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International Court of Justice

LA HAYE

Cour internationale de Justice

THE HAGUE

YEAR 2013

Public sitting

held on Thursday 27 June 2013, at 10 a.m., at the Peace Palace,

President Tomka presiding,

in the case concerning **Whaling in the Antarctic (Australia *v.* Japan: New Zealand intervening)**

VERBATIM RECORD

ANNÉE 2013

Audience publique

tenue le jeudi 27 juin 2013, à 10 heures, au Palais de la Paix,

sous la présidence de M. Tomka, président,

en l'affaire relative à la **Chasse à la baleine dans l'Antarctique (Australie c. Japon ; Nouvelle-Zélande (intervenant))**

COMPTE RENDU

Present:	President	Tomka
	Vice-President	Sepúlveda-Amor
	Judges	Owada
		Abraham
		Keith
		Bennouna
		Skotnikov
		Cançado Trindade
		Yusuf
		Greenwood
		Xue
		Donoghue
		Gaja
		Sebutinde
		Bhandari
	Judge *ad hoc*	Charlesworth
	Registrar	Couvreur

Présents : M. Tomka, président
M. Sepúlveda-Amor, vice-président
MM. Owada
Abraham
Keith
Bennouna
Skotnikov
Cançado Trindade
Yusuf
Greenwood
Mmes Xue
Donoghue
M. Gaja
Mme Sebutinde
M. Bhandari, juges
Mme Charlesworth, juge *ad hoc*

M. Couvreur, greffier

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The PRESIDENT: Please be seated. The sitting is open. Professor Sands you can resume where you have stopped yesterday.

Mr. SANDS:

JAPAN'S "SCIENTIFIC" WHALING IN THE SOUTHERN OCEAN (CONTINUED)

1. Mr. President, Members of the Court, yesterday I began these submissions with some introductory elements that we say the Court will need to have in mind in assessing the activity in which Japan is engaged and today I am going to continue by addressing the characteristics of scientific activity. Could I just correct one error into which I fell yesterday, I made a reference to the *Kyodo Senpaku*, I think I referred to it as a vessel, in the context of the use of whale meat, it is, of course the company, which was the commercial whaling company in the past, so I would just like to correct that.

Part 3. The characteristics of science

2. I turn now to the characteristics of science, the third part of my presentation. How is the Court to determine whether a particular activity is to be characterized as having a "scientific" purpose? One option, of course, would be for the Court to decide that a State is entirely free to decide for itself whether activity is science. If Japan says it's science, it's science. And that is, in effect, what Japan is inviting you to do. Such an approach we say would have the most adverse consequences, not only in relation to the conservation of whales but across the board: fisheries and all international rights and obligations in which science plays a significant role, would all be impacted by such a decision. It would run directly contrary to international practice, to the practice of national science foundations and of research bodies, and to decades, if not centuries, of endeavour in the field of the philosophy of science.

3. Australia has put forward an expert opinion from Professor Mangel on this issue. Having regard to his academic and professional activities, he has identified four essential characteristics that are to be met if the killing of whales by Japan under the JARPA II program is to be characterized as being for purposes of scientific research. And he has drawn on two main sources:

firstly, generally accepted principles of scientific practice[1], and secondly, the criteria developed by the International Whaling Commission and its Scientific Committee[2].

4. (Tab 80) [Screen on — first characteristic] On your screen you can see the first essential characteristic identified by Professor Mangel: it is that a program must have a defined and achievable set of objectives that aim to contribute to knowledge that is important to the conservation and management of whale stocks. And, on his view, this involves the selection of particular hypotheses or questions to be tested by the proposed research, to address gaps in knowledge on the conservation and management of whales. This, we say, is the approach taken by the IWC itself[3].

5. [Add second characteristic on screen] The second characteristic is the application of appropriate methods to achieve those stated objectives. On Professor Mangel's view — again entirely consistent with the approach adopted by the IWC — lethal methods should only be resorted to where they are necessary and the research objectives cannot be achieved by non-lethal means.

6. [Add third characteristic on screen] The third criteria is the need for periodic, independent review of research proposals and results, and the adjustment of the program in response to that review. This, of course, is known as "peer review".

7. [Add fourth characteristic on screen] The fourth characteristic is that the research should be designed to avoid adverse effects on the stocks that are being studied.

8. Now, as the Solicitor-General mentioned yesterday, Australia is not wedded to a particular form of language with respect to these four characteristics. What is important is the substance of the matter. [Screen off]

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[1]M. Mangel, "An Assessment of Japanese Whale Research Programs Under Special Permit in the Antarctic (JARPA, JARPA II) as Programs for Purposes of Scientific Research in the Context of Conservation and Management of Whales", April 2011, App. 2 to MA (Mangel, Original Expert Opinion), para. 4.8.

[2]Mangel, Original Expert Opinion, paras. 4.30-37.

