IN THE HIGH COURT OF SOUTH AFRICA
(WESTERN CAPE DIVISION, CAPE TOWN)

Case No ..../2024

In the matter between

AUKOTOWA FISHERIES PRIMARY CO-OPERATIVE LIMITED	**First Applicant**
THE GREEN CONNECTION	**Second Applicant**
NATURAL JUSTICE	**Third Applicant**

And

DIRECTOR-GENERAL: DEPARTMENT OF MINERAL AND PETROLEUM RESOURCES	**First Respondent**
MINISTER OF FORESTRY, FISHERIES AND THE ENVIRONMENT	**Second Respondent**
TGS GEOPHYSICAL COMPANY (UK) LTD	**Third Respondent**
MINISTER OF MINERAL AND PETORLEUM RESOURCES	**Fourth Respondent**

EXPERT AFFIDAVIT: JEAN HARRIS

I, the undersigned,

JEAN MARY HARRIS

do hereby make oath and say:

1. I am an adult female marine scientist, and am currently the Executive Director of WILDOCEANS, the marine programme of the Wildlands Conservation Trust

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(WILDTRUST), and NGO focused on biodiversity protection and building socio-ecological resilience in the Southern Africa and western Indian Ocean.

2. The facts contained in this affidavit fall within my personal knowledge, except where I indicate otherwise and are, to the best of my knowledge, true and correct. To the extent that I rely on information supplied by others, I believe that such information is true and correct.

3. Together with Dr Jennifer Olbers and Dr Kendyl Wright, I have prepared the report annexed hereto marked "**JH1**".

4. My qualifications and experience are set out in a copy of my *curriculum vitae*, attached to this affidavit marked "**JH2**". I respectfully submit that I am qualified by my qualifications, training and experience to express the expert opinions which are set out in the report referred to above.

5. I further confirm that the report is to the best of my knowledge and belief true and correct.

JEAN MARY HARRIS

I hereby certify that on the 13 day of NOVEMBER **2024** in my presence at DURBAN the Deponent signed this Affidavit and I administered the oath/affirmation in full compliance of the provisions of Act 16 of

1963 and Regulations promulgated thereunder (GN R1258 in GG 3619 of 21 July 1972, as amended).

72569314
SEKHAKHANG

COMMISSIONER OF OATHS

Name: ATHABILE VUYISWA SIKHAKHANE

Designation: Constable

Date: 2024 -11-13

SOUTH AFRICAN POLICE SERVICE
CRIME PREVENTION
2024 -11- 13
BRIGHTON BEACH
KWAZULU NATAL

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"JH1"

ADDITIONAL COMMENTS ON THE TGS ORANGE BASIN BASIC ASSESSMENT REPORT FOR RECONNAISSANCE, LOCATED OFFSHORE THE WEST COAST, SOUTH AFRICA.

Dr JM Harris, Dr JM Olbers and Dr K Wright
10 November 2024

These comments were prepared by WILDTRUST marine scientists, namely Dr JM Harris, Dr JM Olbers and Dr K Wright, as requested by Natural Justice, and relate to an Appeal Decision of an Environmental Authorisation (EA) granted (26 April 2023; Ref: EIMS 1520). This document provides additional comments on the Basic Assessment Report (BAR), dated 6 October 2022, on the TGS Orange Basin Basic Assessment Report for reconnaissance, located offshore the west coast, South Africa.

Having reviewed the BAR and associated specialist reports, it is our opinion that the implications to marine fauna are not being sufficiently acknowledged in the EA to ease/allay fears around the impact of seismic survey (reconnaissance) activities. Comments on the ecological and biological components are given below, but by no means are comprehensive and are intended to highlight key concerns.

General impacts

Historically, the focus of seismic survey impacts and sound has been on cetaceans, with decades of effort and literature published globally to obtain a better understanding of the consequences to these animals which rely on sound for survival, including for communication using sound mainly for social interactions such as mating, mother-calf recognition, predator avoidance and locating food (see reviews of Gordon et al 2003, Weilgart 2007, Weilgart 2013, Kavanagh, 2019). Notwithstanding this, it has been well documented that various other animals also require and use sound critical to ensure functional life cycles (see Jasny et al. 2005). Sound is used by many species, by actively producing sound (Tyack 1981), by listening to sounds emitted by other living organisms (Clark et al. 2009; Van Opzeeland 2010), and taking cues from physical or non-living factors producing sounds, contributing to the ambient background noise, such as wind, waves, swell, bubbles, currents, turbulence, earthquakes, rainfall, ice cracking or breaking (Hildebrand 2005). Apart from cetaceans, many marine animals rely on producing a sound that is heard, and also having the ability to hear a sound and interpreting the sound for their survival (Hildebrand 2005).

