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Report using expert elicitation to estimate total unique vaquitas and calves seen in the Zero Tolerance Area during the 2021 survey

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Report using expert elicitation to estimate total unique vaquitas and calves seen in the Zero Tolerance Area during the 2021 survey

Lorenzo Rojas-Bracho[1], Cormac Booth[2], Barbara Taylor[3], Len Thomas[4], Armando Jaramillo-Legorreta[5], Sarah Mesnick[3], Tim Gerrodette[3], Annette Henry[3]
1: Proyecto PNUD-Sinergia en la Comisión Nacional de Áreas Naturales Protegidas, Ensenada, B.C. México; 2: SMRU Consulting, St Andrews, Scotland; 3: Southwest Fisheries Science Center, La Jolla, CA USA; 4. Centre for Research into Ecological and Environmental Modelling, University of St Andrews, St Andrews, Scotland; 5: Comisión Nacional de Áreas Naturales Protegidas, Dirección Regional Península de Baja California y Pacífico Norte

1. Executive Summary

Between October 17 and November 3, 2021 surveys were conducted from two ships (R/V *Narval* and M/V *Sharpie*). Surveys concentrated within the Zero Tolerance Area (ZTA), a rectangle of about 288 km^2 or roughly 12 by 24 km. Passive acoustic data continue to indicate that the ZTA is the area used as primary habitat by vaquitas. Experienced observers found and tracked vaquitas with methods developed for the earlier effort to capture vaquitas in 2017. A total of 8 sightings were made during 48 hours when winds were low enough to sight and track vaquitas.

There were no photographs taken of the quality needed to identify individuals and hence to estimate population size within the study area using mark-recapture; instead expert elicitation was used to estimate the number of unique calves and unique vaquitas (including calves) seen during the survey. Note that the target quantity is different – the number seen is an estimate of minimum population size and does not attempt to account for animals missed during the survey. This report summarizes results from the expert elicitation, which used the Rational Impartial Observer method (EE-RIO). The EE-RIO exercise required all experts to take 3 hours of online training and to read the evidence dossier covering the 8 vaquita sightings. Elicitation was facilitated over a 2-day period using video-conferencing for a total of 6 hours. Experts independently determined their lowest and highest plausible values for number of unique calves and unique total vaquitas. Each expert generated a distribution using probability points and then was asked to verbally give his/her rationale verbally. Facilitators led a discussion towards a consensus distribution that the group believed would represent the view of a Rational Impartial Observer (RIO) who had seen the individual distributions and listened to the discussion. Experts agreed that a RIO would estimate that there was a nearly equal chance that one or two calves were seen, with a very small chance of three (Figure 4.1). Experts agreed there was no chance that zero calves were seen. The median of the elicited distribution for number of calves seen was 1.5. Experts agreed that a RIO would judge, based on the discussions, that it was implausible that the true number of vaquitas sighted was less than 5 or more than 13, with a 0.78 probability there was between 6 and 10 vaquitas. The median of the elicited distribution for total animals seen was 8 (Figure 4.2).

2. Introduction

2.1. Summary of rationale for developing visual/acoustic survey method.

The decline in vaquita numbers has been well documented. The first effort to cover the full vaquita distribution used visual line-transect methods (Jaramillo-Legorreta et al. 1999). This effort noted the difficulty in sighting this species because of small group size, inconspicuous surfacings and avoidance of the survey vessels. Imprecise abundance estimates raised concerns about timely detection of potential declines in abundance (Taylor and Gerrodette, 1997). Acoustic monitoring methods were developed to increase precision of estimating both abundance and trends in abundance (Jaramillo-Legorreta et al. 2016), and a combination of visual and acoustic methods were used to estimate vaquita abundance in 2008 (Gerrodette et al., 2011) and 2015 (Taylor et al., 2016). Acoustic monitoring indicated that the vaquita population continued to decline rapidly, about 48%/year, through 2018 (Thomas et al. 2017, Jaramillo-Legorreta, et al. 2019).

Recent developments, however, have made both acoustic monitoring and visual line-transect methods difficult. Illegal fishermen have removed the acoustic detectors (CPODs) used to record vaquita clicks. The data recorded on each device is lost, and it is expensive to replace the stolen CPODs. Unless enforcement of the fishing ban is effective and the theft of equipment is stopped, acoustic monitoring of the vaquita population using previously successful methods is so difficult that alternative approaches are necessary.

Visual line-transect methods face a different problem. The number of vaquitas is now so low that the number of sightings is not sufficient to estimate the parameters necessary to estimate abundance. If a line-transect survey was carried out utilizing the same ship as in past surveys (the R/V *David Starr Jordan/Ocean Starr*), an estimate of abundance would be possible with relatively few sightings, because the probability of detection, one of the key parameters in lin transect models, has been estimated for this ship. However, chartering this vessel and hiring experienced observers for the necessary time would be expensive, at least US$3,000,000 for a survey. Because such funds for a full survey were not available, the size of the 2021 vaquita population could not be estimated using line-transect methods.

Faced with these difficulties, vaquita researchers have turned to photographic identification, which requires high quality photographs to identify individual vaquitas. Photographic identification of vaquitas began in 2008 (Jefferson et al. 2009). Opportunistic efforts resumed in 2017 during the VaquitaCPR effort. CIRVA, the international vaquita recovery team, recommended using photo-identification methods to produce an estimate of minimum abundance, and to refine our understanding of aspects of vaquita life history, potentially including birth and death rates.

2.2. Summary of 2018, 2019 and 2021 research

In September 2018 a 7-day photo-identification effort produced the first evidence that vaquitas could calve annually (Taylor et al. 2019) and showed that a minimum of 6 healthy animals remained in a small area near San Felipe, Mexico. This minimum was the number of animals seen simultaneously and was influential in the abundance estimate for that year (Jaramillo-Legorreta et al. 2019).

Two short efforts focused on photographic identification were conducted in 2019. Full details of the 2019 field effort are available in the survey report and the Expert Elicitation report (Rojas-Bracho *et al.* 2019, Rojas-Bracho et al. 2020).

In 2021 a survey took place between October 17 and November 3 to estimate the number of unique vaquitas (including the numbers of unique calves) seen in the Zero Tolerance Area (ZTA). The Government of Mexico agreed to strictly enforce a region-wide ban on fishing with gillnets within the ZTA where the remaining vaquitas are concentrated. Most of the 2021 survey was conducted in this area. Two ships (the R/V Narval with observer eye height of 7.7m and the M/V Sharpie with observer eye height of 8.1m) used experienced observers to find and track vaquitas with methods developed during an earlier effort to capture vaquitas in 2017 (Rojas-Bracho et al. 2019). There were only 5 full days when winds were low enough (Beaufort 2 or less) to sight and track vaquitas. Vaquitas were seen on 5 days. Rojas-Bracho et al. (2021) give further survey details.

2.3. Description of Expert Elicitation using Rational Independent Observer (RIO) process (EE-RIO)

Expert elicitation (EE) is a formal technique by which available data can be combined with expert judgements to derive probabilistic distributions on quantities of interest. It was first developed in the 1950s and 60s (Brown 1968, O'Hagan et al. 2006) and is now widely applied, including in ecology and conservation, where there is a relative lack of data but an urgent need for conservation or management decisions (Runge et al. 2011, Martin et al. 2012). Specifically, Morgan (2014) indicates: *"Expert elicitation should build on and use the best available research and analysis and be undertaken only when the state of knowledge will remain insufficient to support timely informed assessment and decision making".* Martin et al. (2012) describe how this technique can be used to access substantive knowledge on particular topics held by experts and such techniques have been discussed and used widely recently (e.g. MacMillan and Marshall 2006, Aspinall 2010, Knol et al. 2010, European Food Safety Authority 2014, Sivle et al. 2015), including in the assessment of risks from climate change (Lenton et al. 2008) and future sea level rise (Bamber and Aspinall 2013). The technique can also be used to translate and combine information obtained from multiple experts into quantitative statements, while minimizing bias in the elicited information, and ensuring that uncertainty is accurately captured. The formal process of expert elicitation aims to address many of the well documented problems, heuristics and biases that arise when the judgements of only a few experts are canvassed or where expert knowledge is sought in an unstructured matter (Kynn 2008, Kahneman 2011, Morgan 2014). In the field of marine mammals, a number of elicitations have been conducted in recent years involving the project team and seeking to improve the methods for marine mammal issues (Booth et al. 2016, Tollit et al. 2016, Booth and Heinis 2018, Booth and Thomas 2021). The approach used to elicit experts' beliefs to quantify what was seen in the 2019 and 2021 survey is described below in 2.3.1. Experts and the exercises in which they participated are given in Appendix 1.

The objective of an EE is to construct a probability distribution to accurately represent the knowledge and beliefs of an expert or group of experts regarding a specific Quantity of Interest (QoI), which has a true but unknown value 'X'. In the variant of EE used here, a two-stage process was employed.

First, each expert was asked independently to provide their individual judgements on the plausible limits and to distribute 40 "probs" among the plausible integer values. The plausible limit was defined such that it may be theoretically possible for the true value of X to lie outside these limits,

but that the expert would regard it as extremely unlikely that X was outside this range. Experts sent their personal judgements to the facilitator.

Second, a facilitated group meeting took place, with the aim of reaching a consensus distribution. All experts' individual judgements were shown to the group, in an anonymized manner. Experts were invited to justify their judgements, particularly those that were divergent, to ensure that the range of judgements had been discussed openly. Following this, the group was asked to reach a 'group consensus' judgement (in the form of a consensus distribution using the 40 probs). It is important to note here (and stated clearly to experts), that there was no expectation that the experts would reach complete agreement on a probability distribution for our QoI. That is because it is unlikely that there is one single distribution that would be accepted as perfectly representing the opinion of all experts. Instead, experts are asked to discuss and agree upon a distribution representing the reasoned opinions of a theoretical external observer, called a Rational Impartial Observer (or RIO), who was party to all of the information and discussions that had taken place. The RIO would not have identical views to any one of the experts but would instead find some merit in all the differing arguments or justifications – and give some weight to each. A starting point for this consensus distribution was the arithmetic average of the individual judgements, but the final distribution is typically (and was in both cases here) different from the start point.

