Workshop on the management of fishing and diving at Grey Nurse Shark aggregation sites

Norm Jordan Pavilion
Coffs Harbour Show Ground

Pacific Highway, Coffs Harbour NSW 2452
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Facilitator's Summary

1. Introduction

In May 2011, the Minister for Primary Industries released a Discussion Paper for Grey Nurse Shark Protection. Respondent's to the paper provided a diverse and often diametrically opposed range of views concerning the best way to manage fishing and diving at Grey Nurse Shark (GNS) aggregation sites. As part of the Department's responsibility to try and bridge these gaps, a workshop was called to engage and involve a range of peak stakeholder organisations in the development of options for the future management of fishing and SCUBA diving activities at GNS aggregation sites.

The workshop set out to develop consensus-based options or to identify areas of general agreement, however, where this was not possible, outstanding points of difference and options to mitigate impacts of any management changes were to be documented. This summary report will form part of a briefing package on the review of GNS protection to the Minister for Primary Industries, which will also include a summary of submissions, scientific audit advice, and Fisheries NSW scientific and management advice.

2. Attendance

The Department invited a balance of stakeholder organisations to the workshop, noting that the numbers were limited in order to increase the chances of a successful outcome in a facilitated group forum. In most cases, invitations were extended to peak representative bodies (rather than an individual) and it was left to the peak body to nominate their representative. In so doing, there was the inevitable risk that those who were not invited would feel 'left out'. Requests were received from several additional organisations and individuals to attend, and the Minister's office requested that invitations be sent to five additional individuals on Monday 12 March.

Notwithstanding the attempts by DPI to invite balanced representation, concerns were expressed during the workshop that the Conservation sector was 'outnumbered' and that an additional conservation organisation should have been invited and had expressed interest in attending (Project Aware), but was subsequently refused entry. An objection to this action was noted and attention drawn to the large number of responses to the GNS issue that that Project Aware action had generated, which, it was suggested, was reflective of the interest in the workshop by Project Aware members. The level and tone of discussions at the workshop reflected the level of recreational fishing representation.

An uninvited representative with recreational fishing and tourism interests also attended the workshop venue, but in the interests of fairness and equity to the other attending members, the individual was requested to leave before formal commencement of the workshop. An attendance list is provided as Attachment 1 to this summary.

3. Introductions and overview

Following self-introductions, the Facilitator outlined the agenda for the day, noting that the issues would be divided into four key sections:

i) Review of available scientific information on the status of GNS populations in NSW

ii) Primary threats to GNS from fishing and diving

iii) Current range of mitigating measures, their effectiveness and any remaining threats

iv) Options and tools to deal with remaining threats

The workshop agreed that rather than comprehensive minutes based on individual inputs; the facilitator would prepare and circulate a draft Chairman's Summary to a subset of participants for review and comment prior to finalising and submitting the report. Notes were taken by two administrative support officers from DPI to be provided to the Chairman at the conclusion of the workshop.

Where individuals wished particular comments to be noted, every attempt would be made to record these. Key points from the presentations were also summarised and included. To assist the facilitator, seven volunteers drawn from workshop participants agreed to review the first draft of the summary. The final version would be the responsibility of the Facilitator.

During the introduction, participants indicated their expectations for the day, which included:

- Ensuring adequate protection for GNS.
- An equitable outcome allowing appropriate resource access for all sectors.
- Resolution of what is a long running controversy.
- Decisions/recommendations based on science.
- No further restrictions on commercial fishing.

The participants were also advised by DPI that due to:

- the operation of the commercial Fisheries Management Strategies;
- Commonwealth assessment and accreditation processes under the EPBC Act; and
- the wide range of mitigating measures implemented with the Ocean Trap and Line Fishery following the Administrative Appeals Tribunal case;

the management arrangements in the Commercial sector with respect to GNS aggregation areas were largely "locked in" and not subject to change as a result of the workshop. Commercial fishing was however discussed by the workshop in discussions of residual risk (the risk after mitigating measures are applied) of commercial fishing at aggregation sites. At times, conservation and dive interests brought up the issue of commercial impacts outside of GNS aggregation sites, the results of which were evident from photographs, generally taken at aggregation sites, however the focus of the workshop was management of fishing and SCUBA diving activities at GNS aggregation sites.

The workshop dealt with a number of contentious and emotive issues, with strongly held views on all sides. The debate was robust and, in the time permitted, it was not possible to draw out or expand on a number of issues that would have been helpful in exploring options for compromise. Much of the debate on options was focused on options to manage the area of activity identified by the workshop (and the Discussion Paper) as having the highest relative risk i.e. hook and line fishing, particularly with bait.