Cetaceans

The BAR highlights that occurrences and encounters with various cetacean species are inevitable, all of which are protected in South African waters. Information supplied on cetaceans is largely based on observational data, i.e. Marine Mammal Observer (MMO) surveys (Figures 29a &b, and 30; Biodiversity and Ecosystem Services Assessment). These data are somewhat outdated and do not account for the population dynamics of the cetaceans present in the reconnaissance area or area of interest (AOI). To understand the risk of seismic surveys on cetaceans, the population status of species of concern needs to be established. This requires many years of research and depends on the temporal trends for each marine mammal species (Nowacek et al., 2015) specific to the AOI. Considering this, developing other metrics for cetacean population status, such as current distribution, ranging patterns, population structure, and body condition, should be a priority (Nowacek et al., 2015). Furthermore, without a proper understanding of the ecosystem within and surrounding the AOI, as

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highlighted in the BAR, it is impossible to assess the impacts of seismic noise on prey distribution, which ultimately influences the predator populations and distributions, such as with cetaceans (Nowacek et al., 2015).

Behavioural responses to noise are dependent on various factors, such as age, sex, presence of offspring, location and an individual animals' previous encounter with a specific sound or noise. Behavioural responses may include modification of vocal behaviour, displacement from important habitats, and other subtle responses, including increased breathing rates, change in dive duration, time spent at the surface, and rapid or erratic movements (Bowles et al. 1994; Lesage et al. 1999; Williams et al. 2002; Ng and Leung 2003; Aguilar de Soto et al. 2006). These all with potentially high energetic costs (Williams et al. 2006; Koper and Plön 2012). The time period, frequency and magnitude of a behaviour modification caused by anthropogenic disturbance, with its associated long-term implications, at a population level, remains unknown, and there remains no evidence to suggest that the change in behaviour is not detrimental.

Stress caused by disturbance is associated with a change in body chemistry (Jasny et al. 2005) and can be equally disruptive as physical damage. Stress has implications on sexual maturation, inhibits growth, reproduction and general survival ability (Pickering 1992; McCormick 1999; Consten et al. 2001). Perceptual effects can occur when there is an interference of sounds of interest to a specific animal but are being drowned out or masked by anthropogenic noise. The impact of this in the long term could have implications on breeding populations, thus on reproduction within a population (Erbe 2001). Many animals may have the ability to counteract this and make minor changes to their vocalisations and behaviour; however, these modifications may come at a cost in terms of energy expenditure (Tyack 2008) and are likely to reduce breeding productivity of the population. This is of particular concern for species that are already threatened.

Barendse et al. (2010), Best & Allison (2010), and Elwen et al. (2014) highlighted that there is no existing evidence of a clear 'corridor' of migration and humpback whales appear to be spread out widely across the shelf and into deeper pelagic waters, especially during the southward migration, in the Benguela ecosystem. Despite various species being recorded frequently on the coasts and within the Exclusive Economic Zone, the location of breeding grounds of Sei (*Balaenoptera borealis*) and Fin whales (*Balaenoptera physalus*) are unknown, the seasonality of pygmy (*Kogia breviceps*) and dwarf (*Kogia sima*) sperm whales are unknown and the abundance and occurrence of the offshore common dolphin (*Delphinus delphis*) is also unknown, highlighting that encounters with these animals cannot be predicted and the generic mitigation measures may be insufficient.

In 2020, Vermeulen *et al.* warned that there is an observed decrease in Southern Right Whale calving success (i.e. low numbers of unaccompanied adults) of the South African population, with a strong link to foraging success (Vermeulen *et al.* 2023). It was highlighted that reduced maternal body condition, could contribute to a decreased reproductive rate and potentially have serious consequences for cow-calf pairs in relation to South Africa's whale-watching industry in the future. Germishuizen (2024) and Vermeulen *et al.* (2023) show that Southern Right Whales are responding to changing climate conditions by modifying foraging behaviours within their high-latitude foraging grounds. These adaptive strategies, which include altering migratory behaviours, are associated with energetic costs (Vermeulen et al. 2023). The consequences of these changes in energetic costs, at a population level, remain unknown.