3. Methods

Expert eliciation relies heavily on an evidence dossier that gives all experts the same information upon which to base their judgements. The dossier was written for each sighting the evening after the sighting was made. Observers on both ships read the narratives of those who saw the vaquitas and suggested other observations that would help them fully understand what had been seen. These narratives together with photographs, videos and maps were compiled into the evidence dossier used in the elicitation (Appendix 2).

In November 2021 an expert elicitation was conducted and facilitated by Cormac Booth (SMRU Consulting) and Len Thomas (Centre for Research into Ecological and Environmental Modelling (CREEM) University of St Andrews). This pair has developed expert elicitation approaches for marine mammal issues and facilitated many similar elicitations in recent years (e.g., Booth & Thomas, 2021). The experts consisted of 11 observers/recorders, all of whom remained on November 4 (Appendix 1). Experts participated in this exercise in 2 sessions, on November 4 and November 19, totaling 6 hours. Observers were given the same vaquita sighting summary that was now called an 'evidence dossier' (Appendix 2). All experts took the expert elicitation training (https://smruconsulting.com/?page_id=12926).

The expert group discussed and agreed to provide their judgements for the following QoI:

1. How many unique individual vaquitas were sighted during the 2021 survey (including adults, juveniles and potential calves)?
2. How many unique individual calves (only) were sighted during the 2021 survey?

To avoid linguistic uncertainty, the definition of a calf for the purposes of the elicitation was:

"*While calves are biologically defined as less than one year old, age cannot be determined in the field. Therefore, inferences about whether an animal is a calf is determined through a combination of size (as compared to the other member of the pair) and behavior. Vaquitas in October are roughly 6 months old and therefore the size can be both small and only slightly*

smaller than the adult. The dorsal fin may appear only slightly smaller. Because of this, the behavior is also key. Dependent calf behavior is to surface within one body length and slightly behind the mother. With more time observed with a pair in this conformation (larger individual in the lead followed by a smaller individual within a body length), confidence that the pair is a cow/calf increases. However, because October is roughly the time of weaning, the calf can be expected to be more independent and may not always be in this position. The evidence dossier uses both the term 'calf' and the term 'juvenile'. It is assumed that observers using the term 'calf' had confidence that they were observing the behavior above. Use of the term 'juvenile' indicates less confidence but definitely does not preclude that the smaller individual could have been a calf."

Booth served as the primary facilitator with Thomas assisting with statistical input and advice. Prior to the first meeting, the experts input their personal judgements into a spreadsheet which was sent to the facilitator. At the meeting, the facilitator then presented the anonymized individual judgements of all experts to the group and had each observer give her or his rationale for each question (question 2 on calves considered on the first day of discussion and question one on the second and final day). To obtain the RIO distribution, an initial distribution was drawn summarizing the views across the panel of experts (using an arithmetic average of individual probs). From there the distribution of amalgamated results was critically assessed, beginning with a re-examination of the lower and then upper plausible values. It was clear among the experts that the primary drivers in judgements were the lower and upper estimates of the total number of animals sighted by the observers during the 2021 survey, the photos of some of the sightings, the descriptors of animals sighted – which was critical in assessing the potential for resighted animals. Candidate final distributions were rigorously assessed and critiqued from the perspective of what a RIO would think.

4. Results

Details of the survey (Rojas-Bracho et al. 2021) show no photographs of the quality needed for photographic identification were taken. All sightings were of short duration, the longest being 24 minutes compared with the two sightings with photographically identified vaquitas in 2019 that lasted 59 and 48 minutes. Many of the sightings were on a single day (October 22), but without good photographs, even these sighting could have been all or mostly resights of the same vaquitas (see details in the evidence dossier, Appendix 2).

Experts discussed the main possible mechanisms or drivers for their differing views of the number of calves sighted. The main drivers were regarding the true number of animals in a group (which experts agreed was affected by the length of the sighting) and the potential for resighted animals (particularly given the intense spatial coverage of the survey). Critically, experts were comfortable eliminating 0 as a potential lower plausible value (this discounts the possibility that no calves were seen during the survey). Experts had varying judgements regarding the upper plausible limit, but agreed that a RIO would agree that 3 calves was a small but plausible value. This was due to a widespread belief that many sightings were both short in duration and distant such that calves could have been missed. Experts agreed that a RIO would estimate that there was a nearly equal chance that one or two calves were seen with the median value being 1.5 (Figure 4.1). There was no chance that zero calves were seen and a very small chance that there were 3 calves seen.

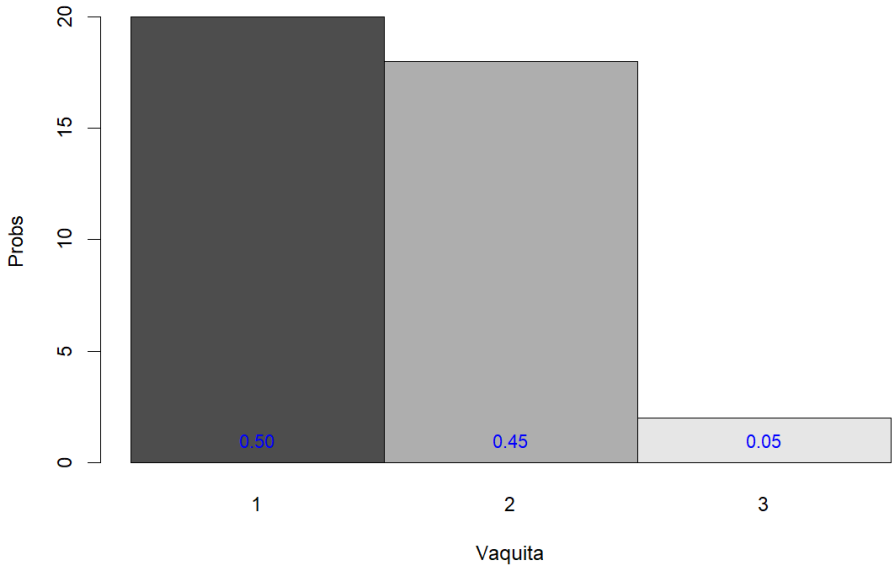

Figure 4.1 – The elicited probability distribution for the number of unique vaquita calves sighted during the 2021 survey with the number of probability points (out of 40) on the vertical axis, the number of calves on the y-axis and probabilities in blue within the histogram.

Similar rationale existed in the experts' individual judgements of the true number of unique vaquitas sighted during the survey (Figure 4.2). Experts agreed that a RIO would judge, based on the discussions, that it was implausible that the true number of vaquitas sighted was less than 5 or more than 13, and that the most likely values were 7 and 8. The RIO distribution indicates a 77.5% belief that the true number of unique vaquitas sighted was between 6 and 10. The median for the elicited number seen was 8.

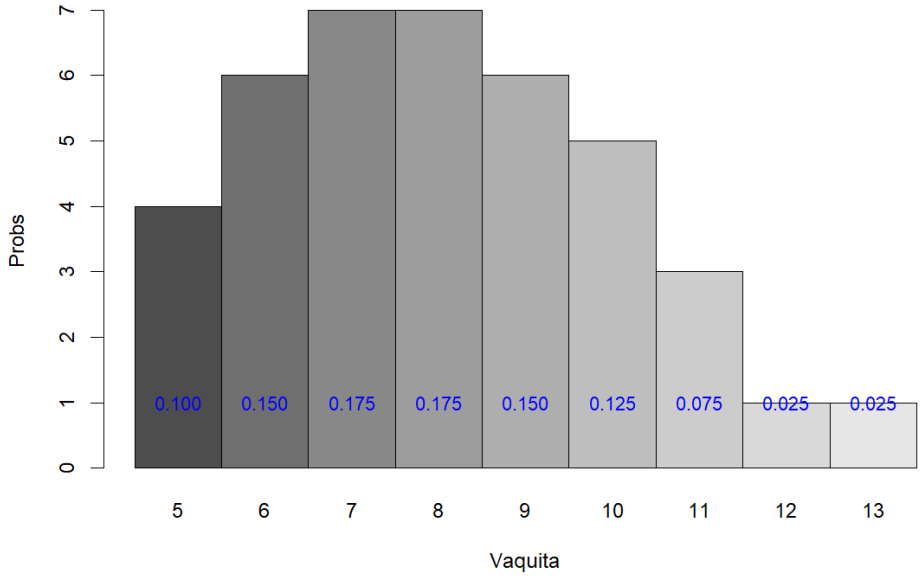

Figure 4.2. – The elicited probability distribution for the number of unique vaquitas (including calves) sighted during the 2021 survey.

5. Conclusions

With no photographs of sufficient quality to do photographic identification collected during this survey not only was a mark-recapture estimate impossible but deciding whether sightings were new or resights became a matter of probabilities. Even sightings within a day could not be either ruled out as being the same or ruled out as being different. The EE process provided a process to pool our expertise and thoroughly discuss what numbers were plausible. It was very helpful to compile the evidence dossier in the field when memories were fresh. Doing the initial EE on the day following the survey, as recommended from the 2020 EE exercise, was not entirely successful. Finishing a survey effort is always a tiring process because of the need to clean and pack on the equipment often following a day of field effort. As a result, experts were not as rested as they would have preferred before participating in the elicitation, which requires good powers of concentration for long periods. As a result, a second period was scheduled to complete the elicitation. The 2-week period did allow additional information that came to light during the first elicitation to be added to the evidence dossier, and experts were well rested for the final shorter session. Although this 2 session process was unplanned, the process worked well and is a better recommendation than trying to do the entire EE immediately following the survey. Lastly, were funding available, the EE process would be improved through face-to-face elicitation rather than remote video.