There were no votes taken during the meeting, since to have done so would have been meaningless. Where views are noted as having been expressed by individuals or interests from a particular sector, it is not possible to infer the precise level of support (or not) from other individuals or interests from that sector, or indeed from other sectors. However, attempts were made, under challenging conditions, to find areas and options for future GNS management where agreement was most likely to occur.

3. Objective of the workshop

The key objective of the workshop was to engage and involve stakeholders in the development of stakeholder-supported options for the future management of fishing and SCUBA diving activities at GNS aggregation sites.

Options for GNS management at aggregation sites were sought, and participants were requested to consider legal and policy requirements when considering and putting forward the relative merits of each option. These include:

- the policy objectives of NSW Government;
- the Objects of the *Fisheries Management Act 1994*;
- the Principles of Ecologically Sustainable Development which include the
    - precautionary principle;
    - intergenerational equity; and
    - conservation of biological diversity and ecological integrity

Further, it was noted that management options needed to be scientifically defensible, easy to interpret and understand and be able to be adequately and effectively enforced.

There were some difficulties encountered in that given the time allocated, it was difficult to do justice to a number of specific issues, and in particular the differences between sites and sub-sets of particular options – e.g. less than 1,500m sanctuary zones. In addition, it was not possible to give consideration as to the extent that each of the options proposed met these policy requirements.

4. Scientific information and conclusions

Presentation

Dr. Marcus Lincoln-Smith, a consultant scientist with Cardno Ecology Lab, provided a presentation: *Surveys of the East Coast Population of Grey Nurse Sharks (*Carcharias taurus*) – overview of recent research.* The presentation primarily related to a population estimation project undertaken by Cardno Ecology Lab and commissioned and funded by the Commonwealth Government in support of the review of the National Grey Nurse Shark Recovery Plan.

A total of 53 sites along the Queensland and NSW coast were surveyed, ranging from Wolf Rock (just south of Fraser Island) in the north to Batemans Bay in the south. The sites included 31 known aggregation sites and 22 non-recognised sites, which were identified from information provided by divers and fishers.

Two major methodologies were used to acquire information: photo-tagging and underwater visual counts (UVC). The former used photographic and laser methods to identify individual sharks, estimate lengths and identify distance and direction of shark movements, while the latter was based on more traditional diver and clipboard observation and provided data on relative abundance, length and rates of injury related to fishing.

A pilot and initial survey in 2008 resulted in 188 photo-tags, with an additional 402 GNS photo-tagged during a second survey in 2009, resulting in a total of 590 reliable photo IDs. Of these, 524 were attributable to individual GNS, with 66 individuals photographed

in both surveys. Of these 66 re-sightings, 20 were made at the same site, 40 in the same region and 28 outside the region; from this it was concluded that there was evidence of site fidelity (i.e. the degree to which an animal returns to a specific site).

There was generally good agreement between the numbers estimated using the two methods (photo-tagging and UVC), with more sharks being photographed than counted at some sites.

Juvenile (around 1 year old) GNS were most frequently seen in shallow, often turbulent habitats and close to shorelines of rocky headlands & islets. When the juveniles were seen near larger aggregations they were often slightly segregated at sites including: Magic Point, Broughton Island, Sawtooth Rocks, Split Solitary Island and Northwest Solitary Island. Juvenile GNS were also often seen with large shoals of baitfish.

The core estimate of total population size from the Cardno Study was 1,365 GNS, with upper and lower 95% confidence limits of 1146 and 1662 (i.e. there is a high level of confidence that the population of GNS lies between these two numbers. When adjusted for site fidelity (i.e. the core estimate assumes a greater level of movement between sites and therefore biases the number downwards) the core estimate increases to 2,142 (with 95% confidence limits of 1465-3249).

This estimate was compared with early studies as shown in the table below;

Estimator	Population estimate	95% Confidence Limits	
		Lower	Upper
MARK Algorithm (new approach)			
Core Estimate	1365	1146	1662
Adjustment for potential site fidelity	2142	1465	3249
Other Estimates			
Otway and Burke (2003)	443	263	766
Bansemer (2009) multiple surveys	1893	1556	2232

A number of conclusions were drawn by Dr Lincoln-Smith based on the Cardno study concerning the population of east coast GNS:

1. The estimate of the east coast population is statistically bigger than the previous estimate.
2. It is not yet possible to conclude that the population is not decreasing given the uncertainty with the earlier (2003) estimate.
3. It is not yet possible to conclude with great certainty that the population is increasing due to the likely underestimate of the previous (2003) study.
4. The two estimates which were statistically different (Cardno and Otway and Burke) used different estimates using different techniques at different points in time, so it is hard to draw conclusions on the actual population change between these two studies.
5. The photographic database provides an important baseline for future estimates
6. UVC is a valuable supplementary tool, especially for investigating juveniles

Dr Lincoln-Smith also advanced a personal opinion that, in his view, there are indications that the GNS population may be increasing. These were that:

i. the 2009 estimate was considerably bigger than the 2003 estimate (Bansemer's 2009 estimate even bigger);

ii. sizes of aggregations appear to be increasing (pers. Obs. 1991 – 2009);

iii. GNS appear to be seen at more places, but there are fewer GNS being reported from some sites in southern NSW;

iv. the abundance of small juveniles has probably been underestimated in the past; and

v. GNS use sites other than those previously identified (as indicated from observations at non-recognised sites).

Discussion

A number of key points were raised in discussion by participants including:

i) Interests from within the conservation sector expressed concern that the difference between the recent and older population estimates may reflect improved techniques and survey effort and should be considered a good baseline, rather than conclusive evidence of a population increase.

ii) It was noted that a key requirement is a better understanding of fishing/ human induced mortality relative to natural mortality, growth and recruitment in GNS i.e. the dynamics that influence the trend (increase or decrease) in overall population size. A related issue is the rate of the trend i.e. how quickly is the GNS population increasing/decreasing? Answers to these questions will inform management action.

iii) Irrespective of the various estimates of population size GNS is classed as a critically endangered species and requires protection; all estimates have the population well below the 5,000 which is the minimum number before GNS are likely to be downgraded from critically endangered. Interests from within the conservation sector noted that this should be a minimum base on which to rebuild the population, rather than a target.

iv) Suggested that there would be some potential value in combining/ comparing the results of the Cardno study with those of Bansemer, which also used photo ID techniques. Dr Lincoln Smith indicated this is likely to occur, but needs the support of the Commonwealth, which holds the photographic database.

v) General opinion that the population estimate derived from the Cardno study was more valid than that by Otway and Burke due to the scientific developments and increased knowledge; it was also noted that the photographic method was not a proven approach for identifying GNS at the time of the earlier study.

vi) It was suggested that comparisons between the estimates should focus on the science/methodology to derive the numbers rather than differences between the numbers themselves.

vii) Dr Adam Stow observed that i) east coast GNS populations will not be supplemented by migrating individuals from west coast and ii) that east coast populations are geographically and therefore genetically isolated. Genetic methods have been used to estimate numbers of breeding individuals (as distinct from population size) and the current estimate of, one-tenth of the estimate size (126) accords better with the recent census size. The estimated level of genetic effective population size (breeding individuals) is well below the level at which genetic persistence can be expected, which may result in less resistance to pathogens, genetic erosion and other consequences.

viii) Translocation of GNS from the west coast to increase genetic diversity of the east coast population was discussed but considered to be impractical due to biosecurity and other concerns.

5. Primary threats to GNS from fishing and diving

Presentation

A table showing sources of mortality of GNS drawn from the Administrative Appeals Tribunal (AAT) report was presented. The table showed that at the time of the proceedings the two key sources of known mortality were recreational fishing and commercial line fishing with 5 and 4 mortalities per annum respectively.

Threats - Accidental hooking

The following points were made with respect to accidental hooking:

- In recent times hook and line fishing is the largest known source of human induced mortality.
- Hook and line fishing can result in direct mortality and morbidity, through injury, infection, stress, and impaired feeding.
- Hooking has been shown to occur in commercial and recreational fisheries. Research has shown GNS are particularly prone to hooking at aggregation sites.
- Hook and line fishing in areas important for threatened species is listed as a key threatening process by the NSW Fisheries Scientific Committee; the NSW Government's peak independent scientific advisory body on threatened species.
- Bansemer & Bennett (2010) studied hooking at 25 GNS aggregation sites using photo identification and noted:
    - Fish Rock had the highest occurrence of retained gear.
    - The number of sharks observed with retained hooks was significantly higher than expected at Fish Rock (open to fishing) compared to some other sites that were closed to fishing e.g:
        - Fish Rock (n) = 222 (observed) = 32 (expected) = 21
        - Seal Rocks (n) = 117 (observed) = 6 (expected) = 11
- Bansemer and Bennett (2010) concluded the number of GNS hooked at least once has not declined and that current protection measures have not succeeded in reducing hooking rates.
- From 2008 – 2010 DPI conducted research into GNS behavioural response to fishing gear at Fish Rock.
    - 800 bait trials (pilchard, squid, and slimy mackerel) were conducted at various times - dawn, morning, afternoon, dusk and night. No time-of-day preference was noted.
    - GNS approached the bait in most cases.
    - 22% of all baits were taken by GNS (i.e. 177 GNS were "caught").
    - Live bait was not assessed due to animal care and ethics issues.
    - Jigging (benthic, soft plastic & knife jigs). 800 drops. 5% struck GNS. 6 GNS strikes. GNS interacted with benthic jigs in 55% of replicates.
    - Trolling - Over 500 km of deep and shallow lure trolling (dawn, morning and afternoon).
    - No sign of GNS responding to towed lures, suggesting they may have no direct attraction to GNS.