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South Africa's south and west coasts are hosts to eight species of beaked whales (Ziphiidae) (Best 2007), including a new species described in 2021 (*Mesoplodon eueu;* Carroll et al. 2021), which are globally recognised as being sensitive to anthropogenic noise, and having raised conservation concerns. New et al. (2013) found that adult female beaked whales could survive but not reproduce in times or areas of lower habitat quality. They may extend the duration of lactation in mediocre conditions to increase their chance of survival, while still reproducing. New et al. (2013) found that some beaked whale species require high-quality habitat to meet their requirements for reproduction and survival. They suggested that even minor, non-lethal disturbances resulting in changes in behaviour, such as displacement from preferred habitats and stress (discussed above), could impact a population.

Sea Turtles

Adult sea turtles may be less vulnerable to sound damage than cetaceans as the air spaces in their cochlear are smaller than those in cetaceans, making them less sensitive to sound shockwaves (Popper et al. 2014). However, while studies have shown that adult sea turtles have a moderate ability to move from an area being surveyed (Lenhardt 1994; O'Hara and Wilcox 1990), they are prone to Temporary Threshold Shift (TTS) after exposure to sound within 1 km of a sound source, with signs of recovery only two weeks after injury (Lenhardt 1994).

There are five resident sea turtle species that migrate around the South African coastline: Endangered green turtles (*Chelonia mydas*); Critically Endangered hawksbills (*Eretmochelys imbricata*); regionally Near Threatened loggerheads (*Caretta caretta*); regionally Critically Endangered leatherbacks (*Dermochelys coriacea*); and vagrant Vulnerable olive ridleys (*Lepidochelys olivacea*) (Le Gouvello et al., 2024).

In our opinion there is cause for concern of harm to these threatened species of sea turtles both at the population as well as the species level. Sea turtles employ nest site fidelity, essentially returning to the beach where they were born to lay eggs. In South Africa, the leatherback and loggerhead nesting trends have been monitored since 1965, within their rookeries in northern KwaZulu-Natal (KZN), giving clear indications of local population levels. Both species are already under significant pressure offshore including being caught as bycatch in fishing gear and having to contend with increasing plastic pollution. Current estimates of loggerhead turtles are low, with an estimated 801 and 615 adults nesting in the KZN rookery during the 2021/2022 and 2022/2023 seasons, respectively (Figure 1; Bachoo, 2022; Bachoo, 2024). Of more concern is the leatherback turtle, in which only 96 identified individual adults nested during the 2021/2022 season and declined to 46 individuals in 2022/2023 (Figure 2; Bachoo, 2022; Bachoo, 2024). Both populations have shown extremely slow recovery since conservation measures in South Africa were implemented, and further anthropogenic loss could, in our opinion, constitute irreparable harm.

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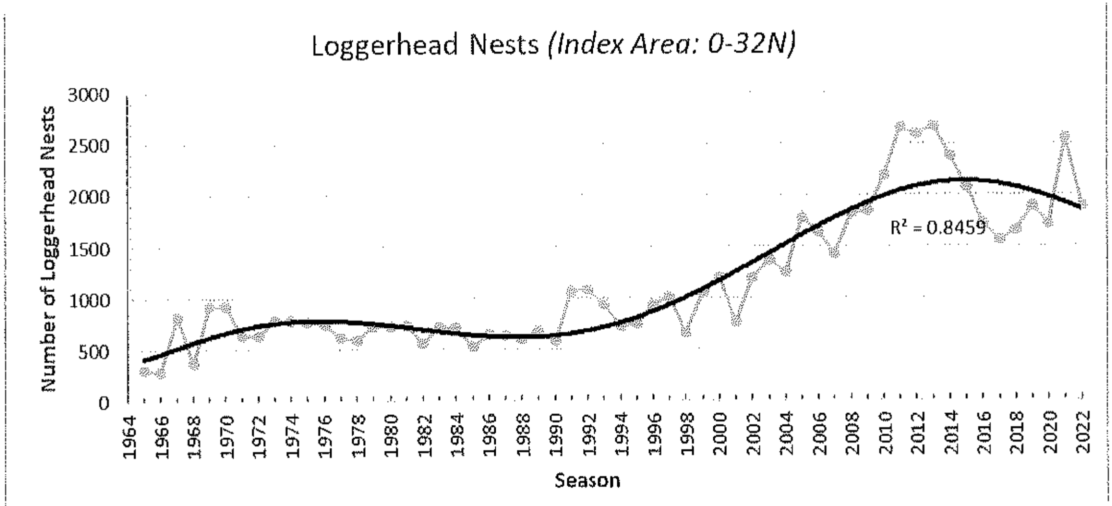