[3]Resolution on Special Permits for Scientific Research, App. 2, Chairman's Report of the Thirty-Eighth Annual Meeting, *Rep. int. Whal. Commn* 37, 1987, 25 (1986 Resolution) [MA, Ann. 43]; Resolution on Scientific Research Programmes, App. 1, Chairman's Report of the Thirty-Ninth Annual Meeting, *Rep. Int. Whal. Commn* 38, 1988, 27-28 (1987 Resolution) [MA, Ann. 44]; Resolution 1995-9 [MA, Ann. 46]; Resolution on Special Permits for Scientific Research, Resolution 1999-2, App. 3, Chairman's Report of the Fifty-First Annual Meeting, *Annual Report of the International Whaling Commission 1999*, 52 (Resolution 1999-2) [MA, Ann. 47]; Process for the Review of Scientific Permits and Research Results from Existing Permits, Report of the Scientific Committee, Ann. P, *J. Cetacean Res. Manage. 11 (Suppl.), 2009*, 398-401 (Ann. P) [MA, Ann. 49].

9. We noted that in its Counter-Memorial Japan put forward no fully independent expert opinion, indeed no expert opinion at all, to challenge Professor Mangel's views. Japan simply stated that the criteria are not relevant to the determination of the key issue before the Court, and it disputes their application to the facts in this case. Notably Japan offered no alternative criteria for the Court. You were given nothing to assist you in assessing whether the JARPA II program is "for purposes of scientific research"[4]. Their view may be summarized in a simple form: if we say it's science, it's science.

10. What Japan has done is to offer operational indicators: the area of operation, target species, numbers taken, tissue samples and so on and so forth. In listing these operational indicators, in its written pleadings Japan notably declined to address the matters raised by Professor Mangel[5]. According to Japan, Professor Mangel's views were simply those of one expert, and not binding on the Parties. Japan dismisses, without discussion, his opinion in that pleading, and notes that its own expert differed from Professor Mangel. Japan offered, as I said, no elaboration in its Counter-Memorial, no expert opinion of its own[6].

11. On Japan's approach there is no need for a testable hypothesis, no need for peer review, no need for any assessment of alternative and non-lethal means. The collection of body parts and data is "science" if Japan says it is science.

12. That was how things stood at the close of the written pleadings. Subsequently, as you are aware, Australia submitted a further opinion by Professor Mangel, which reviewed Japan's Counter-Memorial and which confirmed his earlier conclusions, namely that the JARPA II program is not for "purposes of scientific research", and that the data obtained by Japan over 26 years has not contributed to the RMP, and that anything that Japan claims as a useful product of the killing of whales can be obtained by non-lethal means.

13. Subsequently, after that expert opinion was tendered, Japan tendered its own expert opinion, the statement of Professor Lars Walløe. Professor Walløe has criticized

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[4]For example, see CMJ paras. 8.13, 9.10, 9.12; see also M. Mangel, "Supplement to An Assessment of Japanese Whale Research Programs Under Special Permit in the Antarctic (JARPA, JARPA II) as Programs for Purposes of Scientific Research in the Context of Conservation and Management of Whales", 15 April 2013 (Mangel, Supplementary Expert Opinion), para. 2.2.

[5]CMJ, paras. 5.127-5.139.

[6]*Ibid.*, paras. 9.10 and 9.12.

Professor Mangel's *approach* to the application of the characteristics of a program of science, but significantly, he does not reject the criteria out of hand or at all. In this sense, the criteria of Professor Mangel stand unchallenged by any expert evidence tendered by Japan. Professor Walløe proceeds to dispute the practicality of the non-lethal methods identified by Australia, but that of course will not come as a surprise.

14. Professor Mangel has then submitted a response to Professor Walløe's statement[7]. You will be able to hear directly from Professor Mangel later today, and if you wish, to ask your own questions. In our view, the merits of his criteria, as identified by him, are self-evident, and they are unchallenged on the substance by Japan's solitary expert evidence.

15. Australia has also submitted a statement by Dr. Nick Gales, who is the Chief Scientist of Australia's Antarctic Program. He describes, in his statement, the work of the Scientific Committee, responds to a number of points raised in the Counter-Memorial, addresses the question as to whether JARPA and JARPA II have contributed important knowledge on minke whales and discusses the non-lethal SORP program. And Dr. Gales has also responded to points made by Professor Walløe[8].

16. Japan's position seems to be that these expert opinions are simply irrelevant. Why? Because, as it states at paragraph 7.16 of its Counter-Memorial, "[n]o other State or body is given the power to overturn decisions taken by the Contracting Government in the exercise of its right to authorize special permit whaling"[9]. That is the crux of Japan's argument, and, of course, why it felt no need to tender any expert opinion of its own, originally at least, in the Counter-Memorial. That is essentially a legal argument, but late in the proceedings an element of doubt appears to have crept into Japan's thinking. It might not succeed, perhaps, in its rather far-reaching legal argument. And so it has tendered the opinion of Professor Walløe.

17. Let us, against that background, turn to the objectives of JARPA II and the scientific criteria to which both Parties have directed expert opinion.

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[7]M. Mangel, "Response to "Scientific review of issues raised by the Memorial of Australia including its two Appendices" by Professor Lars Walløe", 31 May 2013 (Mangel, Response to Prof Walløe).

[8]N. Gales, "Statement by Nick Gales in Response to the Expert Statement by Professor Lars Walløe", 31 May 2013 (Gales, Response to Prof Walløe).

[9]CMJ, para. 7.16.

