

Year 12 Mandatory Practical

Apply the Lincoln Index in a modelled
capture-recapture scenario



ANSWERS



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Course Overview and Learning Objectives derived from Marine Science 2019 v1.2 General Senior Syllabus^[1]
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^[1] Queensland Curriculum and Assessment Authority (2018). *Marine Science 2019 v1.2: General Senior Syllabus*. QCAA. Accessed 10 February 2019. <https://www.qcaa.qld.edu.au/senior/senior-subjects/sciences/marine-science/syllabus>

^[2] National Geographic 2021. Accessed 25 July 2021 from: <https://www.australiangeographic.com.au/topics/wildlife/2015/04/gallery-protecting-the-grey-nurse-shark/>

Interested persons are invited to contact the author for information or to indicate errors and omissions.

BEFORE GOING ANY FURTHER, REVISE CONCEPTS INTRODUCED ON PAGE 134 TITLED, 'CAPTURE AND RECAPTURE'

Natural Tags on Grey Nurse Sharks (*Carcharias taurus*)

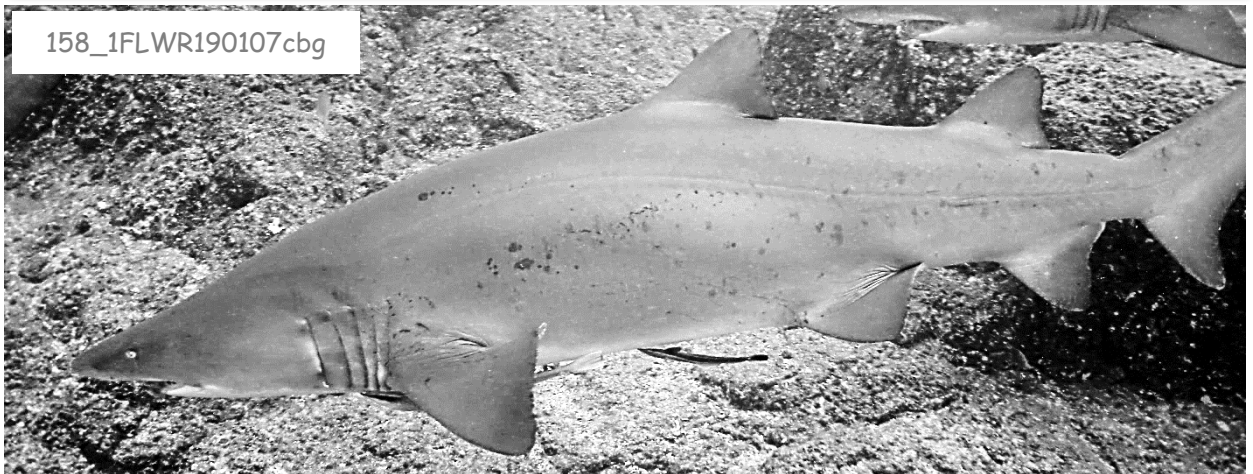
Below are pictures that were kindly donated by Grey Nurse Shark Watch (GNSW), a community Grey Nurse Shark photographic identification program^[1]. The Australian east coast sub-population of Grey Nurse Shark were hunted almost to extinction in the 1950's. They are now **critically endangered**.

The Grey Nurse Shark Watch program tags each shark by giving it a name. Each shark is recognizable from the unique arrangement of spots on the side of its body that act as a 'natural tag'. Once a shark has been photographed, it is named or matched to a previous photograph. *Note:* the sharks often swim in a circuit-like configuration, allowing divers to sit in one spot and wait for the sharks to predictably swim past (usually very close) and have their picture taken. The sharks only 'look' dangerous because they can not cover their teeth (another common name is 'ragged-tooth shark'). They are not dangerous at all.