Figure 1. Number of loggerhead turtle nests in the index area (0 – 32 N) from the 1965/1966 nesting season to the 2019/2020 nesting season. From Bachoo (2022) and Bachoo (2024).

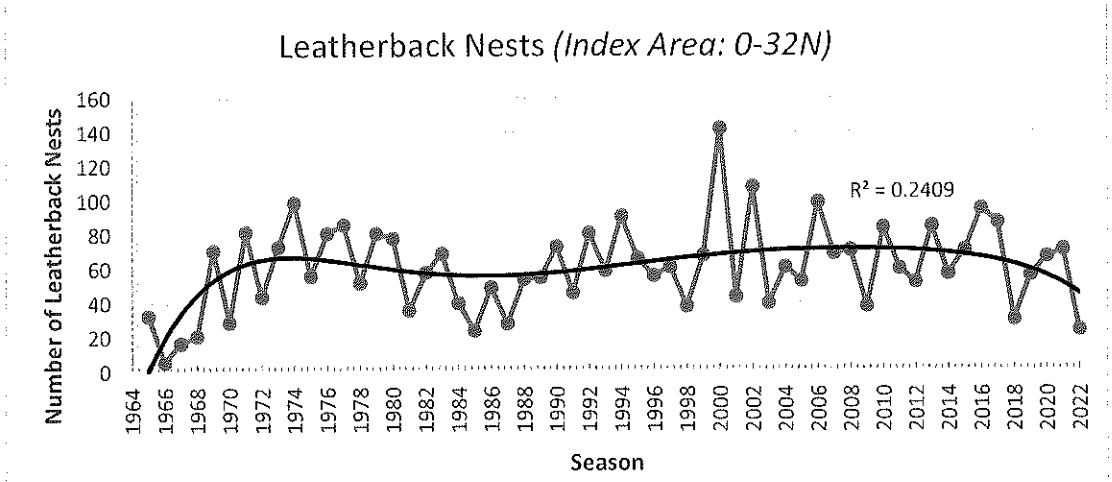

Figure 2. Number of leatherback turtle nests in the index area (0 – 32 N) from the 1965/1966 nesting season to the 2019/2020 nesting season. From Bachoo (2022) and Bachoo (2024).

The migratory lifestyle of sea turtles is mostly attributed to its complex life-cycle and their innate nature to return to their natal areas for nesting (Pendoley, 1997). Nesting of both leatherback and loggerhead turtles, on the beaches of the iSimangaliso Marine Protected Area (KwaZulu-Natal, South Africa) and Ponta do Ouro (southern Mozambique), occurs between October and March, with a peak from December to January (Table 1; Nel et al., 2013; Le Gouvello et al., 2020). Turtle hatchlings are likely to enter the ocean during the first quarter of the year, where they feed off plankton and remain in the open ocean currents until their development is complete (Luschi et al., 2003; Le Gouvello et al.,2024). It is almost impossible to track these 'tennis ball sized' hatchlings, in addition to their high mortality rates and rapid growth, further complicating the attachment of tracking devices. The result, is termed the "lost years", where it remains unclear where sea turtles <10 years old occur before returning to their shallow water foraging grounds (Musick and Limpus, 1997; Luschi et al., 2003). The movement of sea turtle hatchlings and early juveniles from coastal waters into the open pelagic ocean is strongly

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influenced by currents, which aid in moving them away from inshore predatory waters and prevents them from being cast higher ashore (Lucshi et al., 2003). The current systems serve as the optimal environment for hatchlings and juveniles where their passive dispersal movement is a consequence of drifting (Luschi et al., 2003).