Part 4. The objectives of JARPA II and the criteria for science

18. Looking to the objectives of the JARPA II programme and the question of whether it is for "purposes of scientific research", one has to start with the objectives, which were, as we stated yesterday, adopted without the benefit of any prior peer review[10].

19. JARPA II has four supposed objectives[11], closely connected to the objectives of JARPA: this program is open-ended in time and is, as I mentioned yesterday, premised upon the killing of whales and the collection of data.

Objective 1

20. The first objective, which you can find at tab 81 of your folders, is to monitor the Antarctic ecosystem, including whale abundance trends, biological parameters, krill abundance and the feeding ecology of whales, amongst other matters[12]. Professor Mangel's opinion is that the objective is "broad and general", and "without clear and testable hypotheses"[13]. Indeed, he says that it is so broad that it allows "almost any activity"[14]. Japan has not explained how research derived from the collection of body parts of a single species — taken over an extended and open-ended period — could contribute to any understanding of the Antarctic ecosystem as a whole. And you saw on the maps yesterday the full extent of the Antarctic ecosystem in terms of its geographical scale.

21. In reality, this objective is nothing more than "monitoring", "monitoring" by the collection of body parts. And, in Professor Mangel's view, monitoring is not "scientific research"[15]. The collection of data itself cannot be considered as being "for purposes of scientific research"[16]. Now this point is not a novel one. As early as 1902, the distinguished French scientist Jules Henri Poincaré — who happened to be the cousin of the late President of the French Republic — addressed this issue in a rather pithily-written book entitled *La Science et*

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[10]For more detail, see paras. 66-67, below.

[11]CMJ, para. 5.20.

[12]*Ibid.*, paras. 5.22-5.27.

[13]Mangel, Supplementary Expert Opinion, para. 6.3.

[14]Mangel, Original Expert Opinion, para. 5.10.

[15]Mangel, Supplementary Expert Opinion, para. 3.6. The objectives of JARPA and their failures are addressed in MA, Chap. 5 and in Mangel, Original Expert Opinion.

[16]Mangel, Supplementary Expert Opinion, para. 6.3.

L'Hypothèse, which is still in print as a classic, more than a century later and available on Amazon and more widely on the web. It indeed includes a rather lengthy and commendable introduction written by Professor Larmor, the Lucasian Professor of Mathematics at the University of Cambridge, who commends this French text — he translated it — to an English readership as a demonstration of what he calls "the French instinct for precision and lucid demonstration". What does Professor Poincaré have to say? "Science is built up of facts, as a house is built of stones; but an accumulation of facts is no more science than a heap of stones a house."[17]

22. In response, Japan says that it is working on the collection of facts towards what it calls the development of an ecosystem model. Mr. President, a quarter of a century has passed, thousands of whales have been killed, and Japan is unable to offer any evidence of discernible progress[18]. At the annual Scientific Committee meeting held just last week, Japan apparently asserted that results would appear early next year[19]. What was the response to that assertion of the relevant Working Group of the Scientific Committee? It simply noted there was *a lack of clarity in the aims* of Japan's ecosystem modelling exercise.

23. We note also the manifest failure on the part of Japan to explain why lethal take is necessary at all. Let us take an example: Japan claims that to achieve its first objective it has to obtain samples from the stomachs of dead minke whales and measure, additionally, blubber thickness. This, they say, is needed to establish feeding strategies and it can only be done by killing the whales. We say that claim lacks all merit. Dr. Gales has provided compelling evidence to refute the only expert opinion on which Japan relies, namely that of Professor Walløe[20] and you will have noted that there is not a single reference in Professor Walløe's statement, a statement of expert opinion without a single footnote. Dr. Gales has explained how more specific information on feeding strategies can be obtained by non-lethal means[21], exactly what is happening in the

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[17]Jules Henri Poincaré, *Science and Hypothesis*, London: Walter Scott Publishing (1905), p. 141

[18]MA, para. 5.64; N Gales, "Statement by Dr Nick Gales", 15 April 2013 (Gales, Expert Statement), para. 4.11.

[19]Kitakado et al., "Plan for ecosystem modelling for species in Area IV in the Antarctic Ocean using JARPA and JARPA II data", presented to 2013 Scientific Committee meeting as paper SC/65a/EM02. Available at http://iwc.int/sc65adocs.

[20]L Walløe, "Scientific review of issues raised by the Memorial of Australia including its two Appendices", 9 April 2013 (Walløe, Expert Statement), p. 14, para. 3.

[21]Gales, Expert Statement, para. 5.9, eighth dot point; Mangel, Supplementary Expert Opinion, para. 3.28. Gales, Response to Prof Walløe, paras. 4.8-4.9.

SORP program[22]. You can ask him about that later this afternoon. Japan has offered no evidence whatsoever, nothing, to show that the stomach contents of dead minke whales has offered any greater understanding about the Antarctic ecosystem. Eighteen years of the JARPA program has offered nothing more than the information that Antarctic minke whales eat a great deal of krill[23]. That has long been known. To the best of my recollection, I knew that in 1972 when my biology teacher, Robin Jenks, told me that that is what whales ate. The program has added nothing — and I emphasize nothing — to the understanding of the Antarctic ecosystem.