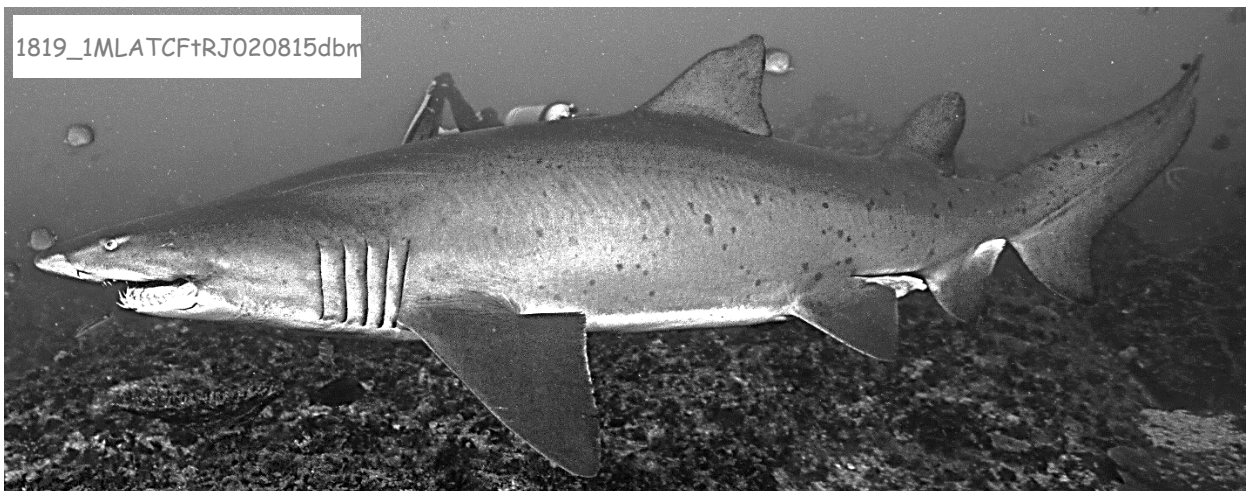
Activity: 'Tag' each shark by giving it a name (write the name in the empty box provided).

Note: for a closer look, you can view all original colour photos at marineducation.com.au

158_1FLWR190107cbg



1819_1MLATCF+RJ020815dbm



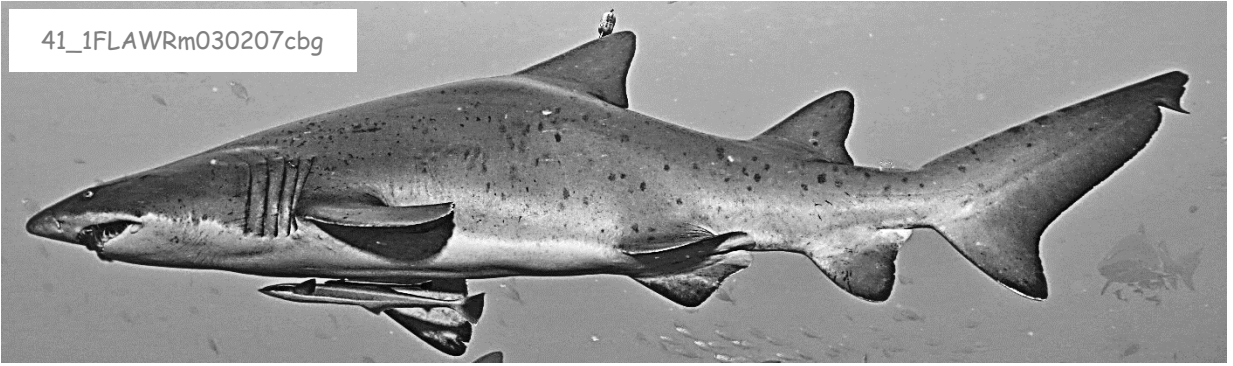
^[1] Photographs © Dr. Carley Kilpatrick from Grey Nurse Shark Watch - Reef Check Australia at https://www.reefcheckaustralia.org/grey_nurse_shark_watch

First Catch (tagging)

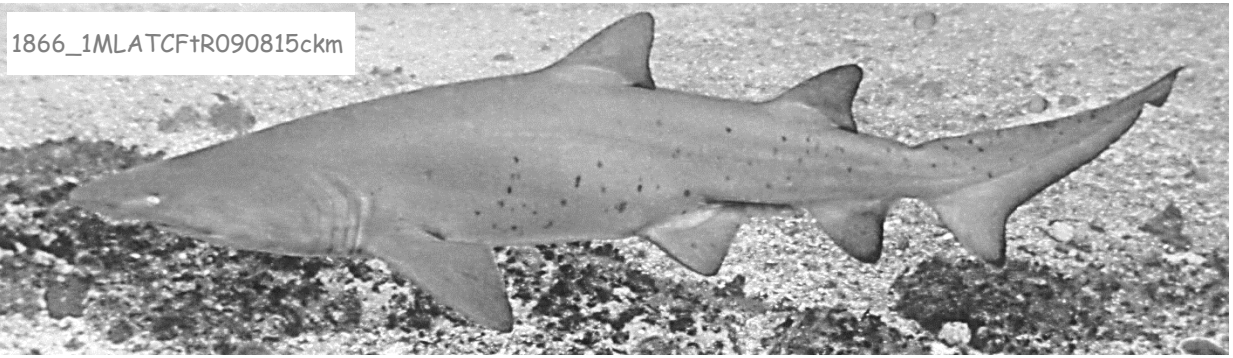
Name:

Date:

41_1FLAWRm030207cbg



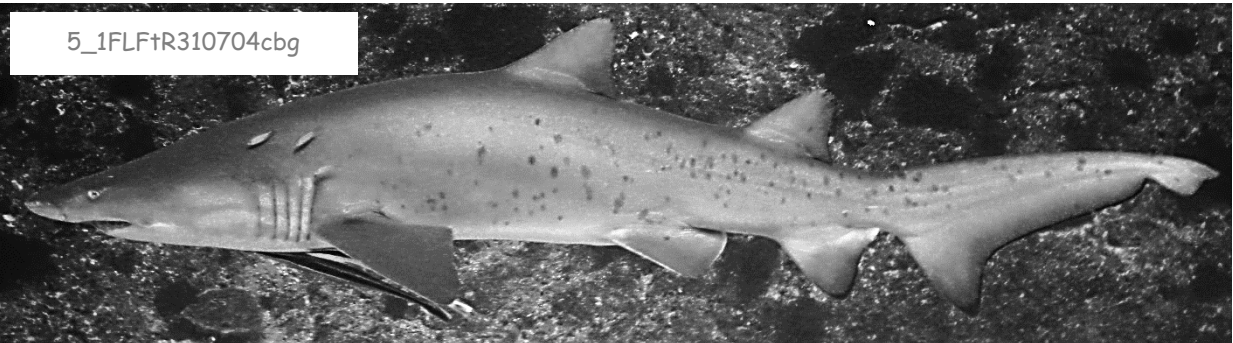
1866_1MLATCF+R090815ckm



142_1FLFR040707cbm



5_1FLF+R310704cbg

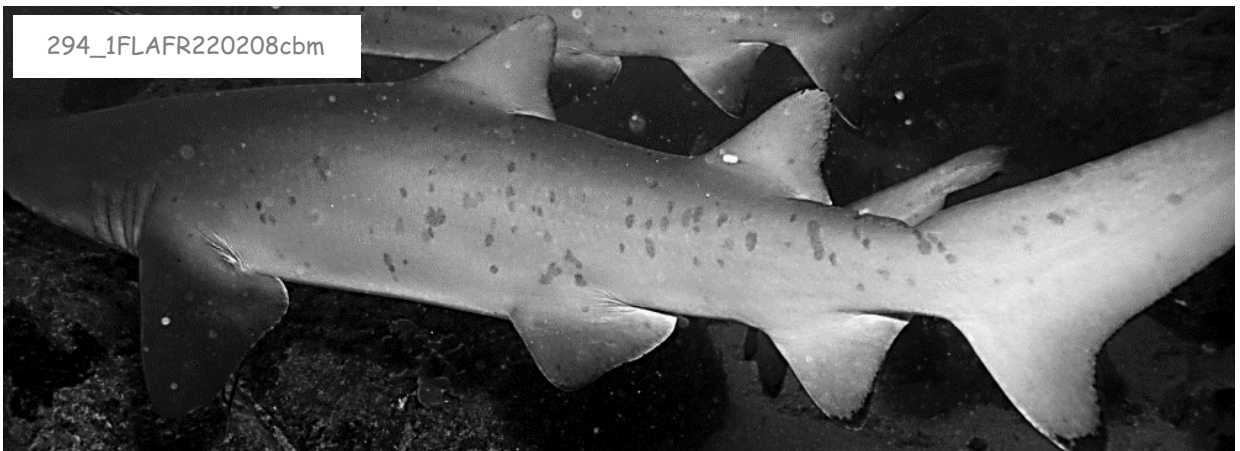
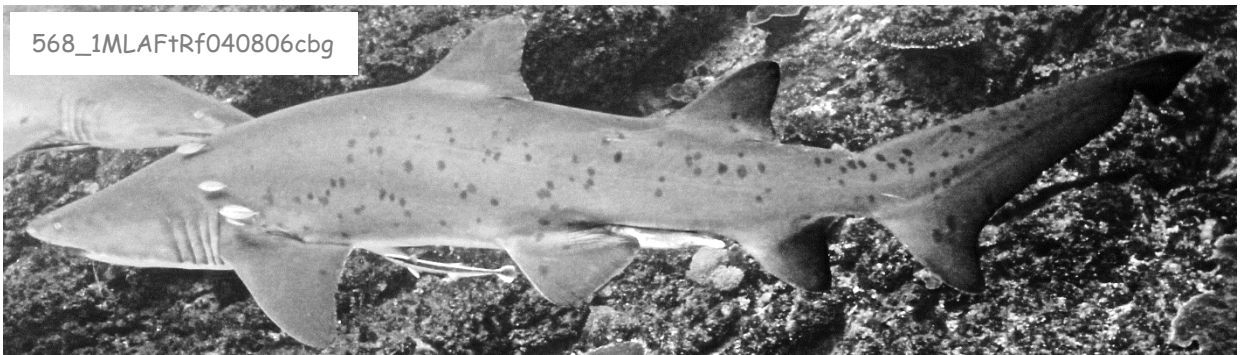