A recent scientific investigation by Le Gouvello et al. (2024) employed modelling techniques to examine the trajectory of neonate (<1 year old) turtles from hatching to one years old, using high-resolution ocean models in conjunction with particle tracking simulations. Juvenile sea turtles, both loggerhead and leatherback, leaving the iSimangaliso Marine Protected Area and Ponta do Ouro, take approximately 200-365 days to reach the west coast region (Figure 3a & 3b; Le Gouvello et al., 2024). Considering the loggerhead and leatherback movements and duration from the east coast to the west coast, raises the question of whether this can be considered a migration behaviour (Luschi et al., 2003). This means that due to the annual introduction of new hatchlings between January and March, and their movement around the coastline from east to west, it is indicative of a high likelihood that juvenile sea turtles will occur throughout the year (Table 1; Figure 3a & 3b; Le Gouvello et al., 2024).

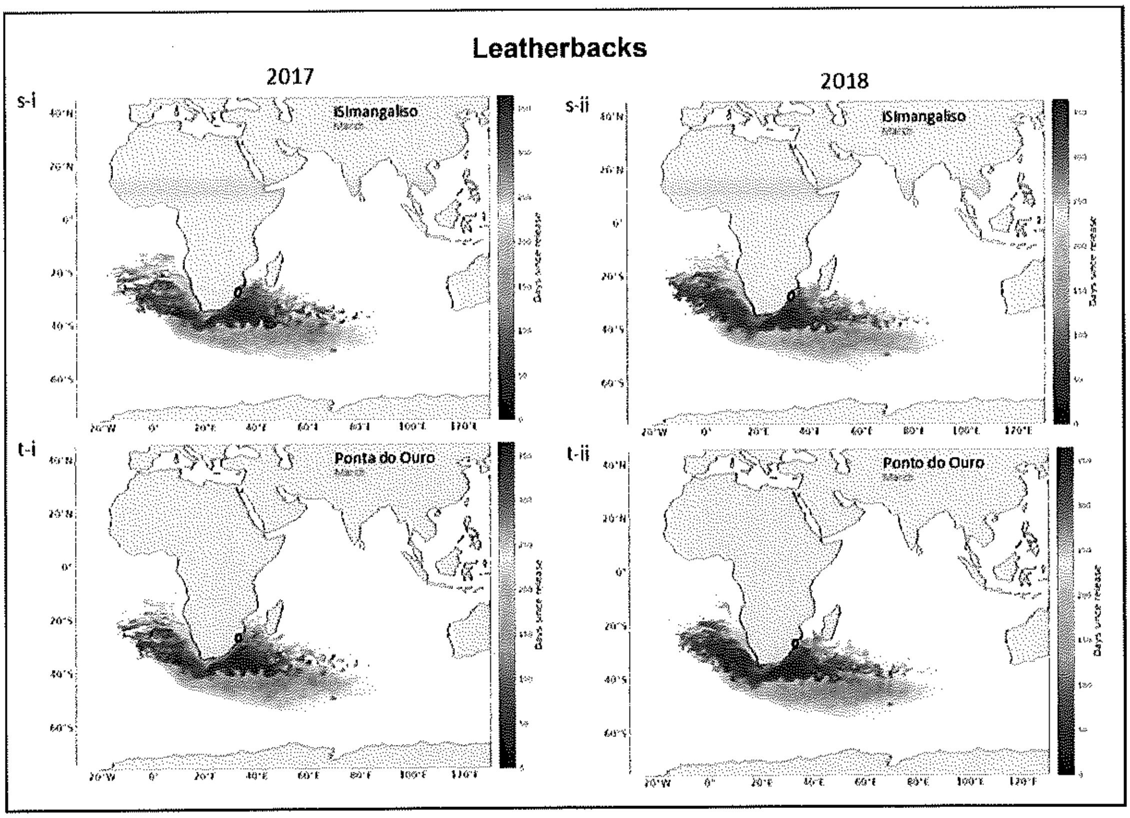

Figure 3a: Dispersal maps showing 12 month trajectories of 5000 particles released from the respective nesting sites (white circles) of leatherbacks in 2017 (-i) and 2018 (-ii) from two rookeries (iSimangaliso MPA and Ponta do Ouro). Colours (blue to red) indicate the number of days since release, and grey text gives the month of release. From Le Gouvello et al. 2024.

