Western Rock Lobster Comment re 2020 Offshore Petroleum Exploration Acreage Release

The purpose of this submission is to draw to attention of authorities (Department of Industry, Science, Energy and Resources and the regulator, the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA)), Western Rock Lobster views and concerns arising from the 2020 Offshore Petroleum Exploration Acreage Release. In particular these comments focus on the Southern Carnarvon Basin and Perth Basin-Offshore Western Australia (Geraldton Region) release areas W20-31, W20-30 and W20-29.

The West Coast Rock Lobster Managed Fishery (WCRLMF) is Australia's most valuable single-species, wild-caught fishery worth more than $400m annually operating between 21degrees 44 minutes south latitude and Cape Leeuwin off the coast of Western Australia. Approximately 235 vessels operate in the WCRLMF under a quota management regime, employing 2400 people directly and indirectly providing overall benefits mostly to regional Western Australia, with multipliers approximating a billion dollars economic value annually. It also supports a globally significant recreational fishery in excess of 60,000 licenced fishers of considerable economic and social value.

Western Rock Lobster (WRL) is the peak industry council for this important fishery and represents the interest of all commercial rock lobster fishers, licence holders and exporters. WRL is a key relevant and potentially affected party to all future activities over these proposed offshore exploration sites.

Known impacts of seismic surveys on fisheries

WRL recognises the importance of the Australian petroleum industry to Australia but continues to be concerned at the lack of detailed due diligence and research into the impacts of seismic airgun technology on the marine environment and fisheries in particular.

WRL is prepared to collaborate with the Petroleum Industry peak body (APPEA) or individual companies to jointly fund and participate in research projects to better understand the impact of seismic technology on all life stages of rock lobster, in particular relevant to the sustainable management of the Western Rock Lobster industry.

Information on the effects of seismic surveys on fisheries focuses primarily on the impact of sound generated by seismic airgun arrays on the physiology and direct damage to fish. These impacts can induce behavioural changes resulting in poor avoidance, increased susceptibility to predation including reduced ability to detect predators, poor nutrition from lesser abilities to find food and even effects on spawning behaviour with significant differences between species.

Collaborative proposals to mitigate the impacts of seismic surveys on fisheries

There is also no standard seismic technology being applied although most operate using air gun arrays typically 30 to 50 metres long that are three dimensional in the lower frequency range between 10 to 250 hertz range. There is little technology capacity to vary array depths due to physical and geophysical technical limitations. However, there exists a practical ability to modify the design of air gun arrays in terms of layout (position and sizes of airguns), in which both the waveform and spectrum of the signal vary strongly with direction resulting in a potential to modify the array layout used in order to reduce the environmental impact while retaining its seismic survey source.[1] This being the case begs the question as to whether the regulator or those conducting seismic surveys are required

[1] Duncan A.J. 2017. *Airgun arrays for marine seismic surveys-physics and directional characteristics*. Acoustics 2017 Perth. Sound Science and Society.

to adopt technical array designs that minimise impacts on the marine environment. If not, as a matter of policy they should.

Whilst attempts have been made to develop alternatives to airguns based on various forms of marine vibrators, airgun technology will continue to be the preferred technology for seismic survey work into the future.[2]

There is no such thing as a typical seismic survey: research indicates precise responses to air gun and seismic survey noise are species specific and dependent on the actual noise exposure regime. Effects of seismic surveys are also known to be cumulative, so the frequency and coverage of successive surveys will be relevant to understanding their impacts. The challenge in Western Australia during the early consultation phase between the proponent and WRL is to identify and acknowledge all research gaps and ensure they are not determined as "no issues". Similarly, all cumulative impacts must also be recognised and addressed during the early consultation phase.

Collaborative preparation should go well beyond the logistics of exclusion areas for fishing vessels during seismic surveys, to also assessing the likely sensitivity of marine species in the area that may be impacted, and developing necessary mitigating measures to reduce impacts. In the case of rock lobster, in terms of the areas of interest to this submission, this should include as a precautionary measure, strategies to avoid seismic impacts on migrating adult rock lobster and larval lobster when they are known to be at their highest abundance within the areas of interest.

Operational aspects such as the "zones of effect" (specific for each airgun signal), how many and how widely spaced they are; the depth and size of the prospecting area; particulars for the data acquisition; and duration of the survey, all need to be incorporated in the planning phase to give some idea of the full impact of a specified seismic survey on marine species in that area. Risk assessments should include characteristics of the specific survey to be used, modelling of probable noise propagation in the area to be surveyed, knowledge of the species present, awareness of their biology, accompanying literature review to identify probable environmental impacts, and mitigation strategies to address the identified risks. The absence of such critical and fundamental information should no longer be acceptable in the approvals process for seismic surveys.