Objective 2

24. I turn to objective No. 2, which you will find at tab 82 of your folders, which has two elements[24]. The first element is to construct a model of competition among different whale species: this involves what is held out as something called the Krill Surplus Hypothesis; and the second element is to devise new management objectives, including the restoration of the cetacean ecosystem[25].

25. In our submission this objective is wholly misconceived. Japan focuses on only a small number of species, just three; and the objective is being pursued unilaterally without any reference to multilateral research activity undertaken elsewhere[26]. Professor Mangel has put the first point clearly: by focusing on a small component of the ecosystem — just minke whales — JARPA II can only produce necessary data on "that single species in its ecosystem model", whereas "all of the other components of the model (e.g., the other baleen whales, birds, mammals)" will not be addressed at all[27]. It is a bit like examining only the European red squirrel to understand what is happening to the European ecosystem: it is a useless exercise unless you carry it out in a manner that is integrated with the assessment of other species.

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[22]Gales, Expert Statement, paras. 6.14-16.

[23]MA, para. 5.13.

[24]*Ibid.*, Ann. 105, p. 161; Government of Japan, "Plan for the Second Phase of the Japanese Whale Research Program under Special Permit in the Antarctic (JARPA II) — Monitoring of the Antarctic Ecosystem and Development of New Management Objectives for Whale Resources", 2005, SC/57/O1 (JARPA II Plan); and CMJ, para. 5.30.

[25]JARPA II Plan, pp.161-2; CMJ, paras. 5.28-5.31.

[26]Mangel, Original Expert Opinion, paras. 5.15, 5.36-37. See also Mangel, Supplementary Expert Opinion, paras. 3.26–3.27.

[27]Mangel, Supplementary Expert Opinion, paras. 5.15 and 5.36-37.

26. What of the "krill surplus hypothesis"? Professor Mangel states that it is "the only clearly identifiable hypothesis in JARPA or JARPA II"[28], but that Japan's approach to it is significantly flawed[29]. Actually, Japan says that it is not even purporting to verify the hypothesis: it is merely seeking to develop what it calls "a model of competition among whale species", and to that end it is considering several possible hypotheses that might explain changes in the abundance of baleen whale species[30]. Japan has not, however, designed JARPA II to test any hypotheses, so we simply do not know what the true aim of the research is. Without knowing the aim, there is no way to assess results. So, body parts are being collected and they are being examined for no reasoned purpose. We just do not know what Japan's program is seeking to establish or explore or test[31].

27. The IWC and the Scientific Committee have strongly criticized Japan's objective of monitoring the Antarctic ecosystem, and the work related to it[32]. The Scientific Committee has conspicuously failed to state that Japan's approach is at all useful for whale management. It is true, as Japan[33] and Professor Walløe[34] have noted, that the Scientific Committee itself does look at ecosystem effects as part of its work. But, the purported ecosystem modelling under this objective of JARPA II is different from what the Scientific Committee is doing. Lethal data is not required or used for the ecosystem modelling agreed by the Scientific Committee[35]. As Professor Mangel has stated, the model being developed under JARPA II "cannot possibly provide any useful results in assessing the ecosystem"[36]. So much for objective 2.

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[28]Mangel, Original Expert Opinion, para. 5.12.

[29]*Ibid.*, paras. 5.11–5.15, 5.36–5.37.

[30]CMJ, para. 5.31

[31]Mangel, Supplementary Expert Opinion, ~~para~~ para. 2.2.

[32]MA, para. 5.20.

[33]CMJ, para. 3.101.

[34]Walløe, Expert Statement, p. 15.

[35]Gales, Expert Statement, para. 4.11.

[36]Mangel, Supplementary Expert Opinion, para. 3.27.

Objective 3

28. I turn to objective 3, which is at tab 83, namely the identification of changes in the temporal and spatial structure of stocks of fin, humpback and minke whales[37]. There is a rather simple point to be made in relation to this objective, beyond the point that it obviously tests no hypothesis: information on whale stock structures and mixing rates between different stocks can be useful for the implementation of the RMP, but it is not required. But even more significantly, all of this data — everything — can be obtained by non-lethal means, such as biopsy sampling, satellite tagging and tracking[38]. So the Court — you, the Judges — are entitled to ask: why kill minke whales to meet an objective that seeks to test no hypothesis, when non-lethal means are available? Dr. Gales will address this point in due course[39].

Objective 4

29. The fourth objective of JARPA II, which is at tab 84, is purportedly to improve management procedures for Antarctic minke whale stocks[40]. This objective is premised on Japan's unhappiness with the RMP, which it considers to be overly conservative. Japan wants to amend the RMP[41], because it is designed to function without obtaining data by killing whales[42]. In short, Japan wants a management régime that allows the killing of whales today to produce higher catch limits tomorrow.

30. Japan's desire to amend the RMP is, we say, misconceived. The RMP operates under the IWC, and it offers a robust and widely supported management procedure[43]. It also includes its own procedures for revision, a process that has been undertaken spanning 25 years of work. In that work, "data from JARPA and JARPA II have not been relevant to those revisions"[44], says Dr. Gales. In Professor Mangel's point of view, he states that he is aware of "no peer-reviewed

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[37]CMJ, paras. 5.32-33.