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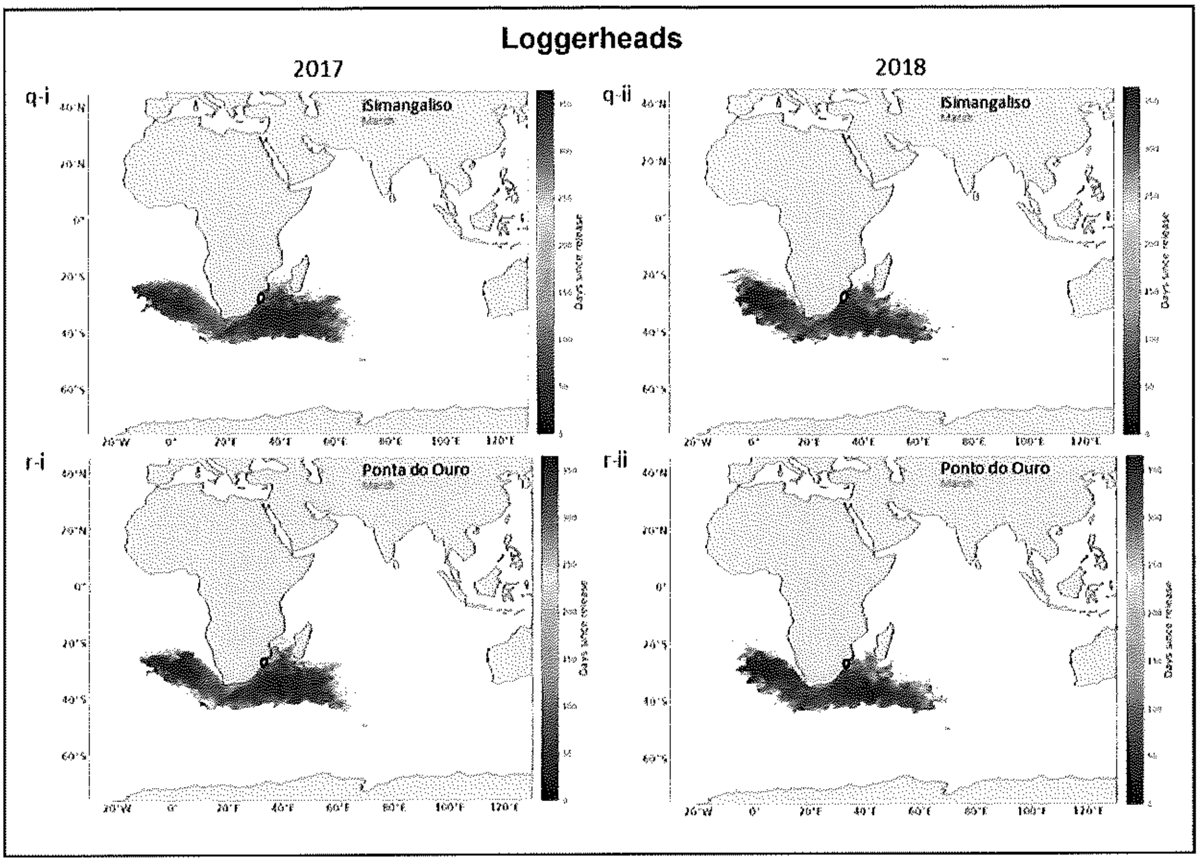

Figure 3b: Dispersal maps showing 12-month trajectories of 5000 particles released from the respective nesting sites (white circles) of loggerheads in 2017 (-i) and 2018 (-ii), from two rookeries (iSimangaliso MPA and Ponta do Ouro). Colours (blue to red) indicate the number of days since release, and grey text gives the month of release. From Le Gouvello et al. 2024.

Satellite tracking data of stranded, rehabilitated and released sea turtles of various species (loggerhead, green, olive ridley) and sizes (juvenile to sub-adult) further confirms their presence on the west coast year-round (Two Oceans Aquarium Foundation, Bayworld, Port Elizabeth and South African Association for Marine Biological Research, unpublished data; Figure 4a, 4b, 4c). The routes of sea turtles from satellite tracking often show direct paths to their destination, but individual turtles may only arrive at their destination after a long detour, making their movements unpredictable.

