A message from Bec and Ross
So here we go, the results of the 2022 5th Birthday Celebration:

"Annual SealSpotter Challenge"

What was the challenge?

- To count as many pups and seals as we could in three weeks 8-22 June.
- To engage Citizen Scientists from across the globe

This year we included some new educational slides for participants to learn more about the Australian fur seal's they are working on.

Our two indicator sites, Seal Rocks, near Phillip Island in central Bass Strait, and The Skerries, near Mallacoota close to the Victorian border with New South Wales, were surveyed by drone in the 2021 breeding season and counted during the "Annual SealSpotter Challenge". We are now excited to present the results. To all who participated: thank you so much for your efforts.

For those keen to continue with additional survey counts, we have kept the portal open and loaded with new images. Additional surveys add to our understanding of the peak of pup births, allowing us to time the surveys to collect the most precise data. For those who prefer a brief burst of intensity, we look forward to our next collaboration during the 2023 SealSpotter Challenge.

Summary of participation:

- 124 Citizen Scientists contributed to the counts.
- Participants were from 15 countries with the highest being Australia, USA and Spain.
- Participants marked 165,514 seals in 13,789 images, providing approximately 10 replicate counts for each image, with several spotters finishing the set - AMAZING.
- Three drone surveys were completed, two at Seal Rocks and one at The Skerries.
- Citizen Scientists put in an amazing effort of over 500 volunteer hours, thank you.
- To exclude unusual counts, we used all counts that were within 1.5 standard deviations of the median, averaged and summed for each image to provide the final result.
- Luke from Tasmania won the draw for a seal adoption prize with the Penguin Foundation.

Results

- At Seal Rocks, we can compare the mid-December survey over time because this is when most pups have been born, with 2021 being a good season for pup births (Figure 1). We will look at trends over time with further analyses.
- However, pup mortality at Seal Rocks may be high by late December to early January (Figure 2) with a difference between surveys of 1,314 pups in 2021 and 1,174 pups in 2019. See below for references to research investigating possible causes.
- As expected, the number of adults and juvenile fur seals at Seal Rocks reduced after the breeding season because individuals leave to forage, with females returning regularly to feed their pups (Figure 2).
- At The Skerries, the 2021 breeding season showed a higher pup count than other years at 1,643 pups, while adult-juvenile counts were similar over time (Figure 3).
- 95% confidence intervals were small (good) and best for adult-juveniles that are easier to count, this is a great indication that we are doing a great job.

Where to next for SealSpotter?

- We have a new PhD Candidate with Monash University investigating individual and population level impacts of marine debris entanglement on the Australian fur seals at Seal Rocks. This will include testing whether images from a thermal camera on the drone improves entanglement detections compared to colour images.