Further research is needed on measuring in the field, the post event impact of seismic surveying on mortality of adult and juvenile stages of rock lobster from physiological damage as well as increased incidence of predation. A well-designed tagging study could elucidate the extent of such impacts relevant to sustainable fishery management practice and as relevant from a fishing industry perspective, issues of compensation. It is no longer acceptable for the petroleum industry to ignore such impacts, especially with the irrefutable knowledge that seismic air guns damage rock lobster mechanosensory (statocysts) organs which persist beyond the next moult.[3][4] Damage is estimated to occur within a range of 200 to 500 metres from the source. However, these results may be threshold dependent requiring further research work.

[2] Ibid Duncan A.J. 2017.

[3] The work by Day et al below was undertaken on Southern Rock lobster. Given rock lobster industry's experience noting the better handling robustness of this species relative to western rock lobster, the impacts on the latter species could be greater.

[4] Day RD et al. 2019. *Seismic air guns damage rock lobster mechanosensory organs and impair righting reflex. Pro.R.Soc. B* **286**: 20191424.http://dx.doi.org/10.1098/rspb.2019.1424

A field study as proposed above, which would also take into account any potentially impaired immunity and decreased nutritional condition arising from aquatic noise[5], including damage to statocysts, to estimate combined rock lobster seismic induced mortality, would facilitate a better understanding of possible ecological and economic impacts in addition to direct and indirect cumulative impacts as a result of seismic surveys.

Solutions to limit the effect of the proposed seismic activity

How early development larval stages of rock lobster, such as stage 1 and 2 phyllosoma and stage 8 and 9 phyllosoma, found close to the continental shelf are affected by seismic survey is not understood from embryo studies[6] (from adult lobsters) as they are physiologically and morphologically different. In field testing coinciding with active seismic surveys through zooplankton surveys may give some short-term immediate insights of seismic survey impacts on larvae, but would be practically unable to provide data on longer term impacts. Widely used air gun technology has been shown to negatively impact zooplankton observed in the field out to 1.2 km range sampled, well beyond previously assumed impact range of 10 m with net tows, demonstrating two to three times increase in zooplankton mortality.[7] This type of research underpins a growing level of concern within the fisheries sector of the long-term and cumulative impacts of seismic surveys on fisheries. In this case, the impact is expected to be significant on rock lobster larvae, noting its long larval life stage and timing proximity to the edge of the continental shelf and on the shelf at particular life stages.

At this stage of research knowledge, WRL prefers a precautionary approach towards minimising seismic survey impacts on western rock lobster by the following actions based on the life cycle and known peak distribution of rock lobster larvae and migration of adult rock lobster.[8] [9] It is against this background of knowledge that WRL identifies the peaks in rock lobster distribution at different life stages relevant to the 2020 Offshore Petroleum Exploration Acreage Release for areas W20-29, W20-30 and W20-31.

1. That for all three areas, the period of highest abundance of stage 1 and 2 phyllosoma found adjacent to the continental shelf and on the shelf during peak egg to larval production occurs October to March inclusive.[10]
2. That for all three areas, the period of highest abundance of stage 8 and 9 phyllosoma found adjacent to the continental shelf coinciding with the period of highest abundance of puerulus settlement occurring on the inshore reefs and at the Abrolhos Islands is (October to March inclusive) relevant to W20-31 and (August to December inclusive) relevant to W20-30 and W20-29.

[5] Carrol A et al. 2017. A critical review of the potential impacts of marine seismic surveys on fish and invertebrates. *Mar.Pollut.Bull*. 114,9-24.9doi:10.1016/j.marpolbul.2016.11.0380

[6] Day RD et al. 2016. Seismic air gun exposure during early-stage embryonic development does not negatively affect spiny lobster *Jasus edwardsii* larvae(Decapoda:Palinuridae) Scientific Reports(6:22723)DOI:10.1038/srep22723

[7] McCauley R D.et al. 2017. *Widely used marine seismic survey air gun operations negatively impact zooplankton*. Nature Ecology &Evolution Vol. 1, Article 0195.

[8] Caputi N et al. 2018.*Optimizing an oceanographic-larval model for assessment of the puerulus settlement of the western rock lobster, Panulirus Cygnus, in Western Australia*. Bull Mar Sci4(0):000-000.2018.https://doi.org/10.5343/bms.2017.1146

[9] Feng M et al. 2011*. Ocean circulation, Stokes drift, and connectivity of western rock lobster (Panulirus cygnus) population.* Can. J Aquat. Sci. **68**: 1182-1196.