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Appendix 1. List of experts

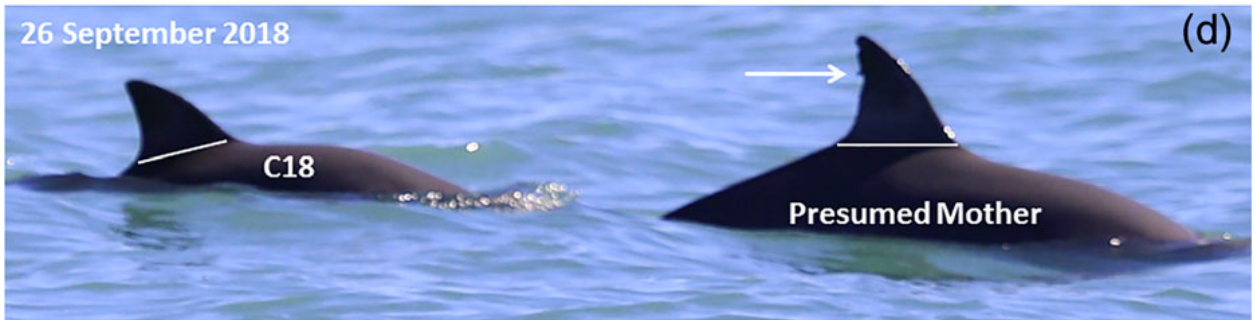
All experts participated in the field efforts as either an observer, recorder or survey leader and were available for the November 4 elicitation. Experts contributed their judgements to the final RIO process.

Jay Barlow
Annette Henry
Eva Hidalgo
Sergio Martinez
Sarah Mesnick
Allison Payne
Juan Carlos Salinas
Isidore Szczepaniak
Barbara Taylor
Felipe Triana
Marc Webber

Appendix 2. Evidence Dossier Vaquita Survey 2021

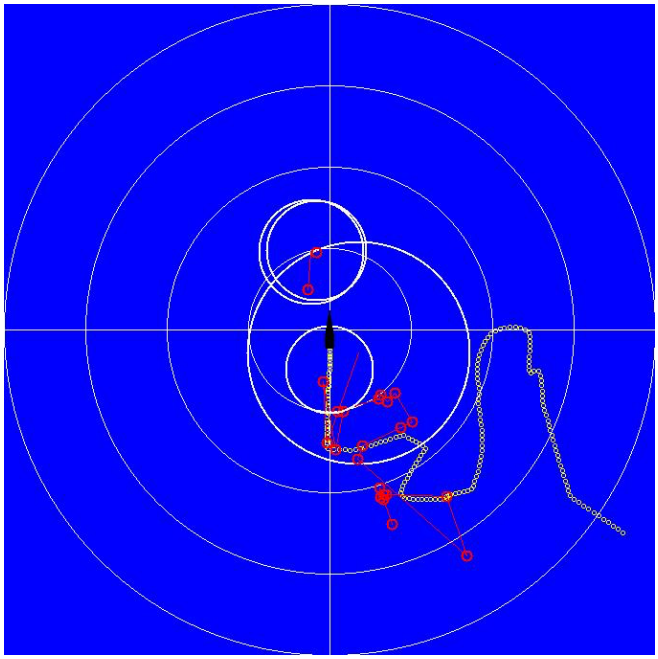
General information on vaquitas and porpoise

The average group size of vaquitas in all surveys (1997, 2008, 2015) was 2. Although the winter period remains mostly unobserved, neonate vaquitas were recovered from early totoaba fishing in February. Thus, calves in October would be 6-8 months old, which is thought to be roughly the age of weaning. The individual marked below as C18 was considered very likely to be a calf.



In the 2020 Expert Elicitation, the following definition was agreed for a calf: "*While calves are biologically defined as less than one year old, age cannot be determined in the field. Therefore, inferences about whether an animal is a calf is determined through a combination of size (as compared to the other member of the pair) and behavior. Vaquitas in October are roughly 6 months old and therefore the size can be both small and only slightly smaller than the adult. The dorsal fin may appear only slightly smaller. Because of this, the behavior is also key. Dependent calf behavior is to surface within one body length and slightly behind the mother. With more time observed with a pair in this conformation (larger individual in the lead followed by a smaller individual within a body length), confidence that the pair is a cow/calf increases. However, because October is roughly the time of weaning, the calf can be expected to be more independent and may not always be in this position. The evidence dossier uses both the term 'calf' and the term 'juvenile'. It is assumed that observers using the term 'calf' had confidence that they were observing the behavior above. Use of the term 'juvenile' indicates less confidence but definitely does not preclude that the smaller individual could have been a calf.*"

Because calves are difficult to distinguish at 6 months of age, it is worth considering the likely range of probabilities that a distant pair seen fleetingly could contain a calf. For simplicity, consider that there are 10 adult vaquitas in the Zero Tolerance area and that all vaquitas are in pairs. If half are females (5) and most are mature (4) and they had a calf every year then there could be 4 calves. If they had a calf every other year there would be 2 calves. So, a poorly seen pair has a non-zero chance of containing a calf and with the number given, the probability would be between .33 (2 of 6 pairs) and .57 (4 of 7 pairs).



The red symbols are the pair shown in the photograph from 2018 recorded in a WinCruz screen shot. The pair had a meandering pattern. Each of the regularly spaced, concentric circles is 1 nmi. (Ignore the bright yellow circles of differing sizes.) The total time of the sighting was 1 hour. The most distant points of this pair within the hour covered 4 nmi. Conceivably if vaquitas travelled in a straight line, they could cover 8 miles in an hour, but more likely you wouldn't expect them to move more than what is seen here (about 4 nm).

In all surveys, sightings were mostly clustered meaning that single sightings were unusual and it was more typical to have a series of sightings in a relatively short period of time.

Notes for 2021

Even though there were only 8 (or possibly 9) sightings, it may be helpful to write each sighting down and draw lines connecting various sightings that could be duplicates to help with your final estimate of the plausible numbers seen. It may be helpful for each comparison to think "Can I rule out that this was the same vaquitas?" If not, there should be some probability that the sightings compared were the same, and some probability that they were different.

Sightings: Each has basic data, observer narratives and as appropriate general comments, screen shots of the Wincruz Vaquita map and photographs or references to videos. Experts were allowed to see locations of vaquitas, but such locations have been removed from this document to protect vaquitas.
Observer eye heights: Sharpie 8.1m, Narval 7.7m.
At the end of this dossier is list of researchers.

OCTOBER 18

Viewing conditions: The Sharpie waited out high winds in the morning and early afternoon. At 3pm we began surveying in B3 conditions.

Sighting 1: Sharpie only

Photos: N
Videos: N

First time seen: 1648:28
Beaufort: 3
Swell: 2'

Last time seen: 1650:58
Beaufort: 3
Swell: 2'

Sighting length: 2 min

Our first sighting occurred at 1648 on 18 Oct 2021. We were closest to buoy 18, essentially between buoys 9, 18, 13 and 14 near the northern border of the ZTA, where pangas are numerous with shrimp gillnets. Viewing conditions were not great – B3 and swell of 2'. Ernesto Vasquez calls out the sighting from the right big eye binoculars at -6 and 0.8 reticles.
Ernesto Vazquez narrative: Initial sighting - observed one dorsal fin heading toward the ship (160°). It disappeared and a few seconds later saw the back and dorsal fin of a vaquita. It went down and a few seconds later, surfaced again and then dove and disappeared.
Chris Hoefer narrative: I was not on bigeyes, but I quickly got to fly-bridge and intensely scanned with my 400mm lens throughout Ernesto´s observations. Between 60-80 seconds after last sighting by him (14deg left, approx.3rets), I thought I caught a glimpse of an end of surfacing in the ¨correct¨ spot given his observations. My glimpse was at approx. 20deg left and ½ to 2/3 nm. The wake was pushed in same observed direction of travel, approx. SSW, observed by him. I could not confirm this as a Vaquita, and it does not change group consensus of numbers. But given that it was very marginal conditions and only one bigeye was reliable (Beaufort was a low three), this animal or ¨group¨ was very poorly observed.
Additional notes during the sighting: the animal appeared "round" and healthy. It was traveling in a straight line. No way to estimate size but "it looked and acted like an adult". Ernesto has confidence that it was not a calf or young animal.

OCTOBER 22

Sighting 2: Sharpie only

Photos: Yes, but not useful for size, position or identification
Videos: Y SSCS video_sightings 2 at 0814 and 3 at 1152_for observers_ 22-10-2021.mp4

First time seen: 0807:15
Beaufort: 3
Swell: 1'

Last time seen (last resight entered): 0817:21
Beaufort: 3
Swell: 1'

Sighting length: 10 min

Sharpie second sighting occurred at 0807:15 on 22 Oct 2021. We were running from line 5 to line 3 passing through buoy 30 on our way to buoy 28. The sighting occurred closest buoy 29. We were in a low B3, low swell, estimated at 1'. Felipe Triana calls out a triangular dorsal fin at 82 right, 1 reticle, on the big eye binoculars, heading in the opposite direction to us.