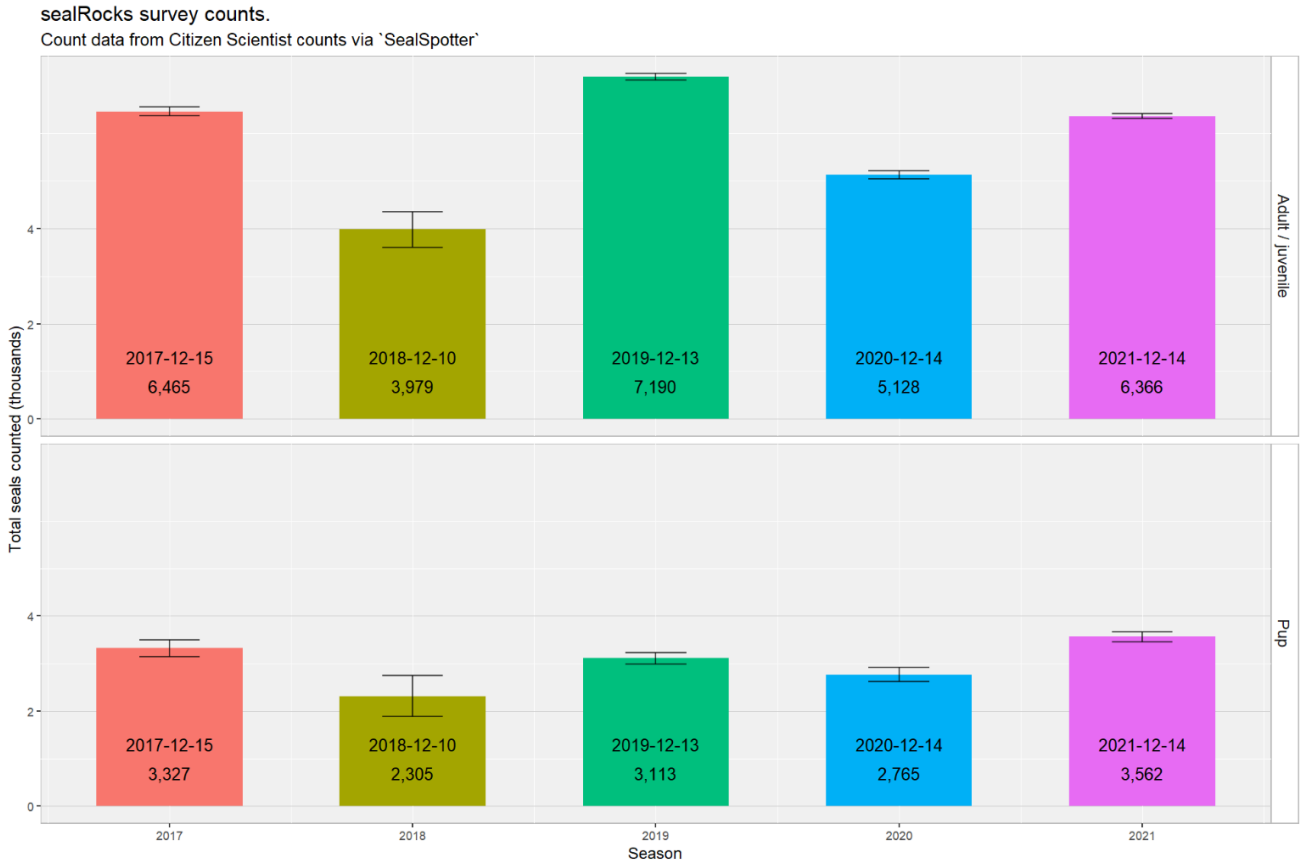

Figure 1. Citizen Scientist averaged counts for adult-juvenile (top) and pup (live + dead, bottom) Australian fur seals at Seal Rocks at the time of the highest pup count of the breeding season (mid-December 2017-2021) counted during the Annual SealSpotter Challenge. Error bars show 95% confidence intervals, calculated after extreme counts have been excluded.