[10] The protection of stage 1 and 2 phyllosoma is of lesser importance as a consequence of substantial natural mortality throughout the long ocean larval stage compared with late stage phyllosoma and puerulus and demonstrated through modelling (see references 8 and 9).

3. That the time of maximum exposure of migrating adult rock lobster on the continental shelf inside 200 metres isobath depth occurs in the period December to mid-February inclusive.[11]

The review articles presented by Caputi N, et al. and Feng M et al. emphasise the importance of the Abrolhos Islands and the deeper waters to the west and north of this group as being most significant as a source of egg production for the WCRLMF as well as larvae contribution to overall recruitment to the fishery. The importance of the breeding stock from this region (between 28-29 degrees south latitude) cannot be underemphasised noting in 2011, it was estimated nearly 60% of the breeding stock was located in this area, making a larger effective contribution to eventual puerulus recruitment coming from this region due to the closer proximity of the edge of the continental shelf.[12] For this reason, every action needs to be taken to minimise seismic survey activity in area W20-31 (which is adjacent to and partly overlaps this area) and certainly not in the period October to mid-February inclusive. This period takes into account observed shifts in timing of peak puerulus settlement observed recently over the last decade from October into December.[13]

The areas W20-30 and W20-29, whilst less important for maintenance of the rock lobster fishery, progressively become less significant the further north past Point Quobba in their contribution to the fishery in both catch and larval contribution inside the 200 metre isobath. For this reason, mitigation exclusion to seismic survey activity is sought for the period most likely to damage migrating adult rock lobster during the period December to mid-February inclusive.

It is noted that the peaks in larval release and puerulus settlement have shifted in the more recent decade with modelling suggesting differences in actual peaks observed and that which demonstrates the optimum time for eventual survival for puerulus recruitment success. However, WRL remains firm on the above proposed mitigation approach leaving any final adjustments to case by case consideration once the seismic survey application details are lodged and the proposal comes under formal consideration. WRL understands that according to NOPSEMA regulations they must be consulted for all offshore activities over the gazetted WCRLMF. In relation to seismic survey environment plans, WRL expects to be consulted on all seismic proposals at the very earliest possible stages of planning for any proposed surveys relevant to W20-31, W20-30 and W20-29.

WRL also explored whether differences in timing between night and day seismic survey activities offered any opportunity for further mitigation. The limited scope, for geophysical and physical reasons to vary in practice the physical depth of airgun array equipment to less than 10 metres (generally between 6-9 metres) when towed by vessel, taken together with the known diurnal migration variation of each category of phyllosoma and puerulus (see Fig. 4. Feng et al), meant any mitigation value would be minimal. This option was not further pursued.

Whether restriction of seismic survey work to daytime periods when adult rock lobster are inactive in periods outside the migration runs and sheltering adds additional protection is not known. Without further research evidence, WRL is unable to comment further on its value as a mitigation tool but potentially could be used where survey vessels are tasked to operate both on the continental shelf

[11] This period coincides with a “whites” inshore rock lobster migration during December early January and a deep water migration of rock lobster northward into the Big Bank region in late January – February north of the Abrolhos.

[12] Ibid Feng et al. see footnote 4. It is acknowledged since the introduction of quota management, an increase in breeding stock throughout the fishery has lessened relatively the importance of this region but irrespective it is still of such importance, every protection must be provided to rock lobster in its various critical life stages within this region.

[13] S de Lestang et al 2019. AMM October presentation. pers. comm.