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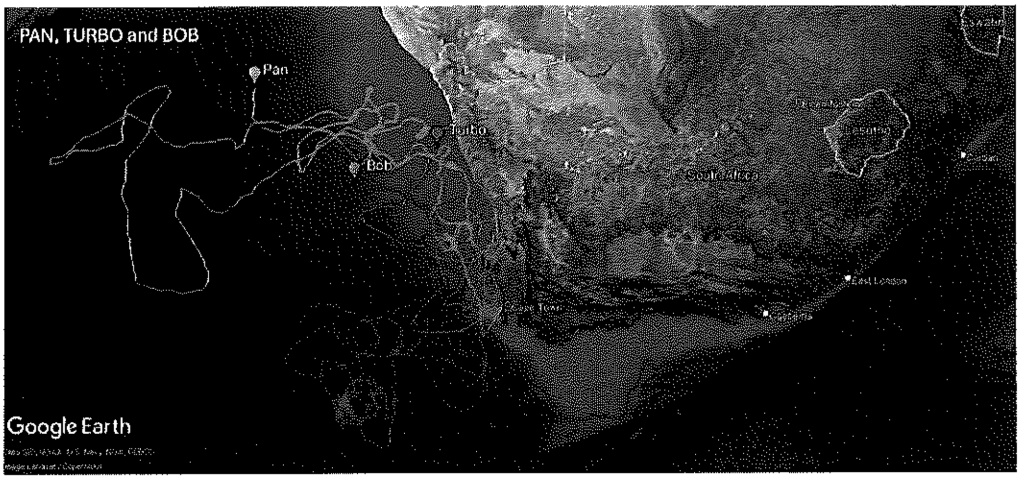

Figure 4a: Satellite tracks of three stranded, rehabilitated and released sea turtles (green and loggerhead), indicating overlap with AOI on the west coast of South Africa. Images from Two Oceans Aquarium Foundation, Bayworld, Port Elizabeth and South African Association for Marine Biological Research, unpublished data; Talitha Noble-Trull, Pers. comm.).

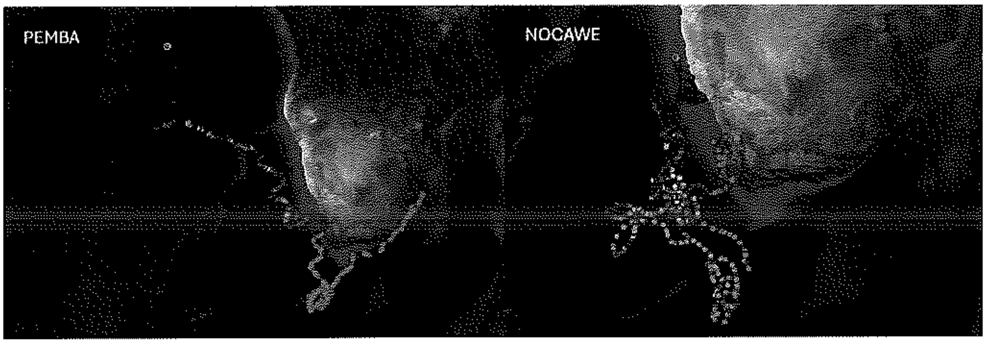

Figure 4b: Satellite tracks of two stranded, rehabilitated and released sea turtles (loggerhead and olive ridley), showing overlap with AOI. Images from Two Oceans Aquarium Foundation, Bayworld, Port Elizabeth and South African Association for Marine Biological Research, unpublished data; Talitha Noble-Trull, Pers. comm.).

Figure 4c: Satellite tracks of one stranded, rehabilitated and released sea turtle (loggerhead), showing overlap with AOI. Images from Two Oceans Aquarium Foundation, Bayworld, Port Elizabeth and South African Association for Marine Biological Research, unpublished data; Talitha Noble-Trull, Pers. comm.).

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The presence of sea turtles at different stages in their life history, are present throughout the year along the west coast and likely within the AOL (Table 1; Le Gouvello et al. 2024; Satellite tracking data, Bayworld, Port Elizabeth and South African Association for Marine Biological Research, unpublished data).