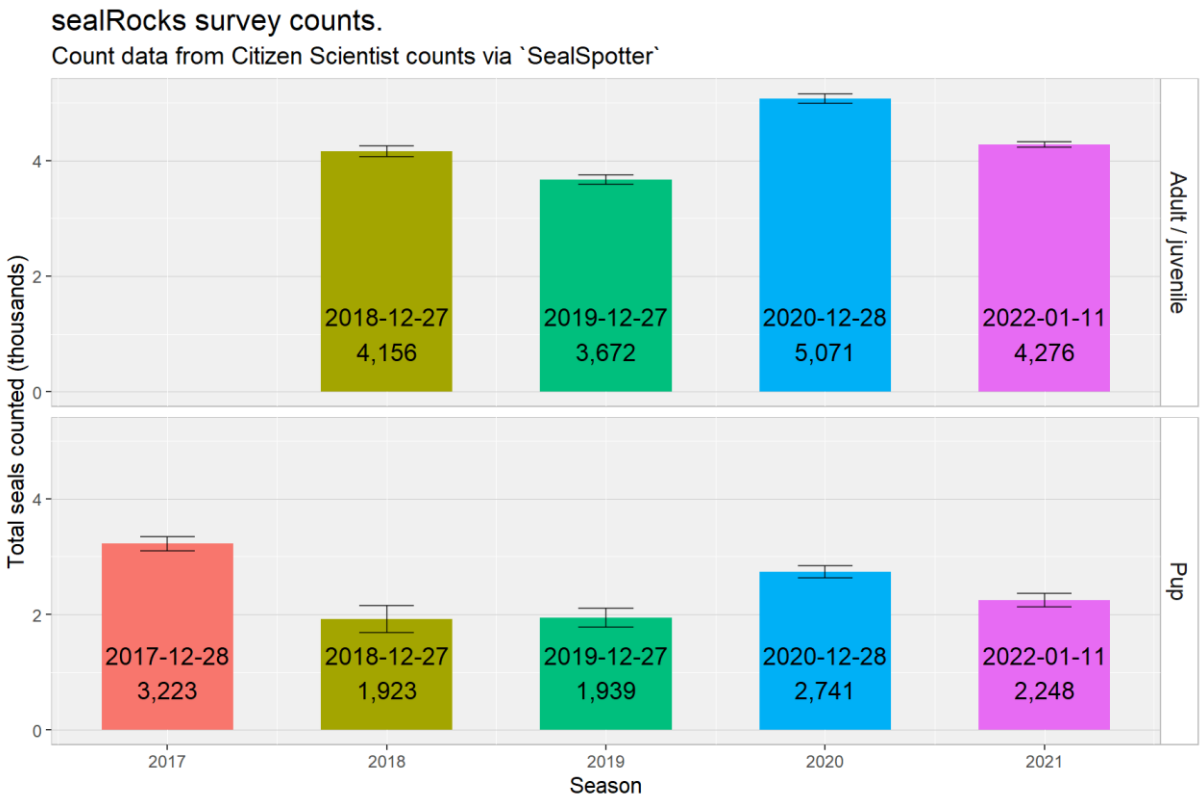

Figure 2. Citizen Scientist averaged counts for adult-juvenile (top) and pup (live + dead, bottom) Australian fur seals at Seal Rocks at the end of the breeding season (2017-2021) counted during the Annual SealSpotter Challenge. Error bars show 95% confidence intervals, calculated after extreme counts have been excluded.