Felipe Triana narrative: Initial sighting 08:05 spotted on the big eyes @ 82 degrees right 1 reticle. I saw 2 dorsal fins (triangular in shape) one after the other, were seen traveling in the opposite direction as the Sea Shepherd (Southerly direction). We decided to turn to investigate and try to confirm species. The Sea Shepherd turned 90 degrees right to close on the animals. After a few minutes of scanning, Chris spotted the animals and confirmed they were vaquita porpoise surfacing in a different direction (NW) or off to the port bow of the Sea Shepherd. They surfaced 3 more times traveling in the NW direction, animals looked similar in size but swam within one body length of each other one surfacing right after the other. The animals were very rapid staying above water less than a couple seconds. The last surfacing was witnessed at a closer distance (reticle 8) off the port bow by myself, Chris, and some Sea Shepherd crew, which were able to capture a photo and a short video. I had a good view of a vaquita at this distance on the big eye as it was beginning to arch to descend into the water. The photo and videos confirm species and group size estimate (2 animals). In the images, the animals don't look too different in size. Originally, I thought it was possible that it may be cow/calf because of the traveling distance between the two animals (less than a body length), but after reviewing the footage, I am more inclined to believe they seem to look more like two adults.

Chris Hoefer narrative: Felipe initially sighted at 82rt and not visible by me on port side bigeyes, highly likely only one surfacing of alternating animals that he said were heading to S. We turned and I subsequently picked them up for three surfacings; all three re-sights the pair was surfacing alternately (i.e. one coming up about 1.5-2secs after first but within about two body lengths consistently. The following animal was not in the ¨calf¨ position during my re-sights. It was more like the animals were fast traveling and remaining within about 1.5 body lengths during that travel. Both animals were high rolling and arching their peduncles at a fairly steep (steeper than usual) angle at end of each surfacing. This allowed for very good looks, and both animals seemed to be full adults and the same size. For the three latter surfacings the animals were heading steadily to the NNW, almost in the exact opposite heading as the initial sighting.

Isidore Szczepaniak narrative: Felipe had the original sighting of 2 porpoise. After Felipe indication the location of the animals I saw them using hand-held binoculars. The 2 animals were 2 body lengths apart. The porpoises were both adults and appeared to be the same size. I saw them surface 3 times. They were moving from right to left.

Video 1 available from L. Rojas-Bracho on request

OCTOBER 22

Sighting 3 (A and B) : Sharpie (A) initially followed by Narval (B)

Photos: Y

Videos: Y SSCS video_sightings 2 at 0814 and 3 at 1152_for observers_ 22-10-2021.mp4

Sharpie narrative:

First time seen: 1141:22
Beaufort: 1
Swell: 0

Last time seen (last resight entered): 1159:44
Beaufort: 1
Swell: 0

Sighting length 3A: 18 min

Vaquita location 3B (decimal degrees): 31.18N 114.76W

Sharpie sighting 3A: Our third sighting was made at 1141:22 on 22 Oct 2021. Sergio sighted a single animal at 45 left and 1 reticle by cpod 9.

Sergio Martinez narrative: Initial sighting at 1141. I saw one vaquita twice at -45˚ and r-5, (triangular fin, and no scars visible) course 315. Viewing conditions were B1, maybe B2, and so I saw the animals very clear. Then Izzy confirms that he saw two animals, a few seconds later. When they come up to the surface I saw 2 vaquitas separated by around one body length apart and a third animal was separated about two bodies length apart, a few second later when they (3 vaquitas) come up to the surface, all of them were around one body length apart. They were traveling on a 270 course and finally a few seconds later, I saw two animals one of them smaller and in a calf position (at the right side from the adult, and just behind the adult dorsal fin. They also come to the surface twice. After that, we try to find them on the small boat, but we did not find them again from the small boat.

Chris Hoefer narrative: A single animal was reported by Sergio for several surfacings, and he was sure this was a solitary traveling animal. I picked it up visually as it was heading to a very significant convergence between turbid green water south-side and slightly more blue water north-side. Approx. 4 minutes later (approx. 0.5nm from solitary animal followed by Sergio), a pair of animals traveling tightly alongside this convergence south-side, green-side. One was possibly in the calf position, but they were too distant to gauge well body size and be sure of this. As this pair passed over the convergence slightly in to the blue water, they began surfacing often (i.e. every few to ten seconds) and were actively milling and slightly more energetic, slightly higher surfacing. At this point, a third animal showed up (very likely Sergio´s solitary animal that was approaching this area) fairly near the area but not quite within the same angle-camera focal area. I took several distant photos at this point of the pair (time stamp for best ¨mom-juv/calf¨ photos was at 11:59 local), and the animals seemed quite interactive. One of the media guys onboard also took some video footage at this point. We lost these animals briefly after they began moving along the convergence to the WNW roughly, and the Narval crew picked them up very close to where they should have been expected. I cannot say what was mentioned by that crew, but only a few sightings were seen at this point as the Narval´s panga and the Sharpie´s tender went in to the water to approach the area. It seemed very likely that we spooked the animals as both large vessels turned onto them, and we only had brief re-sights thereafter of a pair of animals (I believe).

Isidore Szczepaniak narrative: Sergio had the original sighting of 1 porpoise. Using the big eyes I initially saw 2 animals. One porpoise was larger than the other. I saw them surface 3 times and the smaller animal stayed on the right side of the adult. The pair surfaced synchronously with the smaller animal staying tight to the adult and their dorsal fins appeared at the same time.

Notes and observation from media: no good photo identification images but we have carefully examined the photos that Chris took and the video taken by SSCS. There are a series of 28 photos taken by Chris between 1157 and 1200, including the two photos appended to the dossier. There is also a brief SSCS video clip at 1150 – but the time on the video is 2 min slow compared to the time synch on our phones/WinCruz – so the time of the video should be 1152.

<u>Video 2 available from L. Rojas-Bracho on request</u>

We discussed the video for a long time, frame by frame, and enlarged; and ran the video alongside the photos. There are four surfacings. Two of the surfacings were of a single individual. Two of the surfacings were of a pair of individuals. We asked the following questions:

How many individuals? Four people concluded 3 animals. Three people say there may have been 2 animals, with varying degrees of certainty (3 vs 2 animals: 60:40, 40:60, 40:60).

- If it is three individuals – a single adult-sized animal is surfacing twice and the presumed mother-calf pair is surfacing twice. If this is the case there should be three distinct dorsal fins. We drew composite images of each of the three dorsal fins based on the descriptions of the observers. There is clearly one animal with a broad triangular fin. A second, and possibly, a third darker individual has/have more pointed, and falcate, dorsal fins. Per above, no one was 100% certain that the individuals surfacing with the more pointed fins was the same or different; both seemed possible, most considered the pointed fin animals to be different individuals. We drew three distinct fins, but the two pointed ones … could be the same animal.
- If it is just two individuals – one of the pair is surfacing 4 times, twice alone and twice with the other individual. This is unusual and would be a high breathing rate for a single individual in the course of the short sequence.

Is there a mother-calf pair? Most all seemed confident that there was a mother-calf pair in the photo. This conclusion is based relative size of the two individuals. One appears to be a larger animal with the gray triangular dorsal fin and the other smaller, with a smaller more falcate dark dorsal fin.

<u>Chris Hoefer's photographs</u>
Five minutes later, Chris took a series of photographs. We carefully looked at the size and shape of the fins.

Best photo of the what we think is the individual animal (Sergio's original individual) is shown in frame #1765 @1157 in the blue water (Picture 1 but see also Fig. 3 from video). Most observers think this photo is a single animal, and different from the two in the following frame (Picture 2). It has a tall and pointed fin. Chris took frames before and after this and there is no other animal in these frames.

Best photo of presumed mother-calf pair frame #1775 @1159 also in the blue water (Fig 2 and Fig 4). The presumed mother has a distinctly broad, triangular fin. Perhaps a faint indication of a bulge? The fin

and body appear pale in both the video and Chris's photo. The presumed calf appears darker in body and fin color. The dorsal is smaller than the other animal's, and distinctly narrow at the tip.

Summary of the discussion: The strongest evidence for the Sharpie comes from the original accounts of the observers on the big eyes, who saw one animal and a presumed mother calf pair come together. They had good views and were relatively close (reticle 5/6). The photographic evidence (photos and video) for most of the group leans to three, but there was not a definitive way to tell if the animal/s with the pointed fins were the same or different. Similarly, most lean to there being a mother-calf pair in the sighting, due the description of the observers on the big eyes and their interpretation of one animal being smaller in body size and dorsal fin from the photos and video, but again, there was uncertainty around this. Importantly, however, was the subsequent discussion of sightings 4 and 5, which all seemed to agree were of the same sighting as 3. If so, and there were three animals including a mother calf pair in sighting 3 but only 2 animals in sighting 4 and 5 …. then where did the calf go? Alternatively, this meant that there might have been another pair in the area. These uncertainties were captured in the cumulative totals for the group.

Picture 1. CJH_1765 cropped probable solitary animal @ 1157

Picture 2. CJH_1775 cropped probable mom calf pair @ 1159.

Picture 3. Still captured from video of first animal seen in sighting 3.

Picture 4. Still captured from video of pair seen after the surfacing shown in Fig. 3.