[38]MA, para. 5.69.

[39]Gales, Expert Statement, para. 4.8.

[40]CMJ, paras. 5.34-5.37

[41]*Ibid.*, para. 5.37.

[42]*Ibid.*, paras. 5.20, 5.34–5.35.

[43]Gales, Expert Statement, Annexure 2, para. 14.

[44]Gales, Expert Statement, para. 3.5.

published paper that demonstrates fundamental flaws with the RMP that can only be corrected through field-based programs that involve lethal take"[45].

31. In short, the inputs needed for the RMP can all be obtained without killing whales, a point to which Dr. Gales will return.

JARPA II has no testable hypotheses

32. I can assemble all of Australia's concerns with the objectives of JARPA II, the four objectives, under a single theme — and it is an important theme: it has no testable hypotheses. It offers nothing more than the collection of data, a heap of stones — not a house. The core of "scientific research" aims to investigate questions or hypotheses that can be tested. That is their essence. As Professor Mangel puts it, "the mere collection of empirical data without a testable hypothesis simply cannot be treated as "scientific research"[46]. Japan's activities does not test identifiable hypotheses, and for this reason alone it cannot be treated as science. As Professor Mangel puts it, "objectives that cannot be tested are not scientific"[47]. The 21 eminent scientists to whom I referred yesterday made exactly the same point: They said that Japan's research program "lacks a testable hypothesis or other performance indicators consistent with accepted scientific standards"[48], it is not science. The objectives of JARPA II have no end-point, precluding any possibility of assessing progress in meeting purported objectives[49].

33. In challenging that view, Japan relies exclusively on Professor Walløe, who has opined that Japan is engaged in the collection of what he calls "exploratory data" and "exploratory data" is science[50]. Professor Mangel has offered a categorical response and rebuttal to this claim, he says he is "not aware of any scientific research bodies that would support the approach of exploration lacking a conceptual framework going on for decades"[51]. Moreover, Professor Walløe has offered no evidence in support of his claim. It is simple assertion, mere assertion.

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[45]Mangel, Original Expert Opinion, para. 3.29.

[46]Mangel, Supplementary Expert Opinion, para. 3.7.

[47]Mangel, Original Expert Statement, para. 4.12.

[48]"An Open Letter to the Government of Japan on Scientific Whaling", *The New York Times*, 20 May 2002.

[49]Gales, Expert Statement, para. 3.25-26.

[50]Walløe, Expert Statement, p. 7, para. 1.

[51]Mangel, Response to Prof Walløe, sect. 4.

Conclusion on objectives

34. I can be brief in my conclusions on Japan's objectives. They are simply there to allow whales to be killed, not to establish a genuine program of science. A genuine program would identify objectives for conservation and management based on broadly agreed research objectives based on testable hypotheses.

35. Three of the four objectives of JARPA II cannot be achieved — period. The only one that might be capable of being achieved — objective 3, changes in stock structure — merely replicates what can be attained by non-lethal means. There is no support for any of these four objectives from the international community of scientists. They are not required by the RMP. The objectives of JARPA II, in our view, are not science.

Part 5. JARPA II is not science: three further issues

36. I turn to the fifth part of my presentation, focusing on three further specific issues. Professor Mangel has stated that scientific research programs are characterized by a close relationship between methods of research and the objectives that are sought to be achieved. There is no such close relationship between objectives and method in JARPA II.

(i) JARPA II's sample sizes are not established on a scientific basis

37. Let me begin with my first example: sample size. What I mean by sample size is the number of whales that Japan kills to meet its stated objectives.

38. Japan has not explained why it needs to kill 850 minke whales — plus or minus 10 per cent — as opposed to 85, or 8,500, or 85,000. That failure undermines the claim to be engaged in "scientific research". You have got evidence before you from Professor Mangel that it is difficult to understand the statistical basis relied upon by Japan to set its sample size[52]. Japan has simply not contradicted that evidence, another example that is unrebutted. (tab 85) [screen on] Indeed, it seems — as you will see on your screen — that Professor Walløe has conceded the point: "it must be admitted that the Japanese scientists have not always given completely transparent and clear explanations of how sample sizes were calculated or determined"[53]. [screen off] I take that

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[52]Mangel, Original Expert Opinion, para. 5.38.

[53]Walløe, Expert Statement, p. 10.

as an example of Norwegian understatement. The inadequacy of Japan's approach is compounded by the absence of any testable hypotheses. As Professor Mangel puts it for JARPA II "it is impossible to set sample sizes in a proper manner, because sample size is properly set by reference to what is required to answer the focal question"[54].

39. Japan has offered vague explanations as to why it has chosen the sample size that it has. It asserts that it set sample sizes using statistical formulae based on margin of error and confidence interval[55]. Fine. What it has not done is offer any evidence or account to support its choices of margin of error and confidence interval. On Japan's approach, as Professor Mangel states, "one can select almost any sample size and describe it as being required by way of retrospective reference to unexplained choices of each of the parameters"[56]. There is just no scientific rationale there: what there is, however, is the conveniently proximate relationship between a sample size of 850 killed whales and the refrigerated capacity of its factory ship, the *Nisshin-Maru*.