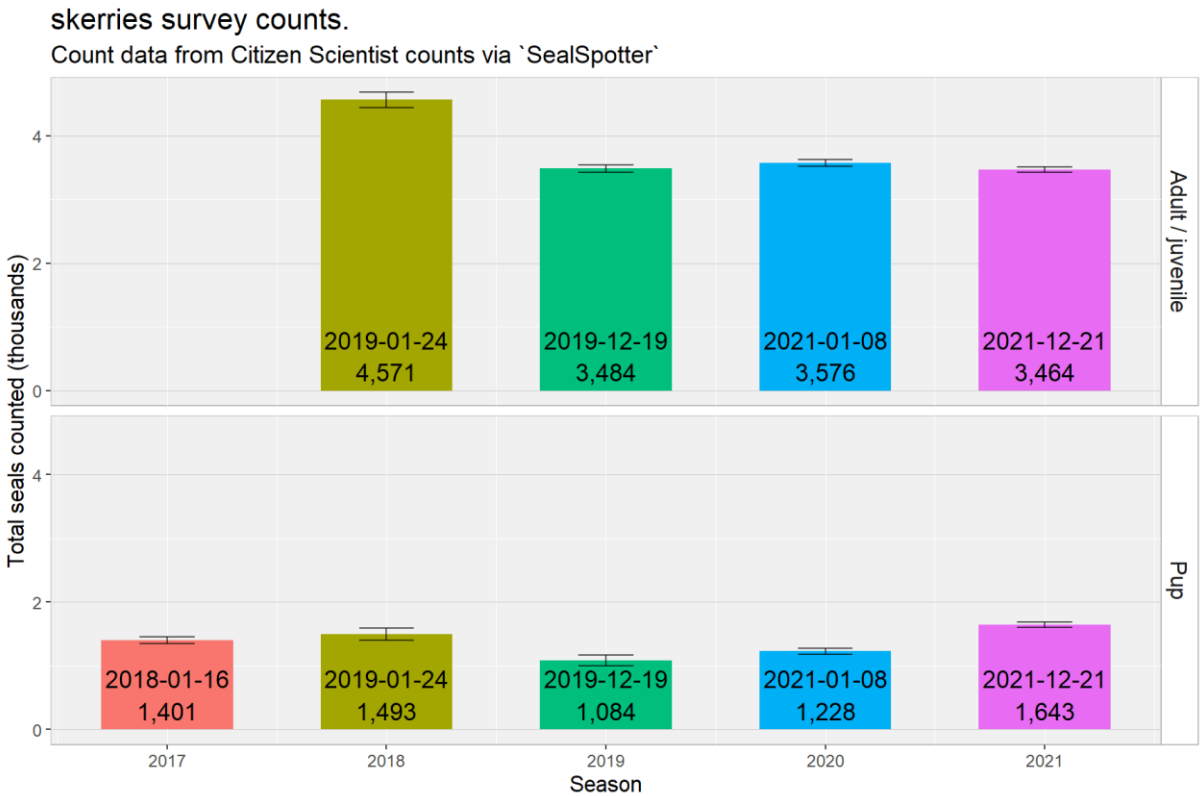

Figure 3. Citizen Scientist averaged counts for adult-juvenile (top) and pup (live + dead, bottom) Australian fur seals at The Skerries 2017-2021 counted during the Annual SealSpotter Challenge. Error bars show 95% confidence intervals, calculated after extreme counts have been excluded.

What are the Australian fur seals up to at the moment?

The females are getting ready for the next breeding season and are they are getting big as their pregnancies progress. Some may be trying to wean their pups from last season in preparation.

Pups are developing their foraging skills and will be weaned over the coming months. They are very inquisitive and playful around the colony.

Males are out foraging to gain as much bulk as they can to be ready to fight for females in the coming breeding season.

Recent research papers (open-source – you can access them online)

McIntosh RR, Sorrell KJ, Thalmann S, Mitchell T, Gray R, Schnagl H, Arnould JPY, Dann P, Kirkwood R (2022) Sustained reduction in numbers of Australian fur seal pups: implications for future population monitoring. PLOS ONE 17:e0265610.

Kusmanoff AM, McIntosh RR, Boag S, Bekessy SA (2022) 'Bins on Boats', a behaviourally-based intervention to curb marine pollution in Bass Straight, Australia. Conservation Science and Practice:e12659.

Kliska K, McIntosh RR, Jonsen I, Hume F, Dann P, Kirkwood R, Harcourt R (2022) Environmental correlates of temporal variation in the prey species of Australian fur seals inferred from scat analysis. Royal Society open science 9:211723.

Gardner BR, Stenos J, Hufschmid J, Arnould JPY, McIntosh RR, Tadepalli M, Tolpinrud A, Marenda M, Lynch M, Stent (2022) An old pathogen in a new environment–implications of *Coxiella burnetii* in Australian Fur Seals (*Arctocephalus pusillus doriferus*). Frontiers in Marine Science 9:809075.

Fulham M, Gray R, McIntosh RR, McDougal F, Power M (2022) Carriage of antibiotic resistant bacteria in endangered and declining Australian pinniped pups. PLOS ONE 17:e0258978.

Taylor S, Terkildsen M, Stevenson G, de Araujo J, Yu C, Yates A, McIntosh RR, Gray R (2021) Per and polyfluoroalkyl substances (PFAS) at high concentrations in neonatal Australian pinnipeds. Science of The Total Environment:14744.

McIntosh R (2021) SoE 2021 marine expert assessments: state and trend assessment – pinnipeds. Australian Ocean Data Network, Hobart. https://researchdata.edu.au/2021-state-environment-trend-pinnipeds/1767579.

Thank you SealSpotters for all your hard work.
Huge gratitude to Ross for his efforts in building this project from the ground up. Ross is moving-on to new adventures and opportunities. Rest assured, we will have a talented new data analyst to support the SealSpotter community and the work we do, stay tuned.
Bec ☺, Conservation Department, Phillip Island Nature Parks.