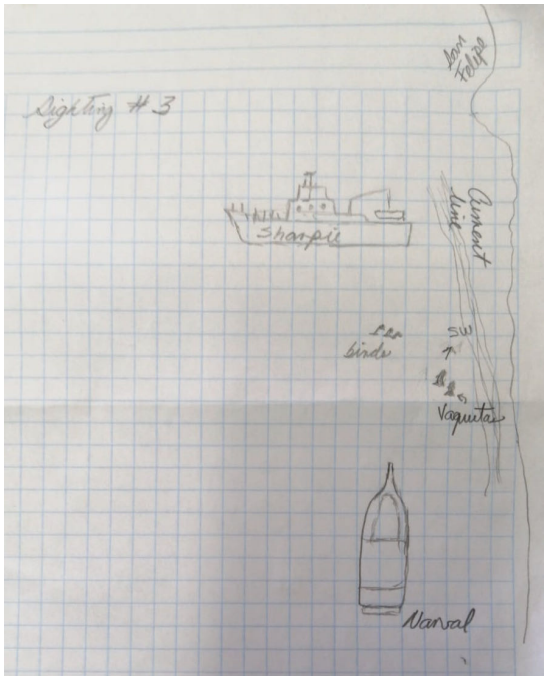
Narval narrative:
Note from the Narval: (presumed) resight of Sharpie sighting #3 and called here **3B**. Two individuals were seen, they see no indication they are different sizes.
No photos or video from the Narval.
Data
First time seen: 1149:54
Beaufort: 2
Swell height: 0

Last time seen: 1207:21

Beaufort: 2
Swell height: 0
Sighting length 3B: 18 min
Sighting length 3A+3B: 26 min

Sergio had sighting 3 from the Sharpie and the Narval was called over.
For the descriptions below, all noted that the animals were swimming along a current line that marked a water color change and had foam. There were 3 western grebes and a distinctive black 2-foot-long log nearby.
Bob Pitman narrative: 11:49:54: Bob Pitman resight of Sharpie sighting #3. The animals were sighted up ahead of us in the general area where we were expecting sighting #3 to resurface. We assumed that this was the same sighting but could not verify 100%. I saw two animals traveling moderately fast to the right. Viewed perpendicular, the lead animal had a robust dorsal fin with a slight bulge to the leading edge; presumably an adult. I barely glimpsed another animal beside and slightly behind it about one body length and on the left side. Behavior suggested a cow/calf pair but I didn't get a good enough look to be certain of the size.
At 12:07:21 I saw what I believe to be the same two animals as above, traveling close together, two more times and heading in the same direction as previous. When last seen, the pair arched up and sounded – it appeared that they might have been foraging. The decision was made to go out in the panga to try for photo-identification shots.
We did not see these animals again from the panga. We did not see the next two sightings from the panga (004 and 005).
After seeing the video I think the pair I saw was the same as the closely associated pair in the video.
*Juan Carlos Salinas narrative:*1201:45 Juan Carlos resights with hand-held binoculars.
Sighting # 3 was originally seen by observers on the Sharpie, (about 1143:48) then few minutes later (11:49 am) some animals were sighted by Bob (004) at 11 left and 0.8 ret on the Narval one animal and maybe two were heading to the right (of the Narval's bow). After some minutes the observers on the Sharpie called to say that the last sighting position was on their port beam. Moments later I saw two animals swimming with a SW direction, about one or two body lengths apart from each other. They seemed to be very similar in size (adult size) and at a distance, the dorsal fins looked clean and similar shaped. However, the animals were swimming away, so sizes are questionable. Almost immediately Mark W. (observer # 031) saw these animals for a few surfacings (3 times?) at 17 deg to the right of the ship's bow and 4 Reticles, he also called two animals seen at the surface in the same field of view, both similar in size. At this point the animals were swimming near a current line. Bob (004) saw a high roll and said that maybe was a good time to launch the boat to attempt to approach the animals close enough for ID photos. The boat was deployed but the animals were not seen again in the area. At 1233 we

decided to move forward and resume searching with a SE direction until 1250 when we turned around 180 deg. back to the general area were last seen.

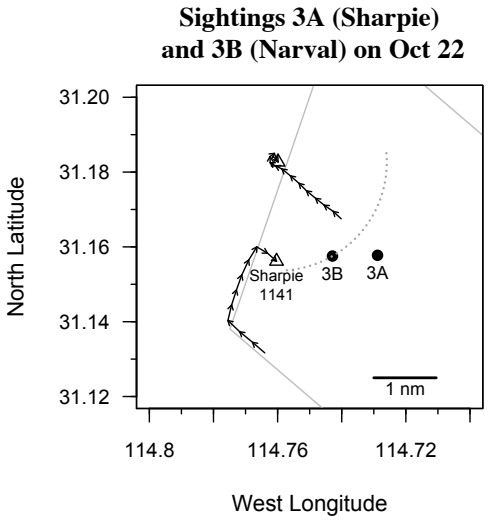


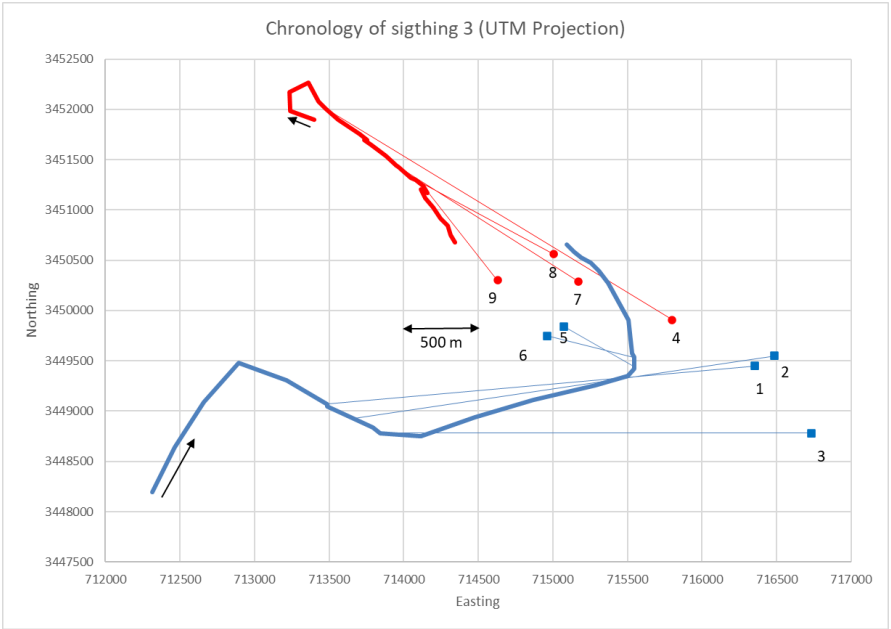
Drawing 1. Juan Carlos' drawing of positions of items mentioned in his narrative for sighting 3.

Marc Webber narrative: 12:02.45 Two resights of sighting 3 logged at this time. At 8° left, 2.2 reticles I sighted the group I believe Bob and then Juan Carlos saw. There were two animals in my view that were moving left to right just on the near side (from our view) of a slick line with light tan foam. The two animals were about the same size with about the same size dorsal fin. I do not think they represented a cow and a calf. Both dorsal fins were erect and nearly triangular with no obvious markings such as nicks. They surfaced almost synchronously with the lead animal surfacing just a moment before the trailing animal, and all 4 surfacings in the surfacing series, both surfaced in this pattern. Neither animal was in any kind of calf position with respect to the other (alongside at the dorsal fin area or slightly behind as done by harbor porpoise). They were in a lead-and-close-follow formation and were not superimposed on each other from my near perpendicular view.
The same group of two were sighted a second time on the near side of the same slick area. They were sighted on a further bearing to the right and moving left to right. All observations about the animal's size, fins and their positions relative to each other are basically the same.
12:05.46: 12° degrees right and 3.4 reticle. I believe this is a resighting of the same two vaquita as noted above. Both animals were again moving left to right on the near side of the slick system. All characteristics of surfacing, position of animals relative to each other, size of animals and size and shape of the dorsal fin are the same.
12:07.21: Resighting of the same two animals, 17° right 4 reticles. I am confident that this sighting was of the same two animals I observed at 12:05.46. All observations about the animal's size, fins and positions near each other are basically the same as the previous three views. I did not see any evidence of a third animal surfacing with the two, or a smaller animal with the two.

Jay Barlow narrative: After Bob first saw the group from the Narval, I spotted it with 8X binoculars on a stick. I saw two surfacings of at least two animals in each surfacing (maybe three). They were far away, maybe ½-3/4 miles, and were very small images in the binoculars. Two appeared to be similar in size.

The third (if real) was more of a perception than a confirmed sighting. Best High Low= 2,3,2. They were moving from left to right (towards the South, I think).
The figure below shows the tracks of the ships and the locations of 3A and 3B. At the times of their sightings, both ships had completed turns. The Sharpie was on a steady course of 132 so the position of sighting 3A should be accurate. The Narval had not yet steadied up, so the ship's heading, and therefore the position of sighting 3B is less certain. The gray dots represent a range of reasonable positions of sighting 3B.





OCTOBER 22

Sighting 004: Narval only

Photos: N

Video: N

Data

First time seen: 1322:49

Beaufort: 3

Swell height: 0

Last time seen: 1340:10

Beaufort: 3

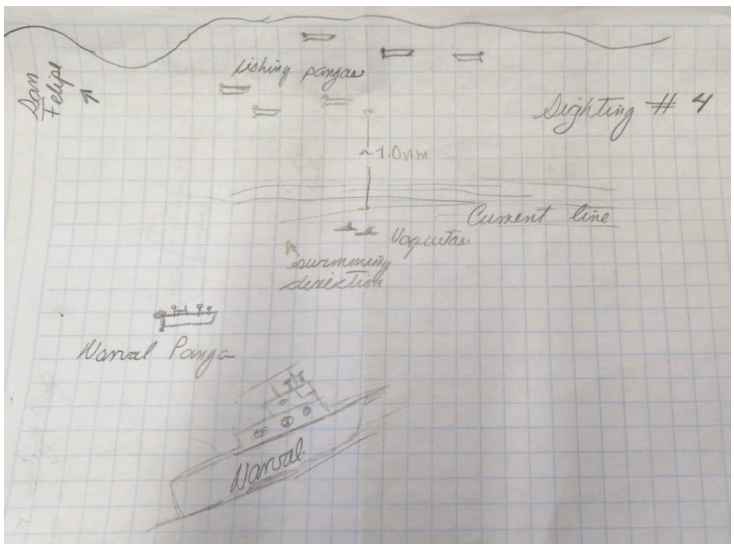
Swell height: 0

No photos or video from the Narval.

