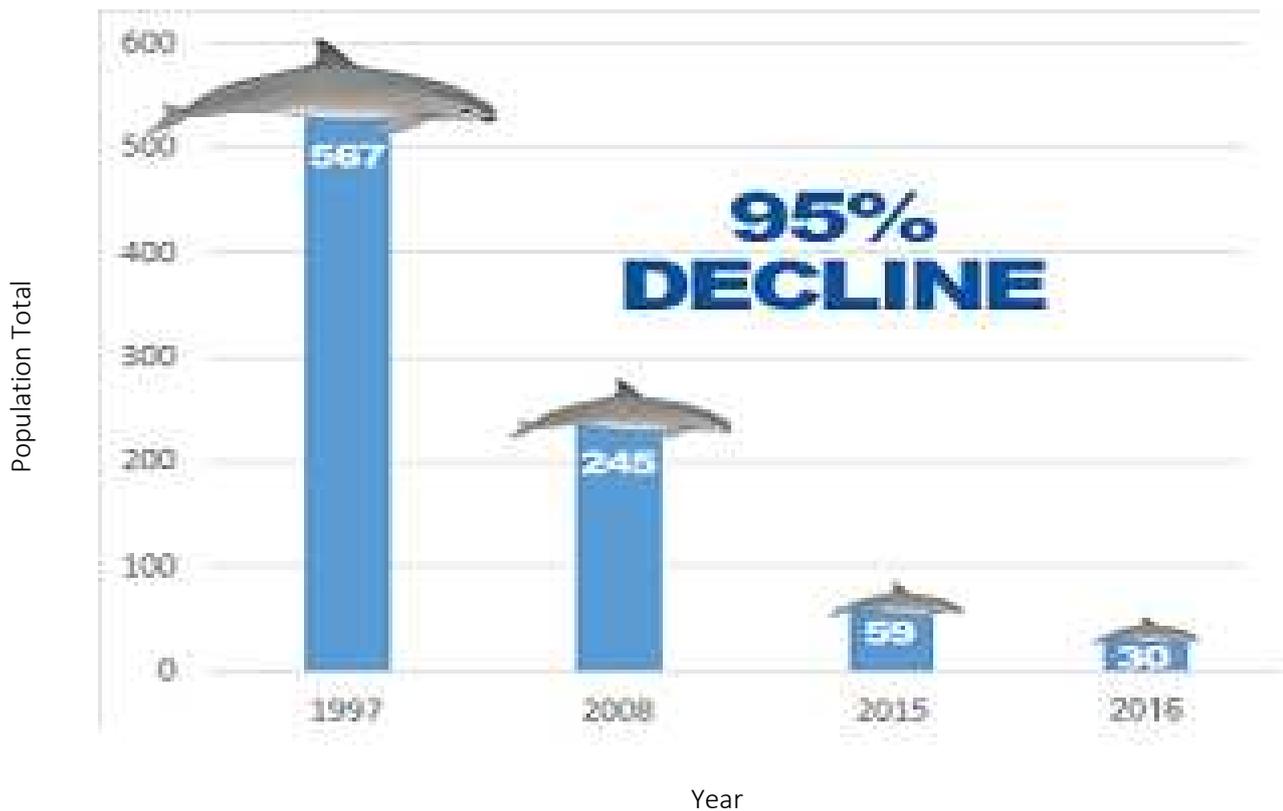
Timeline of the key events of the conservation of the vaquita porpoise continued.

Date	Key Events
2008	<p>PACE Vaquita was implemented as the first effort by the Mexican Government to prevent vaquita extinction. PACE Vaquita sought to preserve the vaquita by compensating fishermen for voluntarily switching to vaquita-safe fishing methods, temporarily reducing fishing efforts, or permanently quitting fishing.</p> <p>Vaquita population estimated at 245 individuals.</p>
2012	<p>PACE Vaquita had been operating for 3 years and the Mexican Minister of Environment announced that the vaquita was on the path to recovery.</p> <p>Acceleration of totoaba swim bladder smuggling.</p> <p>Captive totoaba were released resulting in a population boom. This was recognized by the cartel as a business opportunity.</p>
2013	<p>Vaquita population estimated at 200-245 individuals.</p>
2014	<p>Vaquita population estimated at 97 individuals.</p>
2015	<p>Fewer than 59 individual vaquitas remain.</p> <p>The Gillnet Exclusion Zone was implemented.</p> <p>The Sea Shepard began to actively patrol for illegal gillnets in the vaquitas natural range.</p>
2016	<p>International Save the Vaquita Day was established by ¡Viva Vaquita!</p> <p>Vaquita population estimated at 30 individuals.</p>
2017	<p>Dr Tom Jefferson began the photo identification of the vaquita and named individuals such as “Ana”. Ana was recorded in 2017 and 2018 highlighting the importance of this research.</p> <p>Permanent gillnet ban was implemented.</p> <p>Vaquita CPR attempt to rescue wild vaquitas to place in a sea sanctuary pen. This was abandoned after one female dies and other showed signs of stress.</p> <p>Vaquita population estimated at 18 individuals.</p>
2018	<p>The Mexican Fishing Authorities announce after years of refusal that they will permit new vaquita-safe and alternative fishing gear however, permits are not currently issued.</p>