SCUBA Diving – threats

- GNS underpin a significant dive tourism industry
- Body of peer reviewed research conducted since 2002.
- Research has shown short term behavioural response in GNS to larger numbers of divers or if approached too closely.
- No evidence of site abandonment.
- There have been suggestions that SCUBA divers may impact on GNS habitat / breeding / gestation / feeding, although there is no scientific evidence to support these suggestions to date.

Other threats

- The NSW Beach Meshing (Bather Protection) Program for sharks off NSW metropolitan beaches (noting that the program has been listed as a key threatening process for GNS by the NSW Fisheries Scientific Committee).
- Trawling and other commercial fishing-related injuries (tail roping etc).
- Illegal fishing.
- Aquarium collection (has been subject to a National Moratorium since 2002).
- Unreported mortality, some of which occurs during illegal fishing.

Discussion

i) Clarification was provided that beach meshing referred to the NSW Beach Meshing (Bather Protection) Program used on metropolitan beaches to avoid confusion with Ocean Haul commercial fishery.

ii) Concern was expressed from within the dive sector that the available estimates of mortality are inaccurate, and that it is well known that current rates of mortality are considerably higher than those published in the AAT report. Also some general agreement that mortality estimates need to be more accurate.

iii) Following the AAT proceedings, associated publicity and implementation of regulations, there has been a marked decline in reports of GNS mortality; DPI consider this is likely to be due to reasons other than a decline in accidental hooking and that there are no reliable estimates of mortality currently available. This issue is being addressed through further research.

ix) Strong general support for efforts to improve estimates of GNS mortality and trends in population size and for the completion of further studies to provide additional data points to build on the baseline population estimate established by the Cardno study.

There was consensus agreement that the recent study undertaken by Cardno be repeated as a priority activity to enable a better understanding of population trends in the GNS East Coast Population.

iv) The conservation and dive sectors were strongly of the view that while information on GNS populations may be incomplete, it is adequate to inform decisions to protect GNS, particularly given the responsibility of government to abide by, and take action under, the precautionary principle.

v) Interests from all sectors other than some recreational fishing interests agreed that accidental hooking when fishing with bait at aggregation sites is the main threat to GNS. Dissenting views included views from individual interests that:

  - 22% of GNS taking baited hooks during trials could be considered a low number, 4 out of 5 baits were not taken by GNS.

- The research was a set-up – much lower interactions personally observed during a long period of charter fishing activities.

vi) There was strong disagreement from the conservation and SCUBA sectors on the proposition that jigging presents a low risk; their strong preference is that it should be considered a medium risk until proven otherwise, while interests from other sectors considered that the recent DPI study justified a reduction in risk category from medium to low. Other interests from the conservation and dive sectors maintained that any risk from hooking is unacceptable.

vii) Issue of GNS taking fish being played on jigs or lures thereby increasing the likelihood of hooking or interacting with GNS.

viii) It was noted that SCUBA diving can have short term effects on the behaviour of GNS, but that it was a low risk.

ix) Statements made in the DPI discussion paper concerning the results of research into the effects on GNS of SCUBA were highlighted, with attention drawn to the conclusion that studies had found that changes in behaviour were short lived with no gutter/whole-of-site movement effects as a result of SCUBA diving.

x) There was a major difference between 1) the identification of impacts/threats and 2) the degree of impact/threat and the consequent need to address it through management action.

xi) A number of other threats were suggested by workshop participants:

- Destruction of habitat through land based and other pollution e.g. ocean outfall sewage.
- Climate change and other broad scale environmental change.
- Introduced pests and diseases (noting that genetic persistence was an important factor in relation to resistance to the effects of pathogens).
- Predation by large predatory sharks (e.g. Great White and Tiger Sharks).