Sighting length: 18 min

Juan Carlos Salinas narrative: I saw two animals while we were heading back to the general area of sighting # 3. They were swimming slowly in a SW direction.

The animals were of similar size, and no distinct marks were seen on dorsal fins, but did not have opportunity to observe long enough to see the shape of the dorsal fins. This sighting was about 2.2 nm from the sighting # 3. These animals were swimming also along side of a current line that marked a color change and had foam, maybe 200 or 300 mts. distant. There were 3 western grebes and a distinctive log nearby. Several fishing pangas (about 5 to 7) with gear on the water were seen, abut 1 nm away from this sighting. The panga was still on the water and was directed to the area of the animals but they never saw these animals. At 1340 I saw two animals about 0.5 nm away from my original sighting (#4) position but heading to the NE, and again about the same size and maybe one body length apart from each other. So, the direction of travel changed almost 180 degrees. They were last seen heading towards the Sharpie (see illustration). The animals were not resighted again, but the observers on the Sharpie reported two animals (sighting # 5), several minutes later. These animals were in the same general area of sighting # 3 associated to a some current lines heading to the vicinity of the Sharpie.



Drawing 2. Juan Carlos' illustration of sighting 4.

OCTOBER 22

Sighting 5: Sharpie only (23 minutes after Sighting 4). Note that the Sharpie was called over to where Sighting 4 was to help tracking.

Photo: N
Video: N

First time seen: 1405:10
Beaufort: 1
Swell: 0

Sighting length: 2 min (no last time seen because it was not resighted)

This sighting, which we are calling sighting 5 was made at 1403 on 22 Oct 2021 by Sergio Martinez at 45 left and 6 reticles between cpods 3 and 2 (just outside ZTA). The animals were seen twice. Operator issues with WinCruz messed up the mapping function.

Sergio Martinez sighting narrative: Initial sighting - 14:03 I saw two vaquitas one behind the another at -45 and r-6 course 315 or 320. Less than one body between them, they come up to the surface twice at the same time, the vaquita at the front it was an adult, but the one at the back I´m not sure about the size. This sighting was in the same area where the Narwal had the sighting 4 and a few minutes later, so It´s possible that it is the same sighting. For the vaquita position it was not possible to see the dorsal fin shape.

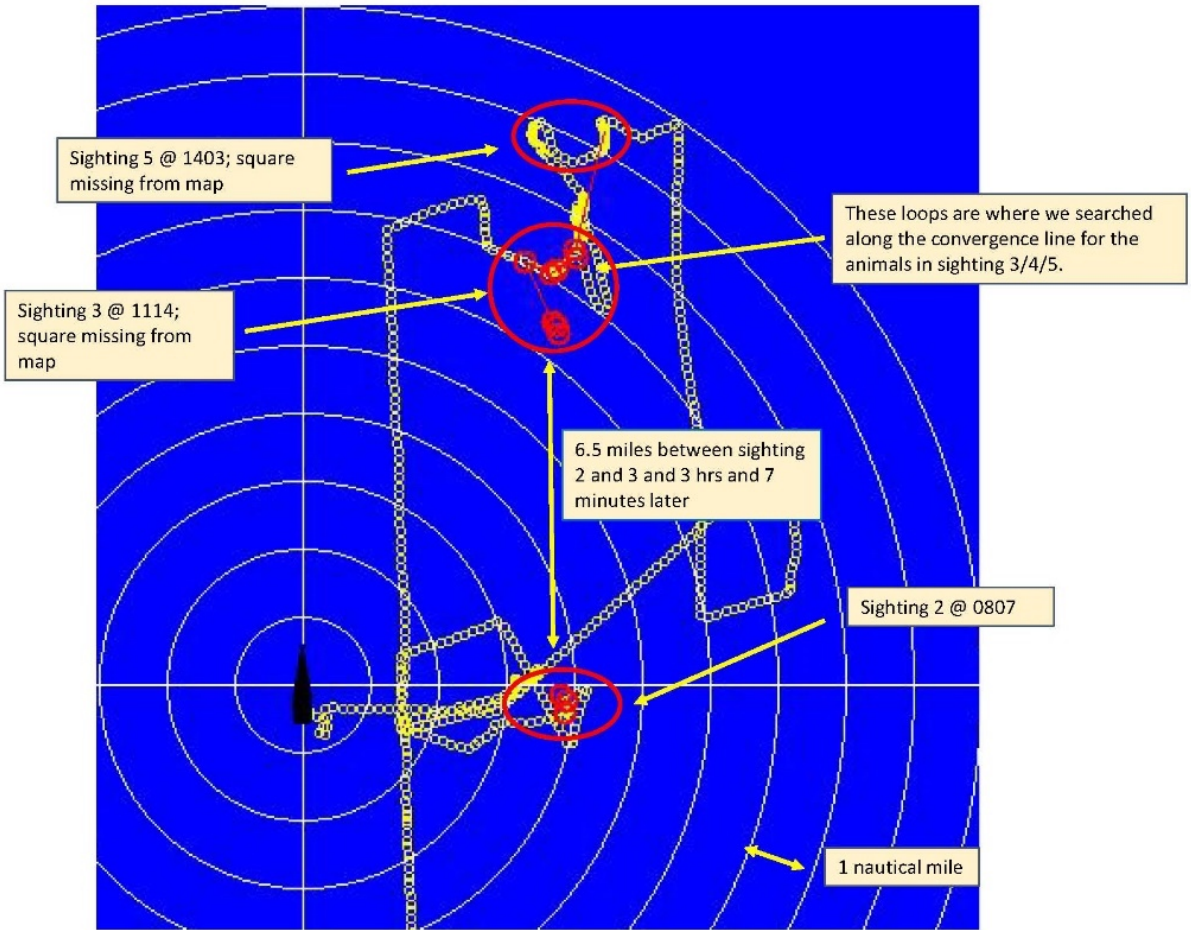
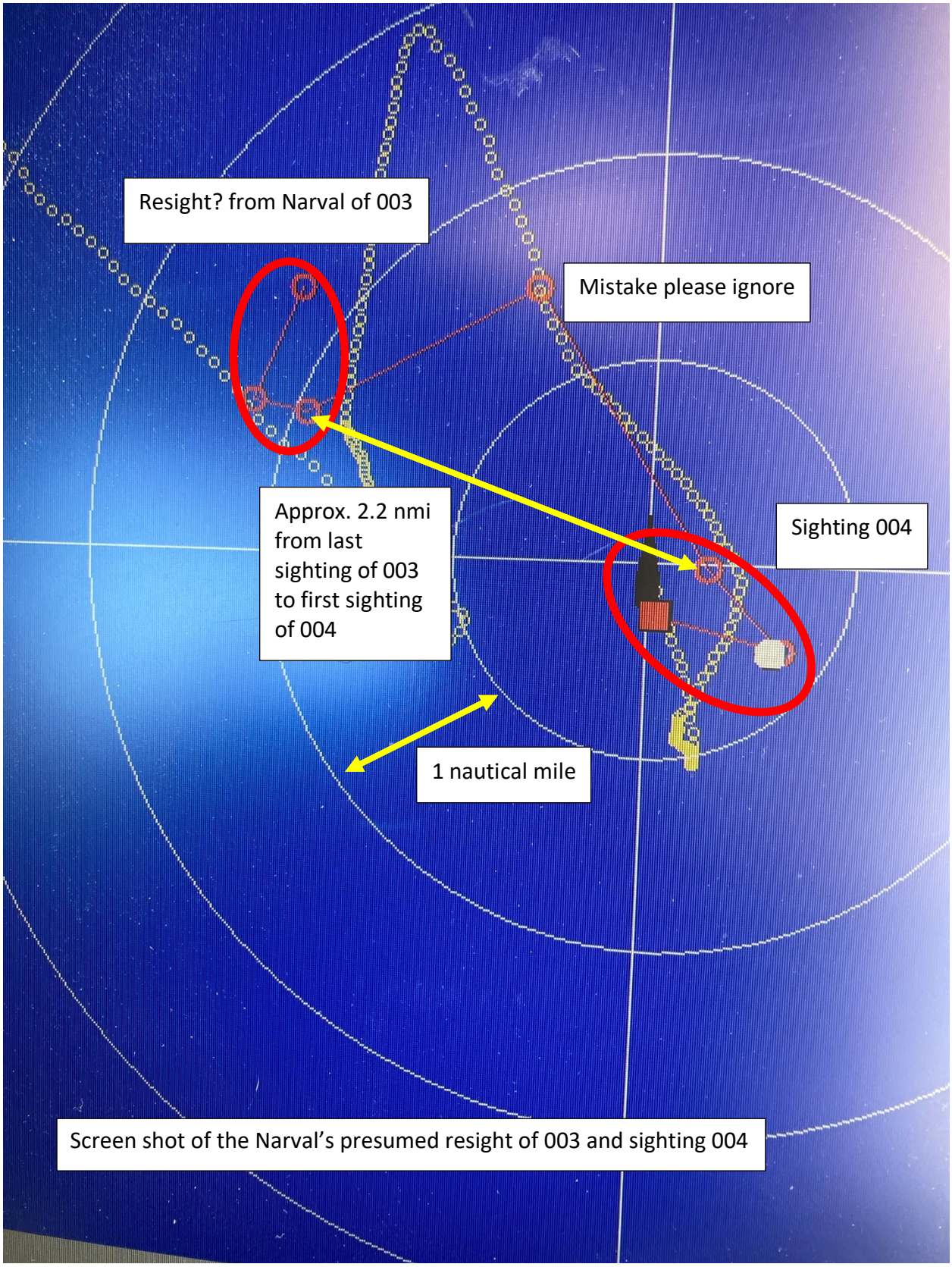