^[1] Photographs © Dr. Carley Kilpatrick from Grey Nurse Shark Watch - Reef Check Australia at https://www.reefcheckaustralia.org/grey_nurse_shark_watch

First Catch (tagging)

Name:

Date:



^[1] Photographs © Dr. Carley Kilpatrick from Grey Nurse Shark Watch - Reef Check Australia at https://www.reefcheckaustralia.org/grey_nurse_shark_watch

Second Catch (recapture)

Name:

Date:

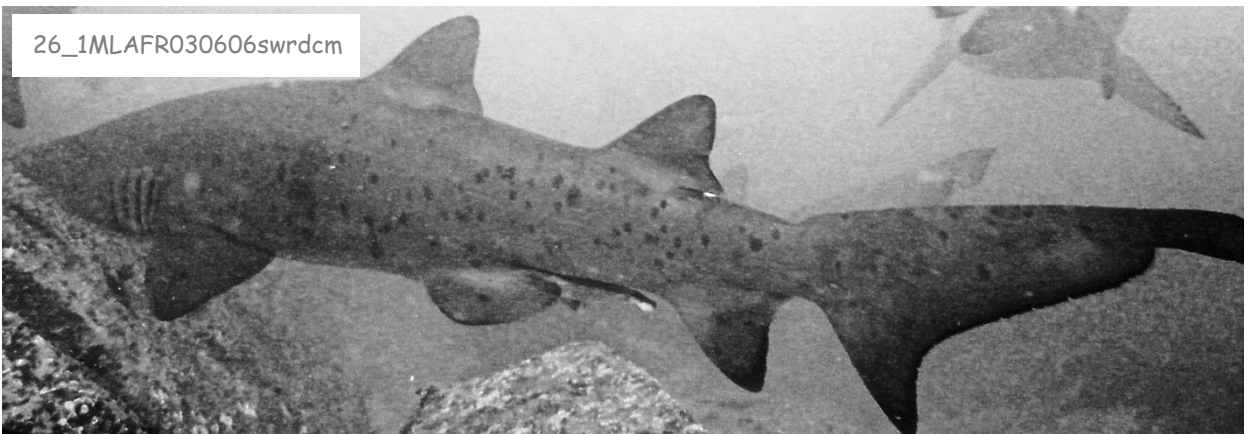
Activity: This 'second catch' also includes 10 sharks. Identify the sharks that you already named (tagged) in the first catch. If it is a new shark, give it a new name in the box provided.