6. Mitigating measures

Presentation

Of twelve major identified GNS aggregation sites, six occur in the NSW Marine Protected Areas network. Five of these sites occur in sanctuary zones within marine parks and the sixth in a restricted Habitat Protection Zone. These sites are considered to have levels of protection that are much higher than the existing critical habitat rules. A further four sites are listed as critical habitat are open to fishing, including hook and line fishing with bait (Fish Rock, Green Island, Magic Point & Bass Point). One of these sites (Bass Point) is no longer considered to be critical habitat and has previously been recommended for delisting. Of the remaining sites identified in the presentation, North and South Solitary Island (currently not critical habitat) are open to most forms of recreational hook and line fishing with specific restrictions on commercial fishing to mitigate impacts on GNS, and Mermaid Reef (currently not critical habitat) is open to recreational and commercial fishing methods with no specific GNS provisions.

The range of recreational fishing rules in critical habitats and buffer zones were also presented, noting that hook and line fishing with bait and/or wire trace is currently permitted in critical habitat sites outside the marine protected areas network.

An outline of the current measures applied to commercial fishing since 2007 was given, including a brief explanation of the environmental assessment of the NSW Ocean Trap and Line Fishery. High risk methods identified in the environmental assessment included setlines, trotlines and handlines, while jigging was assessed as a medium risk. All other methods were considered low risk.

For SCUBA diving the two current mitigating measures (a voluntary Code of Conduct at non-critical habitat GNS aggregation sites and specific regulations under Cl.266 of the

Fisheries Management (General) Regulation 2010 at critical habitat sites) were presented, with attention drawn to the difference between the two.

Finally, the following list of mitigating measures was provided to guide discussions on options to address gaps between threats and current mitigating measures:

- Area based restrictions
- Temporal restrictions
- Modification to gear types
- Changes to methods
- Technological options
- Resource sharing arrangements
- Provision of alternative sites
- Codes of conduct
- Further research
- Improved catch reporting and awareness
- Observer programs

Discussion

i) There are a number of regulations/controls on fishing methods impacting each GNS aggregation site and applying to recreational and commercial fishers. They are often different between sectors, and for the commercial Ocean Trap and Line Fishery, there are additional restrictions that apply wherever the fishery operates.

ii) Marine parks are currently under review following the independent scientific audit of marine parks and it is unknown what the results of that audit will be, or how they will affect this process.

iii) There was a suggestion that there is a need to review all GNS aggregation sites to see if GNS have stopped using some sites (e.g. Julian Rocks and Montague Island) and see which sites still fit the criteria of aggregation sites. There was no agreement on whether sites should have their current status removed.

iv) It was noted that there is some reluctance to identify undeclared GNS sites due to concern by spearfishers and other interests that they would be closed and further access to recreational and commercial fishing denied.

v) Given that the east coast stock travels into Queensland waters, Queensland should be included when considering GNS protection measures.

vi) Surprise was expressed as to the absence of SEWPAC (Commonwealth Department of Sustainability, Environment, Water, Population and Communities from the workshop

7. Options and tools to deal with remaining threats

General

There was general agreement that the current status quo with respect to GNS protection was inadequate, and that doing nothing new in terms of improving that protection was not a realistic option.

There was general agreement that some minimum level of protection was warranted although there was no agreement as to what this minimum should be – some considered total closure to fishing in some non-sanctuary sites as an acceptable minimum, while others saw restriction of high risk fishing methods as an adequate minimum. While

there was general agreement and that the overall package of measures could vary between sites, there was little interest in developing a 'minimum standard' when the issue was raised by the facilitator.

Others, including the Department and interests from the conservation sector, considered that there would be difficulties with having too great a variety of regulations in that they would be difficult to interpret and comply with and that this may well lead to confusion and create enforcement difficulties.

Interests from within the conservation sector suggested that there is more than sufficient information, based on the precautionary approach, best available science and the recognition of current high risk activities to take immediate action to prevent high and medium risk fishing activities at aggregation sites. Further, action is imperative due to the critically endangered status of GNS.

Questions were asked about the efficacy of the new rules introduced by the former Government in early 2011. These rules permitted low risk methods (spinning and trolling) but restricted the use of medium and high risk methods (jigging and fishing with bait). It was noted that these arrangements were only in place for a period of three months before they were rescinded, and as such drawing any hard conclusions as to their effectiveness would not be meaningful. In addition, it was reported that weather was poor during that period and there was limited fishing. However, the Department noted that anecdotal reports were encouraging and suggested that compliance levels with the new regulations had been high.