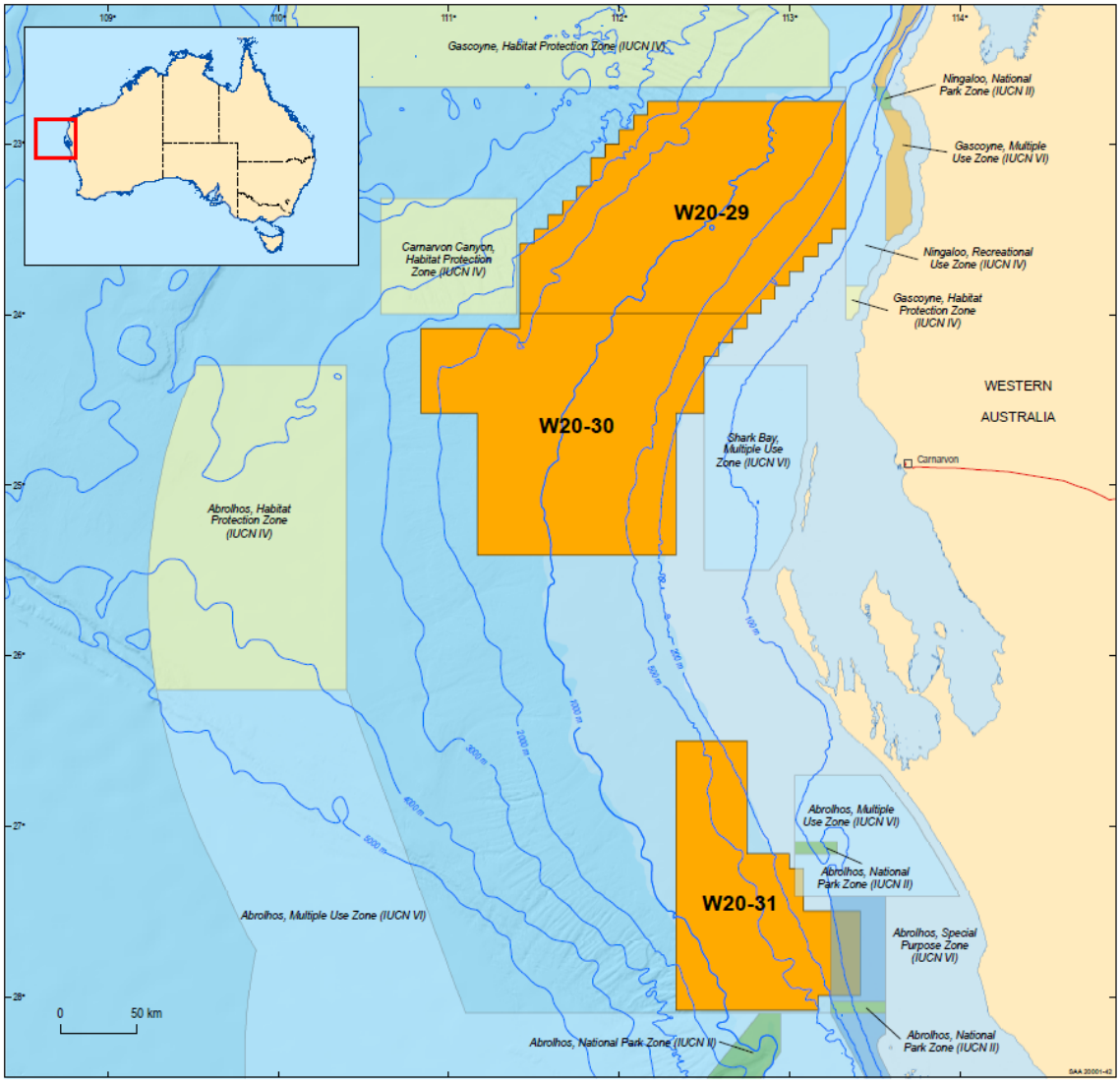
and off the shelf with the assumption sheltered adult rock lobster are better protected from the effects of airgun seismic activity.

Moving forward working together

WRL supports the Western Australian Fishing Industry Council (WAFIC) submission to the 2020 Offshore Petroleum Exploration Release. Their submission draws heavily on their submission to the Australian Senate Standing Committee on Environment and Communications into the impact of seismic testing on fisheries and the marine environment.

The only acceptable strategy open to WRL for the fishing and petroleum industries to effectively work together is to use science as the evidence of understanding impacts of seismic surveys on the marine environment and fisheries with the onus of proof and responsibility for that, that of the instigator, the petroleum industry. Failure to address the science and failure to remediate and fund identified gaps in the science is untenable. The absence of science must no longer be used by the regulator as a valid reason to allow seismic surveys to proceed.

Mitigation approaches are acceptable where supported by science on the assumption precautionary decision making occurs. Longer term damage to fish stocks where reasonably expected or demonstrated should be open to commercial settlement between affected parties, including compensatory adjustment. The regulator has a responsibility to ensure reasonable fairness and balance in managing the consequential impacts arising from seismic surveys. Anything less is certainly considered a failure of policy.