Figure 3. Trackline for Sharpie on 22 Oct 2021

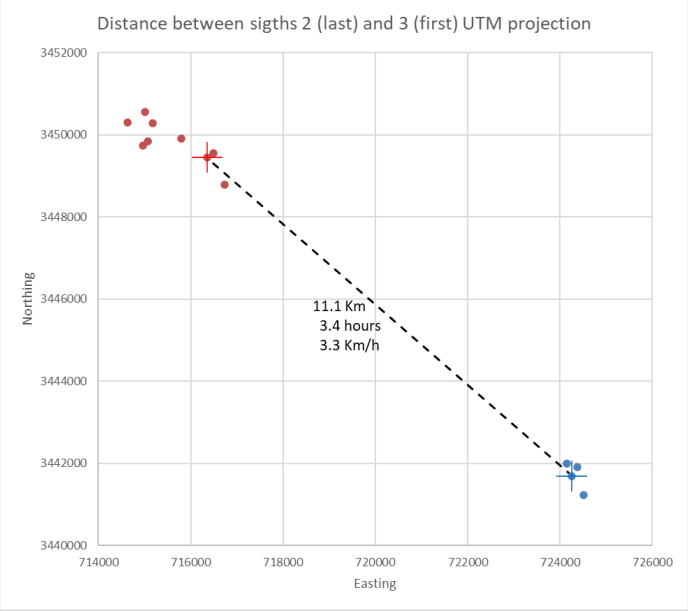


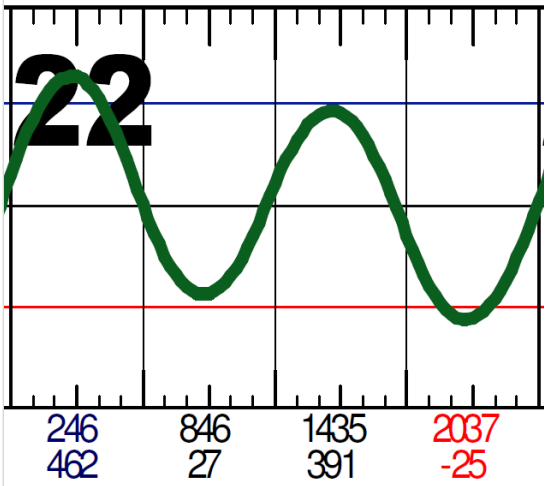
Screen shot of the Narval's presumed resight of 003 and sighting 004

Case # 1. last position for sighting 2 and first position of sighting 3
Case # 2. Narval resight of 3 at 120721 and Narval sighting of sighting 4 at 132249
Case # 3. Narval resight of sighting 4 at 134010 and Sharpie sighting 5 at 140510

Case	*Time.hr*	*Distance.nm.*	*Speed.knots.*
1	*3.4002778*	*5.4*	*1.6*
2	*1.2577778*	*1.8*	*1.5*
3	*0.4166667*	*1.2*	*2.9*

Potential movement of animals between sighting areas 2 and 3 under favorable tidal current. The last observation of sighting 2 occurred at 08:17 (blue cross in figure below) and the first of sighting 3 occurred at 11:41 (red cross). The distance between points is 11.1 Km, hence, if are the same animals, traveled this distance in 3.4 h for a speed of 3.3 Km/h.
Low tide occurred at 08:46, so tidal current was operating in approximately northwest direction as tide was going up (blue lines in right panel below show the times between sights 2 and 3). Hence, tide could help animals in moving between areas of sighting.





23 Oct 2021
Sighting 6: Sharpie only
Photos: N
Videos: N

First time seen: 1307:38
Beaufort: 3
Swell: 2'

Last time seen: 1331:40
Beaufort: 3
Swell: 2'

Sighting length: 24 min

We begin the day in B4 conditions at anchor. The weather begins to improve and we make our way to the tracklines. We start effort in B3 conditions with a 2' swell at 1231. At 1307, Chris Hoefer has a distant sighting, which he initially detects as Tursiops. We enter this as an object (object 2). Izzy resights (object 3), and then Chris (object 4), and then both Chris and Izzy are on the same animal (object 5). As the sighting progressed, and we move closer, it became clear that we had a vaquita sighting. We got a firm ID at 1331, entered as sighting 6. Estimating from the screen, from the time the first object was recorded to the time sighting 6 was recorded, 24 minutes passed and the animals continued traveling in a straight line to the southwest. This trajectory would have taken them outside the ZTA. We searched ahead, back on our tracks and around, but did not resight them.
Chris Hoefer Sighting narrative: Initial sighting - First seen by me distantly at 12 left and 0.6 reticles; the pair was much distorted in the haze/heat waves for the first 3-4 surface intervals. They were so distorted that I thought they were Tursiops initially. But all subsequent surface intervals revealed small, sneaky animals. It was not until the last re-sight that I confirmed them to be Vaquita 100%, i.e. very small bodied with disproportionately large, triangular fins. All together we witnessed 6 surface intervals, and the pair low and slowly rolled tightly together for all intervals, each interval included two surfacings. They were re-sighted accurately on the more stable, starboard bigeyes several times, and were always heading to the SW or SSW. Last sighting was when the Sharpie went to steerage, but the ship managed to maintain the heading more or less. Last re-sight was at 1331 local, 124 right, and 3.7 reticles. The animals were still tightly together and heading to the SW in the glare. I could not get a good look at the far-side animal as it was always obscured by the closer animal. At one point during third surface interval, I thought I could see that the far-side animal was very similar size to the nearer one. But I am not sure about this at all.
Izzy sighting description - Chris was on the right "big eyes" and I was on the left ones. Chris had the initial sighting. I spotted the porpoises a few minutes later. I had 2 sightings of 2 porpoises. Both porpoises were adults and the same size. In the first surfacing sequence the 2 animals surfaced 3 times. All 3 times the animals surfaced together. The second surfacing sequence the animals surfaced twice, again surfacing together. The dorsal fins of the 2 animals were robust, wide at the base. I could not see if there was a bulge on the anterior portion of the dorsal fin.

Monday 25 Oct
Sighting 7 Narval
Photos: N
Videos: N

First time seen: 09:43:54
Beaufort: 2
Swell: 2'

Last time seen: 10:00:35
Beaufort: 2
Swell: 2'

Sighting length 16 min

R. Pitman narrative:
09:43:54 first sighted – closest to c-pod #44, 1 ret, 17° left (a c-pod was being deployed and the boat was spinning during the sighting).
Appeared to be traveling, headed SSW; saw one animal surface 3 times; not 100% because I did not see dorsal fin in very bouncy, heavy swell, but was easily missed as the animal passed quickly through my vertical field of view each time. Surfacing behavior, however, very vaquita-like: smallish animal, dark, a series of three quick rolls, each 5-6 secs apart.
09:59:06 resight – seen for another three surfacings, headed straight away from us, in the glare; two lower surfacings and then a higher arch on the last. No dorsal fin seen again but the animal was headed straight away in the glare. Slight possibility of a second animal, but no more than one seen at one time in either of the two surfacings. Almost certainly one animal.
10:00:35 last seen (sounding arch). We stayed in area another 30 min or so and called in the Sharpie, but we did not see the animal again. 1 vaquita, 90% certain of identification.

Tuesday 2 Nov
Viewing conditions: The Sharpie was enjoying the best weather conditions of the trip. We were relishing the B0 winds, calm seas, no swell. It was vaquita weather.
Sighting 8
Photos: No
Videos: Yes, very distant

First time seen: 1654:16
Beaufort: 0
Swell: 0'

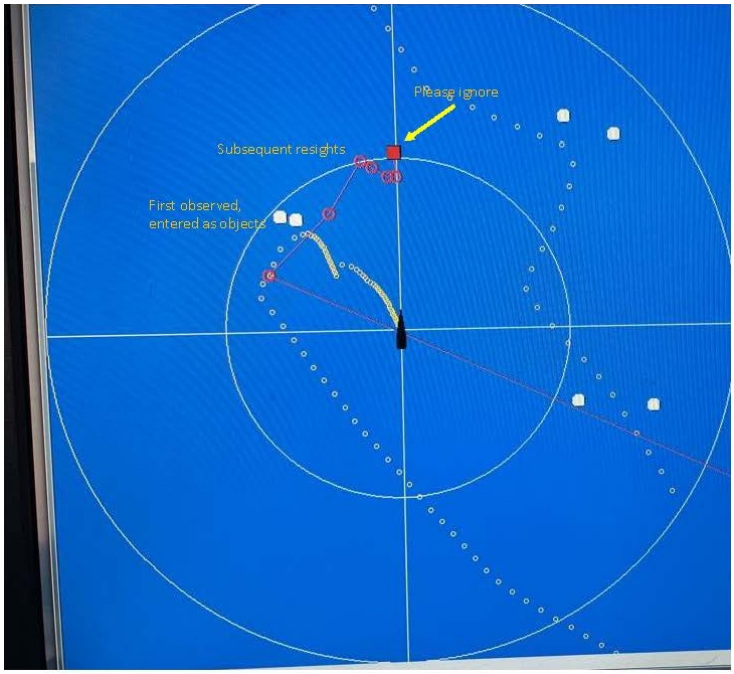
Last time seen: 1708:28
Beaufort: 0
Swell: 0'

Sighting length: 14 min

Sharpie narrative: Our 8th sighting occurred as the sun was getting low on our last day of survey. Viewing conditions were perfect when Felipe called out that he had an animal. An object was entered into WinCruz, and a second object, when resighted. It was soon confirmed by both observers on the big eyes, both saw only a single animal. Izzy also saw a single animal in the handhelds for one surfacing. Both Felipe and Sergio commented that the animal was small in size. Subsequent surfacings were entered as resights into WinCruz. We did not realize until later in the sighting that an actual sighting

number had not been entered. The resights were connected to a deleted Tursiops sighting in the morning. Because the original sighting was so long ago, they were not displaying properly on the WinCruz map. Altogether, there were 7 surfacings recorded into WinCruz, and additional resights were shouted out by Felipe and Sergio, sometimes saying “up” simultaneously.