Adapted from: American Cetacean Society, Anonymous, 2018; 2018, Bessesen, 2018; Jefferson, 2018; Save the Whales, 2018; Vaquita CPR, 2018; ¡Viva Vaquita!, 2018; IUCN Red List, 2017; NOAA Fisheries, 2017; Bodeo-Lomicky & Whittenbury, 2015; Cantu-Guzman, Olivera-Bonilla & Sanchez-Saldana, 2015; Avila-Forcada, Martinez-Cruz & Munoz-Pina, 2012; Bobadilla et al. 2011; Barlow et al. 2010; Barlow, Silber & Gerrodette, 1997.

Appendix 2.

This graph (NOAA Fisheries, 2017) is based on the visual and acoustic data collection represented by three large vessel sighting surveys depicted by the first three dates (Bessen, 2018). Collaborated acoustic data from long-term acoustic studies formed the fourth date. Visual and acoustic data collection are the main types of population monitoring for the vaquita led by Dr. Tom Jefferson. ¡Viva Vaquita! provides funding for this research.



Appendix 3.

Stakeholders affected by the conservation of the vaquita porpoise in the Sea of Cortez.

Stakeholder	Relationship to Conservation Efforts
Fishers and Local Communities to the Sea of Cortez	<p>The communities surrounding the Sea of Cortez suffer from low wages and poor law enforcement making corruption money attractive. It is understandable that they feel frustrated; they cannot fish, they cannot trust their government to protect them from cartels, crime and drug addiction are on the rise (Calderon, Rodriguez Ferreira & Shirk, 2018), and the only profitable livelihood is poaching.</p> <p>For fishers to afford equipment for totoaba poaching, fishers must take money loans from the cartel which ultimately leaves them in debt. Even if fishers want to leave the illegal totoaba trade and pursue an honest career, they will be unable to due to the pressures of owing money to dangerous and powerful organizations.</p> <p>Not all fishers are corrupt. Alternative livelihoods such as collecting illegal gillnets from the Sea of Cortez and helping scientists by deploying c-pods (click detection and passive acoustic monitoring equipment) are rising in popularity.</p>
Conservationists	All conservationists want the same outcome, to prevent the extinction of the vaquita porpoise, however they are fighting against an ongoing war of corruption, power and poverty.
Totoaba Consumers	If the IUCN Red List status of totoaba is down-listed and totoaba are commercially farmed prices, totoaba will be available to consumers with little to no black market involvement. This will also reduce the mortality of wild species that are entangled in gillnets.
Government Officials	<p>A lack of support by the Mexican Fishing Authorities for the gillnet ban and alternative fishing gear has left fishers without work which makes earning money through corruption tempting.</p> <p>Locals believe corruption in the Mexican government travels as high as the armed forces.</p> <p>Protected areas for vaquitas established by the Mexican government are not enforced making them nothing but paper parks.</p>

Adapted from: Bessesen, 2018; Oliver-Bonilla & Sanchez-Saldana, 2015; IUCN Red List, 2007.

Appendix 4.

A campaign poster aimed at shark-fin soup consumers in Asia supported by NBA star Yao Ming (Leo Sigh, 2018). This campaign resulted in a decrease in shark-fin soup consumption (82% decline in shark-fin sales and 85% of Chinese consumers surveyed gave up shark-fin soup) (Wild Aid, 2017). Viva Vaquita could campaign in a similar way for the vaquita porpoises.

YAO SAYS NO

Yao Ming has taken a stand against the delicacy shark fin soup, and so should you.

保護鯊魚
PROTECT THE SHARKS
向魚翅說不

Refuse to eat shark fin soup.
73,000,000 sharks a year end up in shark fin soup. Many are "finned" wasting 95% of the animal.

WHEN THE BUYING STOPS,
THE KILLING CAN TOO

www.wildaid.org

WILDAID