Table 1. Presence and location of sea turtles each month occurring on the southern African nesting beaches and in the area of interest (AOI) throughout the year based on local literature.

	J	F	M	A	M	J	J	A	S	O	N	D
Nesting period	Peak											Peak
Hatching period		Peak	Peak	Peak								
Presence of post-hatchling & immature sea turtles within the AOI (based on Le Gouvello et al. 2024)												

These sea turtles live out their early years on and close to the surface, only being able to dive to depths of 2-3 m. These juveniles and hatchlings cannot swim effectively or fast enough away if in close proximity to the sound source. Up to now, there are no effective mitigation measures which can be offered to mitigate the impact of sound/airgun blasts on the smaller turtles, and this is of extreme concern, not only due to their inability to evade the radius of blasts, but also since they will not be readily visible to visual observers due to their small size and behaviour in the water. Given that the success rate of visual observations by MMOs for large species such as humpback whales is only 44% of the time (Wilkinson, 2021), it renders this method of mitigation ineffective for smaller animals such as sea turtles, but especially for post-hatchling (palm-sized) and juvenile (dinner plate-sized) turtles. The difficulty in visually detecting these animals in the offshore environment is further corroborated by turtle researchers (Musick and Limpus 1997).

A further potential physical impact for sea turtles from seismic surveys is entanglement and/or entrapment in equipment (Nelms et al., 2016). It was noted by Weir et al. (2007) that off the west coast of Africa prior to the turtle nesting season, an influx of sea turtles are observed during seismic surveys, as well as in the vicinity of seismic vessels and its towed equipment (Ketos Ecology (2009). Turtles tend to bask on the ocean surface to slow down metabolic processes and conserve energy during hot and favourable weather conditions (Ketos Ecology, 2009). Therefore, turtle startle dive responses to seismic vessels and equipment may be delayed and occur only after visual detection of approaching objects at close range (< 1 m) (Ketos Ecology, 2009). This basking behaviour of turtles can leave them vulnerable to collisions with dilt floats and tail buoys, which are usually located several kilometres astern the ship and pose a challenge of observing and monitoring for turtle entrapments (Ketos Ecology, 2009). In addition, loggerhead, olive ridley and Kemp's ridley (*Lepidochelys kempii*) are likely species falling victim to tail buoy entrapments while foraging alongside a seismic cable, inevitably causing the fatality of trapped turtles (Ketos Ecology, 2009).

Their presence, coupled with an inability to mitigate the risk of seismic surveys on sea turtles, means that post-hatchling and juvenile sea turtles are at significant risk of harm. Furthermore, with their limited ability to swim and avoid obstacles, pelagic loggerhead and leatherback juvenile turtles are highly vulnerable to seismic surveys because of direct injury or mortality from the towed hydrophone

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streamers (Le Gouvello et al., 2024). In 2020, Le Gouvello et al. reported that female loggerhead turtle size is declining in South Africa, even though their nesting grounds are protected. Therefore, population growth is not always guaranteed if survival is not ensured at other life stages at sea (Crouse et al. 1987; Crowder et al. 1994; Chaloupka and Limpus 2001; Bjorndal et al. 2005; Margaritoulis 2005; Mazaris et al. 2006), and although coastal marine protected areas do work in protecting sea turtles (Nel et al., 2013; Le Gouvello et al., 2020) there is a need for integrated management strategies (Le Gouvello et al., 2020), to protect threatened species.

CONCLUSION

For the reasons outlined above, it is our opinion that the proposed seismic surveys for reconnaissance pose an unacceptable acoustic and ecological risk to the marine ecosystems and species in South African waters. In point 3.2 of the EA, seismic surveys are described as *"generally regarded as non-intrusive in nature", and although states that "the technology poses potential impacts on fisheries and marine fauna,.....the majority of the impacts were assessed to range between low to very low significance with mitigation".* In our opinion, the acute anthropogenic noise over a prolonged period of time, and the extensive survey gear in the water is an ecological risk to threatened and protected marine fauna that primarily use sound to survive and/or are unable to avoid the area of impact. We therefore disagree with the finding of the BAR and Reasons for Decision in the EA, that seismic surveys are regarded as 'non-intrusive', especially when the report clearly acknowledges the presence of impacts, before assessing their significance as low despite the impacts being largely unknown.

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