The workshop gave some consideration to the various sectors (commercial, recreational, SCUBA and spearfishing) and the residual risk (after the application of current measures) posed by their activities.

Commercial fishing

Interests from the commercial sector stated that they believed that they had done enough to address risks to GNS, including temporal, spatial and gear restrictions and that no further mitigation action was necessary. In this regard, they felt that the recreational sector had been able to 'get away with' more (than the commercial sector). There was some support for this view.

In considering outstanding risks to aggregations of GNS sharks from commercial fishing, there was general agreement that, given the management arrangements already in place, commercial fishing presents a relatively low risk to GNS at aggregation sites and that no additional measures were required to mitigate the effects of commercial fishing on GNS at aggregation sites.

An interest from the conservation sector disagreed with this position, noting that in his view and as evidenced by photographic evidence, tail-roping (to remove GNS from fishing gear) was still happening and that this practice was unacceptable.

Spearfishing

Spearfishing interests considered that their sector does not present any significant risk to populations of GNS and would like to see additional access to GNS aggregation areas.

It was however noted that spearfishing does pose some risk, as there have been occasional reported/documented cases of GNS being speared, including in positions on the shark which appear to preclude self defence as a reason.

In considering outstanding risks to GNS at aggregation sites there was general agreement among spearfishing, recreational, commercial and some conservation interests that spearfishing presents a relatively low risk and that no additional measures were required to mitigate the effects of spearfishing on GNS.

Interests from within the SCUBA and conservation sectors disagreed that spearfishing is low risk and with the proposal that spearfishing did not require mitigation, pointing to cases where GNS have been killed or injured, including at Broughton Island and Julian Rocks. In addition it was considered that the removal of a significant number of GNS prey species, including mature individuals, by spear fishers could reduce the food supply for GNS, which could pose an indirect negative impact.

In addition it was suggested that it is possible for spear fishers to take fish at Fish Rock (the Department noted there is a prohibition on the take of demersal species by spear at Fish Rock although pelagic species may be taken) and this could increase the chance of GNS being speared in self-defence.

An attempt was made to provide examples of past convictions and fines involving spear fishermen as evidence of their general behaviour and likelihood of breaching current and future fisheries regulations. This intervention was cut short by the facilitator as it was considered to be unduly inflammatory and of limited relevance in terms of finding a constructive solution.

SCUBA Diving

The SCUBA diving sector considers that it poses no risk to GNS populations and believes that no additional measures (to the Code of Conduct and current regulation) are necessary. A comparison with bush walkers in national parks was made.

The spearfishing sector believes that SCUBA diving does pose risks to GNS populations and that there is evidence to support such a contention. Further, interests from the spearfishing sector believed that SCUBA operators accessing GNS aggregation sites should pay a contribution to research via an access fee in recognition of exclusive access. SCUBA sector interests did not agree with this proposal.

In considering outstanding risks to GNS from SCUBA diving, there was general agreement among all sectors present other than the spearfishing sector that SCUBA diving presents a low risk to GNS and that no additional measures were required to mitigate the effects of SCUBA diving on GNS. There was consensus that the arrangements under the Code of Conduct and Cl. 266 of the *Fisheries Management (General) Regulation 2010* should be reviewed for consistency and applicability.

Recreational fishing

There was extensive discussion on accidental hooking and the relative risks posed by the various fishing methods and gears.

There was general agreement that accidental hooking by recreational fishers using baited hooks fished in close proximity to GNS aggregations currently poses the highest threat to GNS.

There was considerable divergence of opinion concerning the relative risks of jigging.

There was general acceptance that trolling without bait (artificial lure or fly), spinning, and fly fishing presented a relatively low risk to GNS.

It was noted that the presence of a hook in a GNS may not be indicative of a fisher having hooked the shark at an aggregation site. It was suggested that there is likely to have been instances where GNS have taken/ingested 'lost' (e.g. broken off) recreational fish, complete with hooks and trailing gear

Trolling with bait, particularly with weights (lead-lining by commercials and down-rigging by commercial fishers) was more contentious. It was noted that while the commercial sector is allowed to use this method at some non-sanctuary aggregation sites (although these methods have effectively been prohibited at Critical Habitat sites since 2002 to recreational and commercial fishers), it is only permitted under a range of highly regulated controls, including spatial and temporal restrictions. There was no agreement as to the level of risk to GNS posed by this method of fishing (note: this method was not assessed during the 2010 DPI research).

