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17<sup>th</sup> April 2007

The Honourable Philip Koperberg, MP  
Minister for Climate Change, Environment and Water  
PO Box A250  
Sydney South  
NSW 1232

Dear Minister,

Re: Grey nurse shark population estimation

I refer you to the NSW Fisheries Final Report No. 63 of June 2004 entitled "Mark-recapture population estimate and movements of Grey Nurse Sharks" by Otway and Burke.

The population estimate of under 500 grey nurse sharks along the east coast of Australia is based on the Petersen mark/recapture technique that is adequately described in this Fisheries report. Every statistical procedure is only valid if a number of assumptions are satisfied, and the Petersen mark/recapture procedure is no different. Under Section 4.3.2 the report's authors list the seven assumptions of the Petersen technique and gives an assessment as to their validity in the methodology used in the survey used to estimate the grey nurse shark population. These seven assumptions are:

- i) Tagged individuals are unaffected by the tagging process and behave in the same manner as untagged animals
- ii) Tagged individuals disperse throughout the untagged population
- iii) All individuals have the same probability of being tagged individually
- iv) Tags are not lost in the time between the two samples
- v) The second sample is a random sample
- vi) The effects of emigration, immigration, mortality and recruitment are negligible
- vii) All tagged animals seen in the second sample are reported.

The initial tagging was conducted at 5 known aggregation sites selected by Fisheries scientists, being Flat Rock in Queensland, South Solitary Island, Fish Rock, Little Brought Island and Tollgate Island.

The recapture or re-sighting survey on which the population estimate of 416-466 individuals is based occurred between 14th to 29th June 2003 at 44 sites where 313 sharks were spotted, 19 had tags and 50% were juveniles. AAG has since learned that this survey consisted basically of two groups of volunteers, scuba divers and spearfishers. The scuba divers surveys were conducted at known aggregation sites and they spotted 18 tagged sharks from a total of 137. The spearfishers dived on sites than known aggregation sites spotting 176 sharks of which only one had a tag.

This large discrepancy between the two groups of divers of the June 2003 survey was neither mentioned nor discussed in the Fisheries report of June 2004. It is our opinion that this data, if accurate, raises doubts as to the validity of three of the seven assumptions made for the use of the Petersen technique in this survey and hence invalidates the population estimate.

This contention is supported by the results of the disputed second survey of 16-31 August 2003 where 162 sharks were sighted at 27 sights, of which 37% were juveniles but importantly no tagged sharks were spotted. Dr Steve Kennelly stated on Channel Nine's Sunday segment "The Great Shark Hunt" of 25th March 2007 that this data was invalid as the minimum re-sighting requirements for the population modeling of the Petersen technique were not met. This may be true, but it is supportive of our contention that three of the assumptions for the technique were not met and the population estimates are invalid.

The three assumptions that appear to be invalid are:

i) Tagged individuals disperse throughout the untagged population.

How can this assumption be valid when there is such a discrepancy between the number of tagged individuals between the two groups of divers? And from the second survey where approximately one-third of the estimated population was sighted there would be expected to sight one third of the original 24 tagged sharks, being eight. Instead there were no tagged sharks sighted. In both cases tagged individuals are not dispersing throughout the untagged population.

ii) All individuals have the same probability of being tagged initially.

This assumption is only true if all sharks visit the known aggregation sites. Again, this is not supported by the discrepancy between the two groups of divers in the June survey where the tagged sightings on known aggregation sites were fifteen times greater than at other sites. And again the lack of tagged sharks sighted in the August survey suggests that just too many sharks were not subject to tagging, or the population is far greater than estimated. There is obviously an interrelationship between this assumption and the assumption of dispersal.

iii) The second sample is a random sample

The randomness of the re-sighting survey cannot be considered valid due to the differences between the two groups of divers. If it is assumed there is no bias that may arise from agendas of either group of divers, there is obviously a bias in the sampling of the known versus unknown aggregation sites which is reflected the discrepancy of the results of the two diver groups in the June survey and the assumption of randomness is not upheld.

We would appreciate it if the following questions could be answered:

- What were the results of the two diver groups in the June 2003 survey and is our information correct as to the number of sharks sighted, the number of tagged sharks sighted and the difference in locations of the two groups of divers?
- If there is a difference of results between the two diver groups, did Fisheries scientists consider this difference significant? If not, then why not? If yes, then what are the implications? Why was this difference not mentioned in the 2004 report?
- What explanation do Fisheries have for the lack of tags being sighted in the second survey of August 2003? Why was this not mentioned in the Fisheries report of June 2004?
- Have the authors had the population studies of the grey nurse shark published in scientific journals with the papers subject to peer review? If so, can you provide citations and references?

The authors of the Fisheries report quite rightly state: "It is extremely important to consider whether the mark-recapture (re-sighting) estimates are representative and unbiased." In this regard we consider any major difference of the survey results between the two groups of divers in the June survey, and as supported by the results of the disputed second survey of August 2003, to have implications as to the validity of three basic assumption of the Petersen technique used in the survey to estimate the population of the grey nurse shark.

Finally, to resolve long-standing and ongoing issues associated with the science, management and community views on the grey nurse shark issue in NSW and Queensland, would your office be willing to support an independent workshop into the grey nurse shark to define scientific agreed facts on the east coast population of the grey nurse shark; define the level of human interaction on the grey nurse shark population with a risk assessment of human activities; and to define best management practices that is linked to the science and risk analyses?

Yours sincerely

Phil Ingram  
President  
Anglers Action Group

cc. Hon. Morris Iemma, Premier of NSW  
Hon. Peter Beattie, Premier Queensland  
Hon. Ian Macdonald, NSW Minister of Primary Industries  
Hon. Timothy Mulherin, Queensland Minister of Primary Industries and Fisheries