Note: for a closer look, you can view all original colour photos at marineeducation.com.au

1659_1FLAWRm170214ckm

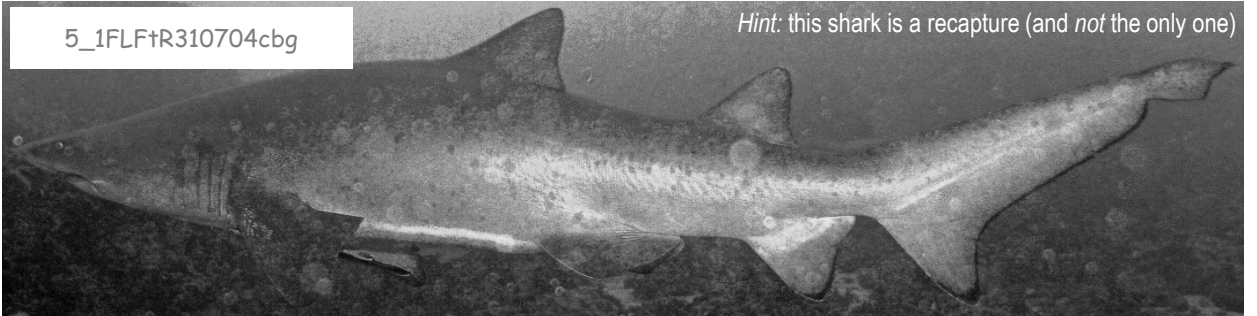


26_1MLAFR030606swrdcm



5_1FLF+R310704cbg

Hint: this shark is a recapture (and not the only one)



^[1] Photographs © Dr. Carley Kilpatrick from Grey Nurse Shark Watch - Reef Check Australia at https://www.reefcheckaustralia.org/grey_nurse_shark_watch

Second Catch (recapture)

Name:

Date:

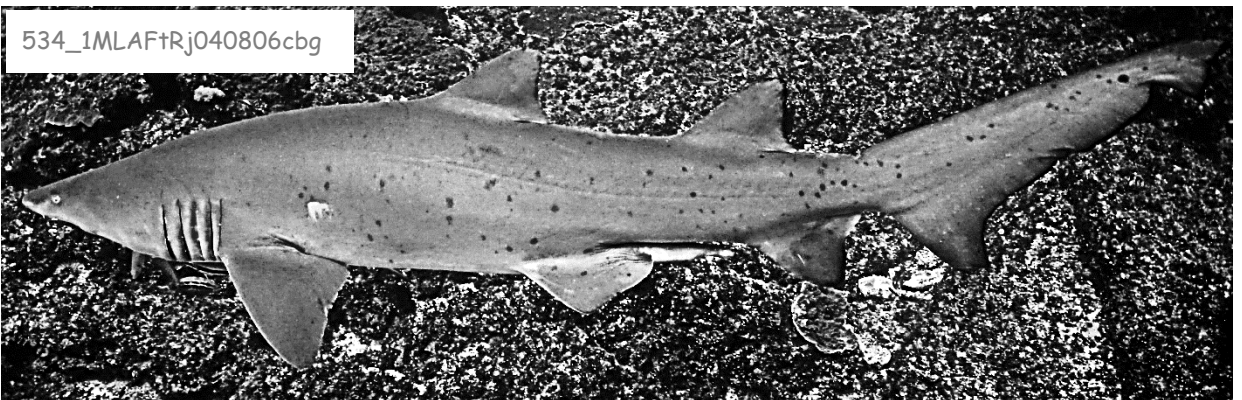


^[1] Photographs © Dr. Carley Kilpatrick from Grey Nurse Shark Watch - Reef Check Australia at https://www.reefcheckaustralia.org/grey_nurse_shark_watch

Second Catch (recapture)

Name:

Date:



Total number of sharks in the first catch	M	10
Total number of sharks in the second catch	n	10
Number of recaptures in the second catch (how many already had a name?)	m	3
Estimated population size (to the nearest whole number)	$N = \frac{M \times n}{m}$	N 33

^[1] Photographs © Dr. Carley Kilpatrick from Grey Nurse Shark Watch - Reef Check Australia at https://www.reefcheckaustralia.org/grey_nurse_shark_watch

FOOD FOR THOUGHT

Name:

Date:

Activity: Refer to Figure 1 (below) to check your estimate of the population.