40. Selecting a different margin of error changes the number to be killed: a higher margin of error allows the number to be killed to be lowered, a lower margin of error would require more whales to be killed. As Professor Mangel states, "knowing what margin of error to apply requires knowing the question that is intended to be answered"[57]. So the question for the Court is: on what basis did Japan fix its margin of error? I cannot answer that question, we simply do not know. There is no information or evidence on the point in Japan's Pleading[58].

41. Japan's lack of transparency and inconsistency in setting sample size began in fact with JARPA. I can explain that by reference to a table you can see on the screen (tab 86) [screen on — table of sample size against stages of JARPA and JARPA II]. The table shows that Japan set catch quotas of 825 minke whales and 50 sperm whales in March 1987, in the JARPA proposal[59] — that is right at the top. Six months later, and before the program was commenced, the number was

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[54]Mangel, Supplementary Expert Opinion, para. 3.11.

[55]CMJ, paras. 5.58–5.60.

[56]Mangel, Supplementary Expert Opinion, para. 3.20.

[57]*Ibid.*, para. 3.14.

[58]CMJ, ~~para~~ paras. 5.57-5.71.

[59]Government of Japan, "The Program for Research on the Southern Hemisphere Minke Whale and for Preliminary Research on the Marine Ecosystem in the Antarctic", 1987, SC/39/04 (JARPA Proposal, 1987) [MA, Annex 156].

reduced significantly, to 300 minke whales and no sperm whales, for a two-year feasibility study[60]. This number — with an allowance of plus or minus 10 per cent — was retained when the full-scale program commenced in 1989. Japan claims that the adjustment was made to respond to comments by the Scientific Committee in 1987[61], and elsewhere due to its own logistical limitations[62].

42. But that is not what the evidence before the Court shows. The real reason for the change was political, it had nothing to do with scientce. The Japan Fisheries Agency reduced the proposed catch limits on the direct instruction apparently of the Prime Minister of Japan, in April 1987. He told the Director-General of the JFA that he had a "gut feeling" that a killing target of 875 — the 825 minkes and the 50 sperm whales — looked too large, and he instructed that Japan should not create the impression of being "unfair"[63]. So Japan reduced the number by about 60 per cent. Interestingly, it offered no relevant change in its research objectives, once the full-scale program began in the 1989[64].

43. From a scientific perspective, Mr. President, Japan's research program either requires 825 minke whales or it does not. The adjustments that took place between 1987 and 1989 were not based on scientific considerations — gut feeling is not science. And that calls into question the whole basis of the program. This conclusion is compounded by the fact that the Court has no real evidence before it to show that the sample sizes were really informed by the program's stated objectives.

44. But that is not the only problem with sample sizes. You will have noted that the sperm whales were removed entirely from JARPA's research plan, and yet, the stated objectives were not changed at all[65]. On a scientific approach, one assumes that the stated objectives required the killing of a certain number of sperm whales. Remove those sperm whales from the research plan,

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[60]Government of Japan, "The Research Plan for the Feasibility Study on 'The Program for Research on the Southern Hemisphere Minke Whale and for Preliminary Research on the Marine Ecosystem in the Antarctic'", October 1987, SC/D87/1 (JARPA Feasibility Study Proposal, 1987), p. 10.

[61]CMJ, para. 4.85.

[62]Government of Japan, "The Research Plan in the 1989/90 Season in Conjunction with note for 'The Program for the Research on the Southern Hemisphere Mink Whale and for the Preliminary Research on the Marine Ecosystem in the Antarctic (SC/39/O4)'", May 1989, SC/41/SHMi13 (JARPA 1989/90 Research Plan), p. 5.

[63]MA, Ann. 127, "Fisheries Agency Director-General Told by Prime Minister: Do Scientific Whaling that Won't be Criticised", *Asahi Shimbun*, 26 April 1987 (morning edition), 2.

[64]JARPA Feasibility Study Proposal, 1987, p. 10; JARPA 1989/90 Research Plan, p. 5.

[65]*Ibid.*, p. 3; JARPA 1989/90 Research Plan, p. 5.

and those objectives, presumably, would have to be revisited. The objectives cannot be met. And, this indicates on its face, that JARPA is not science, it is a program driven by political and commercial considerations.

45. Now let us move forward to 2005 — moving to the bottom of the slide — and JARPA II all of a sudden. Japan decides to increase the sample size for minke whales, more than doubling it to 850 whales — plus or minus 10 per cent — and set a kill of 50 fin whales and 50 humpback whales. Japan's stated research objectives are premised on the collection of body parts from three species of whale, in specified numbers. How were those numbers fixed? I have already told you, we have no idea, because there is no expert evidence before you to provide an account. One would have expected Japan to put forward an independent scientist who would explain, as an expert witness, how Japan took these decisions. It has chosen not to do so. So the evidence of Professor Mangel and Dr. Gales is entirely unrebutted. Again, it is impossible to avoid the conclusion that the reason for the change in 2005 was political, and had nothing to do with scientific considerations. In our Memorial at Chapter 3 we described what happened in 2010, when a Japanese Minister stated that "[W]e don't actually need 800 [whales]", and he then helpfully added "it's more than we need"[66]. What did Japan say in its Counter-Memorial? Nothing of any relevance to that factual assertion[67]. What has Professor Walløe said in response to that material? Nothing. There is no evidence, not a shred of evidence before you to explain Japan's choice on this vital issue of the number of minke whales and other whales to be taken. [screen off]