Gascoyne, Habitat Protection Zone (IUCN IV)
Ningaloo, National Park Zone (IUCN II)
Gascoyne, Multiple Use Zone (IUCN VI)
W20-29
Carnarvon Canyon, Habitat Protection Zone (IUCN IV)
Ningaloo, Recreational Use Zone (IUCN IV)
Gascoyne, Habitat Protection Zone (IUCN IV)
WESTERN
AUSTRALIA
W20-30
Shark Bay, Multiple Use Zone (IUCN VI)
Carnarvon
Abrolhos, Habitat Protection Zone (IUCN IV)
Abrolhos, Multiple Use Zone (IUCN VI)
Abrolhos, National Park Zone (IUCN II)
W20-31
Abrolhos, Special Purpose Zone (IUCN VI)
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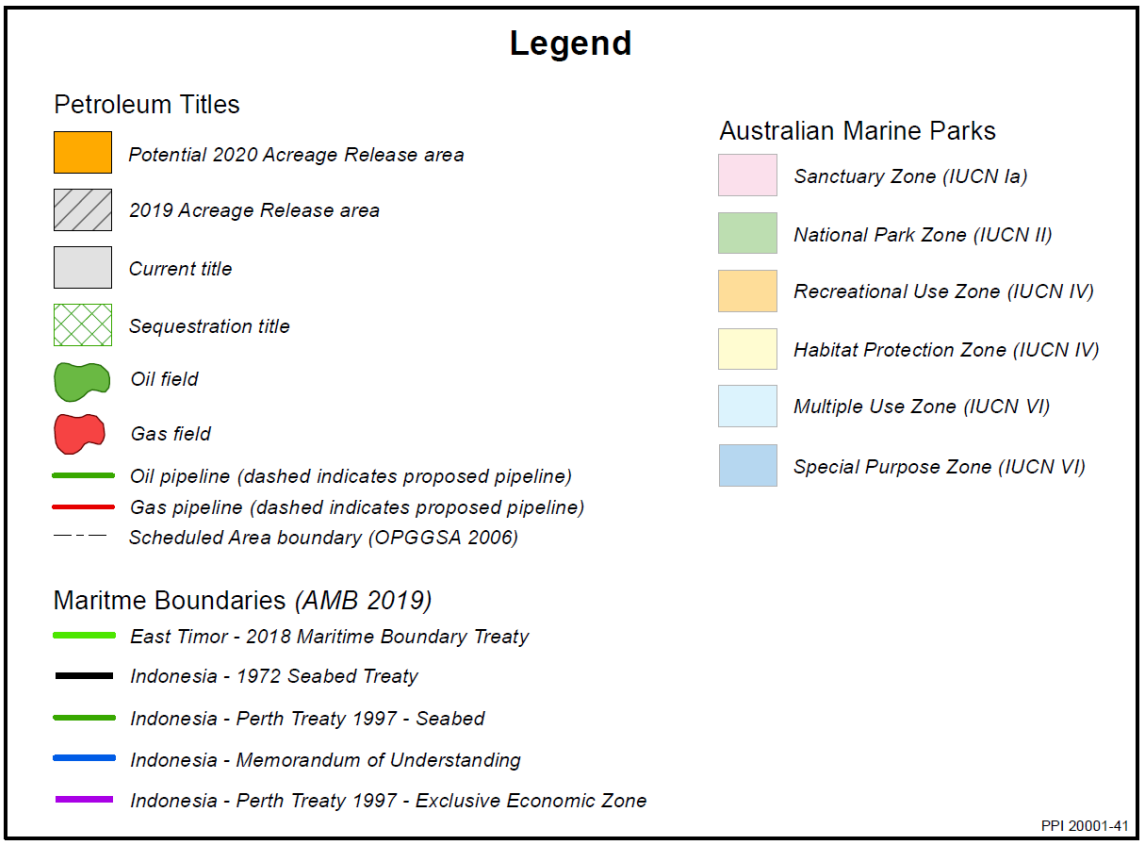
Abrolhos, National Park Zone (IUCN II)


Legend
Petroleum Titles
Potential 2020 Acreage Release area
2019 Acreage Release area
Current title
Sequestration title
Oil field
Gas field
Oil pipeline (dashed indicates proposed pipeline)
Gas pipeline (dashed indicates proposed pipeline)
Scheduled Area boundary (OPGGSA 2006)
Maritme Boundaries (AMB 2019)
East Timor - 2018 Maritime Boundary Treaty
Indonesia - 1972 Seabed Treaty
Indonesia - Perth Treaty 1997 - Seabed
Indonesia - Memorandum of Understanding
Indonesia - Perth Treaty 1997 - Exclusive Economic Zone
Australian Marine Parks
Sanctuary Zone (IUCN Ia)
National Park Zone (IUCN II)
Recreational Use Zone (IUCN IV)
Habitat Protection Zone (IUCN IV)
Multiple Use Zone (IUCN VI)
Special Purpose Zone (IUCN VI)
PPI 20001-41