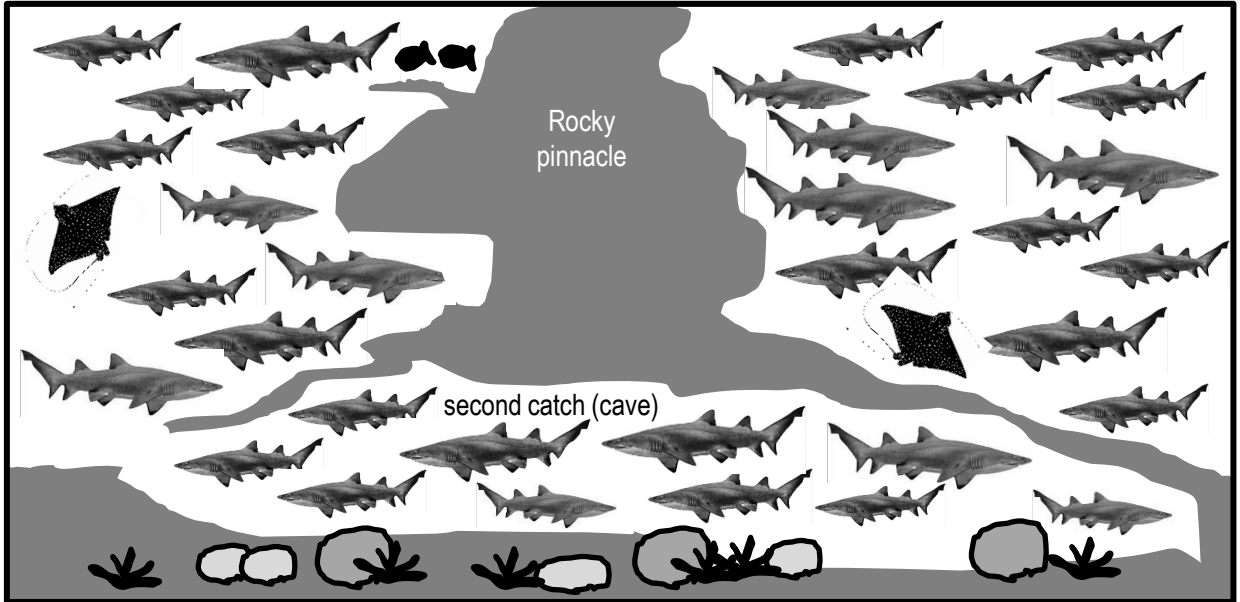


Figure 1: All the sharks in the first catch are pointing to the right. All the sharks in the second catch (recaptures) are in the cave (although, they may not have been photographed whilst in a cave; and the size of the sharks in Figure 1 are not representative of the size of the sharks in the photographs).

Activity: Discuss the assumptions that are made when estimating population size using this method.

Code Names

Grey Nurse Shark Watch use a code to name their sharks. The code goes like this: the first number is the unique ID number for that shark. Underscore. The photo number for that individual shark on that day and at one site. Then, the gender of the shark, whereby males have claspers (**Male/Female/Unknown**). Then, the side of the shark that the photograph was taken (**Left/Right**). Followed by the maturity of the shark (**Adult/Sub-Adult/Juvenile**). Then, the site code (*note*: these sharks often aggregate at a particular site at a particular time of year, e.g. **Solitary Islands, Wolf Rock, Flat Rock, Julian Rocks**). If applicable, any other information such as fishing gear (f) jaw injury (j) mating scars (m) pregnant (p) tag or tag tether present (t). Lastly the date, the initials of the photographer and the photo quality (**good, medium, poor**)^[2].

Q. Is the following shark male or female? 1_3FRSAWRjp100815jgm **Ans.** Female

Combing through the Grey Nurse Shark database to find a match for a photograph of a shark is quite the task.

The code names make it a little easier to narrow it down. But a software program would make it a lot easier!

You just tried to find a match for 10 sharks. Imagine trying to find a match for hundreds of sharks!

If you would like to donate to Grey Nurse Shark Watch to help them raise money for a shark matching software program, or if you want to volunteer to match sharks, or take photographs of grey nurse sharks in the wild to upload to the database, visit their website at https://www.reefcheckaustralia.org/grey_nurse_shark_watch

^[1] Department of Environment (2014). *Recovery Plan for the Grey Nurse Shark (Carcharias taurus)*. Commonwealth of Australia. Accessed 12.05.2019 from: <https://www.environment.gov.au/resource/recovery-plan-grey-nurse-shark-carcharias-taurus>

^[2] Methodology © Dr. Carley Kilpatrick from Grey Nurse Shark Watch - Reef Check Australia at https://www.reefcheckaustralia.org/grey_nurse_shark_watch