46. I have so far focused only on targets. What about the actual take of whales? Well, as you know from the pleadings[68], Japan's actual take has, in most years of JARPA II, been far below the targets. (tab 87) [screen on — visual representation to show actual and projected catch]. As you can see on the screen, on average over the last eight seasons the take has been 454 minke whales, which is less than half the maximum target of 935. And Japan of course, sets an annual take of 50 humpback whales under JARPA II, but has not taken a single one. That is not for scientific reasons, it is for a political decision taken in the face of massive protest, at the IWC and

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[66]MA, Ann. 107, Government of Japan, Minister for Agriculture, Forestry and Fisheries (H. Akamatsu), Transcript of Press Conference, 9 March 2010.

[67]See CMJ, para. 5.81.

[68]MA, para. 5.78.

beyond. And what about fin whales? It should have caught 400 over the past eight years, it has in fact caught 18. [screen off]

47. What changes have been made to the research program based on this failure? As far as we can tell, none. There has been no change to the stated objectives. This too confirms that this is not about science. I ask you to pause for a moment and imagine a domestic research programme, on the impact of certain vaccines on children with three different blood types. You set an annual figure of 850 for one group, and 50 for the testing of each of the two other groups. As to the first group, you find only 425 volunteers; of the second group you find only two volunteers, and of the third group you find none. Does the research programme go ahead without any change to the objectives? Of course it does not go ahead. In fact, it is unlikely that the project would proceed at all. Yet Japan nevertheless has just gone on and on, without any change to objectives of the research program.

48. Let me be clear on one point — Australia welcomes the fact that fewer whales have been killed than were targeted. But the numbers actually killed raise a fundamental question that Japan has thus far not been able to answer: how can it meet research objectives of JARPA II, purportedly premised on killing a stated number of three species, when in fact it has killed far fewer of only two species? Why is Japan silent about this? What does its single expert have to say about it? Nothing. Any scientist — any one of the 21 scientists I referred to yesterday — will tell you that a sample size has to be fixed by reference to the hypothesis that is being tested, and if the sample size is changed the whole research objective has to be changed, or abandoned. If JARPA II was truly a true scientific research program, Japan would have adjusted its objectives. If it was really science, that would have happened. What has Japan done? It has continued its program and says that the matter is being "evaluated"[69].

49. Mr. President, Members of the Court, the claim to "scientific research" is wholly undermined by the gap between target and actual sample sizes. This is politics and commerce, not science.

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[69]CMJ, paras. 5.73 and 5.80.

(ii) JARPA II's commitment to lethal take is not scientific

50. I turn to a second key issue, namely Japan's unbending commitment to lethal take. (tab 88) [on screen, Resolution 2003-2] On the screen you can see IWC Resolution 2003-2, by which the IWC unambiguously called for scientific research to be limited to "non-lethal methods only"[70]. The Resolution recognized that Article VIII of the Convention was drafted at a time when there were few alternatives to lethal take, but that today's situation was "drastically different". Numerous IWC resolutions on Japan's special permit programs have recommended that they be halted and restructured to make use of non-lethal methods, as Professor Crawford has noted[71]. Professor Walløe has nothing to say on these resolutions, or on the need to avoid killing whales, or on the work of the Scientific Committee. [screen off]

51. In its Memorial, Australia set out alternatives to the killing of whales[72]. Dr. Gales has expanded on these in his expert statements[73]. There is no evidence before the Court to show that Japan turned its mind to these options, either for JARPA or JARPA II[74]. There is not a shred of evidence before the Court of any assessment by Japan of alternatives. Japan has simply asserted that they are not available, and relies on Professor Walløe, who offers no reference to support his own assertions.

52. Japan claims that lethal methods are necessary and indispensable because certain research can only be conducted by obtaining the body parts of whales. Let us subject this claim to a little more scrutiny.

53. The reports from JARPA and JARPA II indicate that about one hundred body parts are sampled from each whale killed. The reports do not, however, indicate how this growing collection of body parts and data is tied to specific objectives of JARPA II. We say that the body parts are not needed, because the research is not reliable or useful for the conservation and management of whales in the Southern Ocean. ~~Even~~ We also say that, even if the data could be said to be needed — and we say it is

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[70]MA, Ann. 38, Resolution 2003-2.

[71]MA, Ann. 25, Resolution 1994-10; *ibid.*, Ann. 28, Resolution 1996-7; *ibid.*, Ann. 30, Resolution 1997-6; *ibid.*, Ann. 39, Resolution 2003-3; *ibid.*, Ann. 40, Resolution 2005-1.

[72]MA, ~~para~~ paras. 5.65-71.

[73]Gales, Expert Statement, section 6; Gales, Response to Prof Walløe, paras. 2.6-2.11, 4.4.