Jigging was discussed extensively. Recreational sector interests were strongly of the view that it should be classified as low risk due to the low number of 'mouth' hookings, and that where hooking did occur it was considered to be low risk and not a significant contributor to recreational fishing mortality of GNS. Further, it was suggested the 2010 DPI research appeared to give weight to this argument since the 'medium' risk had been attributed to jigging by an earlier (2006) assessment.

The conservation and dive sectors could not agree on this point and strongly supported the position that jigging not be classified as 'low risk' at this stage since there was not compelling evidence to do so. Also, they considered that hooking of any sort presented a considerable risk of morbidity.

One of the scientific representatives present voiced a personal opinion that jigging was likely to be low-risk activity.

Fishery managers reserved their position, acknowledging that jigging provided relatively lower risk than bottom fishing with bait, but that they would need further scientific advice before taking a decision.

Options considered

In response to a request for participants to consider options to address outstanding risks to GNS populations that reduced the impacts of fishing on GNS within legislative requirements , three options were put forward from the floor.

These were:

Option 1: Use of low-risk fishing methods in non-sanctuary aggregation sites

Discussion of this option centered on the definition and relative risk of recreational fishing methods as discussed above. Other than strong opposition from some interests from within the conservation and SCUBA sectors, there seemed to be reasonable support for this option across the sectors, subject to a clear definition of 'low risk' and the intended area of application.

The conservation sector generally recognised that some compromise may be necessary from all sectors. If the definition of low risk fishing was acceptable and compliance was effective, then there would be some chance that the conservation sector (possibly not all organisations) could accept this option. During the meeting however, the conservation interests became increasingly concerned that their offer of compromise had not been met in good faith by recreational fishers as evidenced by the compromises being sought by some recreational fishing interests (such as trolling with bait with wire traces for mackerel in the pelagic fishery at some locations and during some seasons (not Fish Rock) and live baiting) and the definition of 'low risk' methods. As a result many groups had hardened their stance on this option by the end of the meeting.

Recreational fishers considered some methods (e.g. jigging) to be low risk, but interests from within the conservation sector believed that some of these methods should not be categorized as such until there is clear scientific evidence to support a reduction in risk. As a result conservation groups increasingly considered that sanctuary zones would be necessary to reduce uncertainty and provide an appropriate level of protection. It was suggested by a scientific adviser that a compromise involving recognised low-impact fishing methods may lead to greater support from the stakeholders.

There was some support for a general approach that would establish an area around aggregation sites, the extent of which may vary between sites, where fishing using low risk fishing methods and gear could occur. However, determining which fishing methods or gears constitute 'low risk' will need to be resolved before full agreement can be reached.

Option 2: A 1500 m sanctuary zone around all known aggregation sites.

There was general support for this option from the SCUBA and conservation sectors. The recreational and spear fishing sectors strongly opposed this option, which was also not supported by managers as the best way forward. It was noted that this distance had been recommended from tracking results obtained and analysed by Dr Stevens of CSIRO and had been strongly supported in submissions to the Department. For one conservation member, support for this option was subject to the need to ensure an adequate level of site specificity. It was noted that in a number of locations, the use of 1500 m was overly conservative, particularly for some sites, and lessened the chance of acceptance by the recreational sector.

The socio-economic impacts of this option are likely to be more significant.

The recreational sector made it clear that it will not be possible to reach agreement on any complete exclusions.

It should be noted that in earlier workshop discussions, there was support for site specific protection arrangements for GNS, and that not all critical habitat zones and aggregation sites should be subject to identical rules and regulations. This included sanctuary zones and zones around GNS aggregation sites where specific rules and regulations for the protection of GNS would apply.

A 200 m sanctuary zone, with a further zone allowing low risk fishing was put forward by a representative of the SCUBA sector as a possible conciliatory option for Fish Rock.

Option 3: Fishing in non-sanctuary aggregation sites using low-risk fishing gear

This option was put forward by recreational fishers but considered by the conservation sector as a proposal 'to apply a high-risk fishing method using low risk fishing gear'. Conservation and SCUBA interests did not support this option.

A number of 'low-risk gears' (with 'low risk' as defined by the recreational sector present at the workshop) were suggested by recreational sector interests including circle hooks, monofilament leaders (ban on wire traces) and a ban on use of stainless steel hooks. It was suggested that magnetic repellents i.e. rare earth metal magnets (based on the sensitivity of GNS electro-receptors ampullae of Lorenzini), are unlikely to be an effective means of reducing the incidence of GNS interactions.