Felipe Triana – initial sighting narrative – I initially saw the animal at 1654 off the starboard bow at 35 degrees and 4 reticles on the big eyes. I saw a small cetacean surfacing three times slightly towards the right and away from the vessel. The animal was at an angle so I wasn’t able to determine a triangular shaped dorsal, but it was a small animal maximum length of 1 meter and it wasn’t a fish so I suspected it must be vaquita. After the 5th surfacing, Sergio (who was on the left big eye) saw the animal at 50 degrees and 4 reticles and confirmed it was a vaquita. It was behind a sitting bird, which helped Sergio locate it. At this point the vaquita had switched directions towards the left. The vaquita surfaced several times in that direction, slowly getting away from us. The vaquita went down, and resurfaced after a couple minutes but I wasn’t able to spot it. Sergio saw it surface at 17:07 at least three more times continuing in the direction left and away from us. A few more seconds passed before it resurfaced, this time I was able to see it again. At 12 degrees right and 5 reticles. The animal was now swimming towards the right and still away from the vessel. It surfaced several times progressively getting farther away again. The Narval was notified and approached to try to locate the animal. Once the Narval got closer, I did not see the animal again. The Narval however, did see it. At this point, I switched out with Ernesto because I had to move the tarp above, that serves as our shade, to move it out of the way. I was also hoping to be able to get a photo, but I never saw it again. At this point the Narval observers were the only ones to see the animal. The Narval observers were the last to see it. Throughout the 12 surfacings I only saw one animal.
Sergio Martinez narrative - Felipe saw the vaquita for the first time at 1654 and told me the position. I couldn´t find it with the left big eyes. A few second later he had a resighting and after that at 17:07, I saw one vaquita at 5 right and reticle 5. The vaquita was going between a course of 340 and 350. It had a triangular dorsal fin, no scars visible and good body condition (not skinny). It seems that it was “small” (but there is nothing to compare to), the vaquita came up to the surface and breathed 3 times but Felipe could not find it in that surfacing. One and a half minutes later, it came up to the surface and breathed 4 times, heading almost in the same direction. Felipe and I, both saw the vaquita and we said “up” each time it came up to the surface. After that the Narval arrived on our port side and they had a resighting. After that we were trying to find it again until the sunset but, we didn’t find it again.

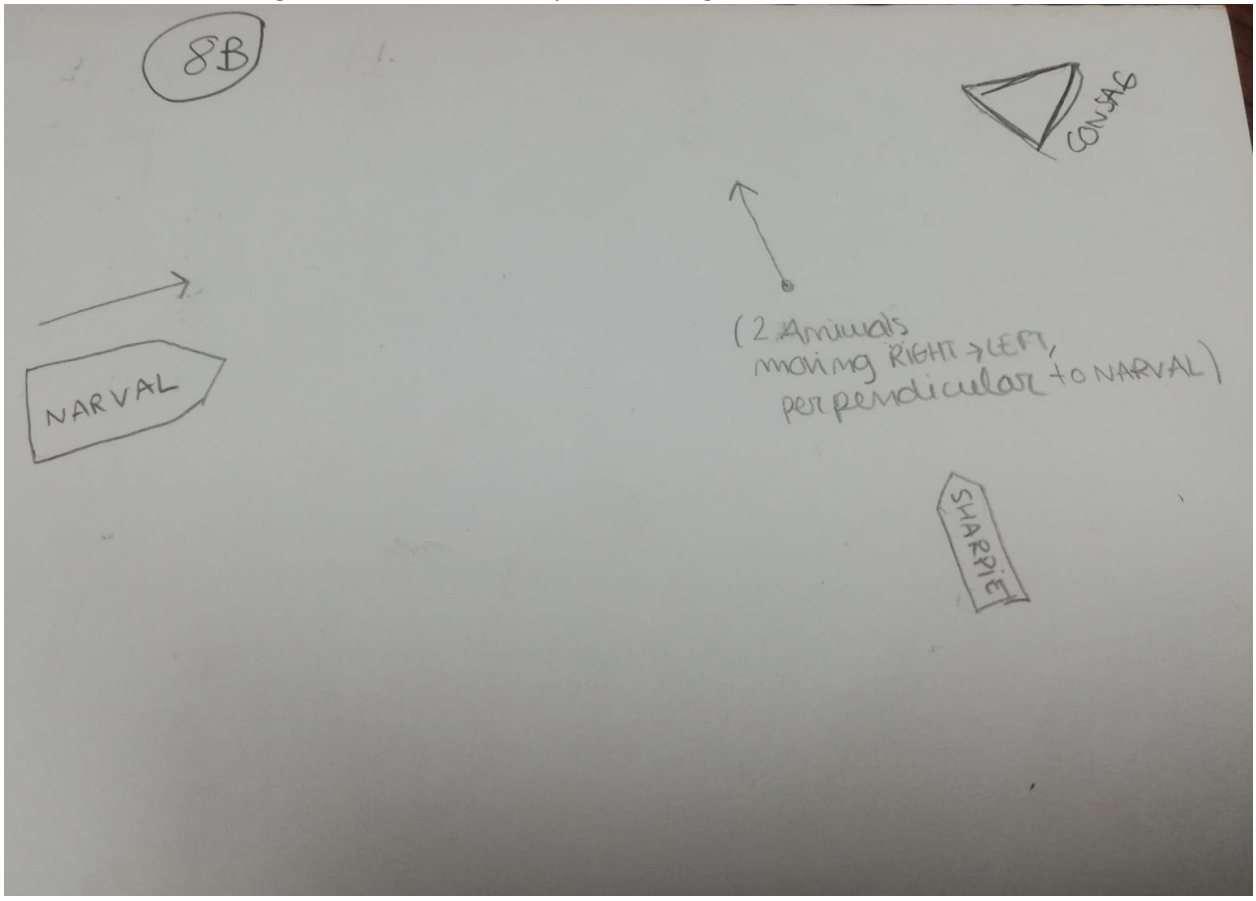


Narval narrative:

A. Jaramillo narrative from the bridge of the Narval: Sharpie observers alerted me to the sighting using Whatsapp so I could tell the flying bridge team. Moments later Juan Carlos called a resight (but his sighting was later confirmed to be a bottlenosed dolphin) and I then moved to the 20x bigeyes on the front of the bridge to help scanning for the sighting.
I then heard the cameraman Joel saying that the sigthing was between our boat and Rocas Consag. I moved bigeyes in that direction and seconds later saw two animals surfacing. They rolled in the usual manner vaquitas do, with a rapid movement, not showing all the rostrum nor the flukes. The animals were, from my angle, close toghether as I saw a dorsal fin of the animal closer to me and half the size of the dorsal fin of the other animal. The 20x bigeyes do not have reticles, but I estimated that the animals would have been between 1.5 and 2 reticles away in the 25x binoculars.
The animals swam to the left, and were seen to the left of Rocas Consag. I kept searching on the left side of the vessel, but did see the vaquitas again.

E. Hidalgo narrative: After the sighting was reported by the Sharpie, the Narval approached the area of their sighting to help search. I was the recorder together with Annette. While standing behind the recording station with handheld binoculars (7X30) I scanned the horizon. Just in front of Rocas Consag I saw two surfacings of a vaquita (at approximately at 17:15). Initially I thought of it as the same animal surfacing twice, one body length apart between surfacings. I used the observed triangular fin and its proportion to body size consistent with vaquita traits as the main identification factor. The fin and body observed on both surfacings appeared to have the same size and shape, and I only observed one fin at a time at the surface. The direction of travel was from from right to left from the bow of the Narval, passing in front of Rocas Consag. I roughly estimated the distance between the Narval and the sighting to be 800m. My observations are not inconsistent with the possibility of having two separate animals

instead of one surfacing twice, but that was my initial thought.



Drawing 3: Eva's drawing of the sighting from the Narval's point of view.

Joel – As part of the media team, I was sitting between the two Big Eyes on the flying bridge, right in front in the middle. Because of the sighting from the Sharpie, I was looking through my camera viewfinder trying to relocate the sighting. I was using a 600mm lens + 2X teleconverter but my camera was in standby. Then I spotted them right in front of Roca Consag. I saw them once, and seeing two animals surfacing consecutively and shortly after each other very close together. I saw the two animals being almost on top of each other, which I think may have been caused by my point of view. I did not have time to obtain a picture or video, and while trying to change modes to be able to record them, I lost the sighting.

Henoch -- At the same time as Armando, I saw two vaquita surface together using camera with 400 fixed lens in the area between Rocas Consag and Narval while standing on bridge deck. Animals were perpendicular to the camera and one animal was slightly behind the other. Appeared to be mother-calf pair. I also saw what I considered to be a calf in sighting 3 and thought that calf appeared darker the this calf.

Video 3 available from L. Rojas-Bracho on request

Participants (legs present in parentheses, visual (v) or acoustic (a))
Sharpie:
Sarah Mesnick (1 & 2, v)
Ernesto Vazquez (1 & 2, v)
Sergio Martinez (1 & 2, v)
Felipe Triana (1 & 2, v)
Isidore Szczepaniak (1 & 2, v)
Chris Hoefer (1, v)

Narval:
Armando Jaramillo (1 & 2, a)
Gustavo Cardenas (1, a)
Juan Carlos Salinas (1 & 2, v)
Marc Webber (1 &2, v)
Barbara Taylor (1, v)
Dawn Breese (1, v)
Jay Barlow (1, v)
Robert Pitman (1, v)
Annette Henry (2, v)
Eva Hidalgo (2, v)
Allison Payne (2, v)