Other issues

Compensatory habitat. The establishment of artificial reefs or fish aggregating devices to provide alternative venues for recreational fishing was considered as a potential

means of compensation for loss of fishing opportunities due to the establishment of GNS protection areas. One member from within the conservation sector put forward the proposition that the most favoured response from the submission process was a 1500 m sanctuary which could be offset at Fish Rock with a sunken artificial reef as used at Vaucluse. It was noted that the Minister had stated an intention to position an artificial reef on the North Coast.

The representative also suggested that Fish Aggregating Devices (FADS) to attract kingfish, which are the main target species of fishers at Fish Rock, could be provided.

An alternative view from within the recreational sector considered that artificial reefs may be non-practical due to the availability of suitable vessels or other forms of artificial reefs. Another issue was the fact that GNS may be attracted to artificial reefs, thus undermining their value as a means of reducing GNS mortality.

The issue of displaced effort was raised in relation to sanctuary zones.

There was general agreement that offsets/compensatory mechanisms for recreational fishing such as artificial reefs and FADs could offer a useful means of facilitating the introduction of increased protection measures for GNS.

There was no discussion regarding commercial fishing access to alternate habitat and commercial sector interests suggested that this will need to be addressed if and when these alternate habitats are deployed. The issue of how artificial reefs may attract GNS and what needs to be done if this occurs was also raised.

Compliance/enforcement – Some proposed rules can come down to whether a motor is idling in gear or in neutral as to whether an offence is being committed, and as such are effectively unenforceable. Difficulties with underwater compliance and enforcement were also highlighted. It was generally accepted that effective enforcement and compliance was essential, and that this would have an influence on any new GNS protection measures to be introduced.

Research to answer questions on risk. Much of the discussion would have been more fruitful had there been unequivocal scientific evidence available; this includes additional information on stock status and the impact of various fishing gear types. One option to deal with the latter could be to introduce a package of measures that include recommended research work and modify arrangements once this research is complete i.e. apply the precautionary principle and if/when further research shows some additional methods are safe/low risk then they could be introduced.

Risk to critically endangered species. The issue of what is an 'acceptable' level of risk with relation to GNS as a critically endangered species was raised. This issue goes to the heart of the discussions concerning the definition of low-risk fishing methods and gear. Views from within the conservation and dive sectors noted that any fishing with hooks around GNS aggregations presents a risk of mortality and given the status of the GNS as critically endangered, even a single mortality through line fishing is unacceptable. It was noted that the same fishing method or gear may present a greater or lesser risk depending on the level of effort – more fishers, more hooks, more risk and vice versa. A form of the latter has been achieved for the commercial sector by restricting access for certain fishing methods to certain times.

Precautionary principle – was cited by interests from the conservation and SCUBA sectors as a key principle to be implemented when considering GNS protection as an endangered species (Note: the precautionary principle states that that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation).

One size may not fit all. There was wide support for not using identical rules and regulations to apply to all sites and that each GNS aggregation site should stand in its own merits in terms of the type of protective measures required. There was also some recognition that there were advantages to having a harmonised set of rules/regulations for all GNS aggregation sites for the purposes of simplicity, understanding and compliance and enforcement.

Attachment 1

List of attendees

Interest
Scientific
Marcus Lincoln-Smith – Cardno Ecology Lab
Adam Stow - Senior Lecturer - Macquarie University
Commercial Fishing
Professional Fisherman's Association - John Harrison
Ocean Trap and Line Management Advisory Committee - John Best
Macleay River District Fisherman's Co-op Ltd – Lawrie McEnally
Recreational Fishing
Advisory Council on Recreational Fishing – Bruce Schumacher
Coffs Harbour Deep Sea Fishing Club – Geoff Parker
Hat Head Fishing Club – Chris Wallis
Community Action for Fish Rock – Les Palmer
NSW Underwater Skindiving and Fisherman's Association – Peter Saunders
Recreational Fishing Alliance of NSW – Malcolm Poole
Australian National Sportfishing Association NSW Branch – John Burgess
Ecofishers – Ken Thurlow
Coffs Harbour Bluewater Freedivers – John Featherstone
Conservation Interests
North Coast Environment Council – John Jeayes
Sydney Aquarium Conservation Fund – Claudette Rechtorik
Humane Society International – Alexia Wellbelove
Nature Conservation Council of NSW – Anissa Lawrence
National Parks Association of NSW – Ashley Love
Charter Dive Industry
Jetty Dive – Coffs Harbour – Mike Davey
South West Rocks Dive Centre – Peter Hitchens
Sundive - Byron Bay – Giac Cavazzini