[74]Mangel, Supplementary Expert Opinion, para. 2.2.

not — all of it can be obtained without killing whales, principally by biopsy sampling and satellite tagging of whales[75].

54. Let me very clear again on another point: Australia welcomes legitimate scientific research on whales in the Southern Ocean, and it contributes to various multilateral efforts in the field, as described in the Memorial[76] and in Dr. Gales's expert reports[77]. Australia participates in numerous programs, including the SORP program, a scientific initiative described by Dr. Gales and led by the IWC's own Scientific Committee[78]. Japan has chosen not to participate. There is also the Ecosystem Monitoring Program of the CCAMLR (CEMP), in which both countries are active participants, which does not require lethal "research". There was also the earlier Scientific Committee-led IDCR and SOWER programs, which did not seek or require lethal "research". Japan could have linked JARPA II to these programs, but it has not done so. As I mentioned yesterday, it has even kept JARPA II entirely separate from all of the work carried out by its own National Institute of Polar Research (NIPR)[79]. It has been kept out of it because the work of JARPA II is premised on the killing of whales, and it has nothing to do with science.

55. Japan has also promoted JARPA and JARPA II as an activity distinct from the RMP. The IWC's agreed management procedure. This was described to you yesterday by Mr. ~~Professor~~ Burmester. Note that Japan does not like the RMP[80].

56. The Parties are in strong disagreement on whether information on matters such as the structure of whale stocks and mixing rates can be ascertained by non-lethal means. You have got evidence before you from Australia's two experts, and Japan's own expert. Australia's experts say that this information can be obtained from non-lethal means; biopsy sampling and satellite tagging[81]. Japan's expert disagrees. All three experts will be available to you to have your

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[75]MA, paras. 5.65-5.71.

[76]*Ibid.*, paras. 5.60-62.

[77]Gales, Expert Statement, Sec. 6; Gales, Response to Prof Walløe, paras. 2.6-2.11, 4.4.

[78]Gales, Expert Statement, ~~para~~ paras. 6.1–6.17.

[79]See *ibid.*, ~~para~~ paras. 3.21-3.24.

[80]Walløe, Expert Statement, p. 11.

[81]Gales, Expert Statement, para. 4.8, third dot point of para. 5.9, paras. 6.15–6.16; Mangel, Supplementary Expert Opinion, paras. 5.4–5.13.

questions put to them and you will be able to form your own view on which is the more persuasive of views.

57. Japan also says that non-lethal biopsy sampling and satellite tagging is not practicable[82]. Yet Professor Walløe does accept that "DNA analyses of biopsy samples obtained non-lethally from minke whales can provide sufficient genetic information to determine stock structure". He recognizes that the approach "is correct", in theory at least[83]. But what he says is that "in practice it would be impossible", because it is "prohibitively expensive" and because "the number of biopsies that could be obtained with a similar effort to that in the current [Japanese] research whaling program would be far lower"[84]. But, once again he offers no evidence whatsoever in support of that assertion. Even if he is right — and Dr. Gales offers actual data to show that he is not — he recognizes that it is possible to do it, and that is the crucial point. It should at least be explored. That is a concession made by Japan through its witness, it is an important one and it offers the Court a way forward.

58. Over the past 25 years there have been huge advances in biopsy sampling and satellite tagging. The evidence before the Court shows that these methods are feasible, used and successful. And they are being used on minke whales. You will hear more from Dr. Gales on this later this afternoon[85].

59. The evidence before the Court also shows that information on stock structure[86] can be obtained by genetic analysis from biopsy sampling, and that information on whale movements and mixing rates can be obtained effectively by satellite tagging[87].

60. What is Japan's response to these alternative techniques? Well, it says, there are some things that cannot be known unless you kill the whale and obtain a particular body part. It rests its case very largely on the earplug of the whale, a feature I must confess I was not aware of before I became involved in this case. You too it seems must now turn your attention to the earplug of the

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[82]CMJ, para. 5.49 and footnote 696.

[83]Walløe, Expert Statement, p. 11.

[84]*Ibid.*

[85]Gales, Response to Prof. Walløe, paras. 2.1-2.18.

[86]CMJ, para. 4.83.

[87]Gales, Expert Statement, third bullet point of para. 5.9.

(Please put in FN98 from Submitted Speech) → Gales, Expert Statement, paras. 3.46-3.47, fourth dot point of para. 5.49; Mangel, Original Expert Opinion, para. 5.28; MA, para. 5.12.

whale, a body part measuring, I am told, not much more than the size of my thumb. It can only be obtained by killing the whale and, Japan asserts that it is "a valid and useful tool for age determination"[88] and to assist in determining natural mortality rates[89].

61. Australia has offered two simple points in response. First, the earplug of the whale has not been established to show the true age of whales. Secondly, even if it did establish that, the data is of no use[90]. Japan has collected nearly 7,000 earplugs from dead minke whales under JARPA. What have we learnt from this? As far as we can tell, absolutely nothing at all: the evidence before the Court is that our understanding of mortality rates for Antarctic minke whales is exactly the same as it was in 1988, before this program began. There is no evidence before the Court that the age data obtained by Japan has offered any other scientific insight. And the situation has not changed under JARPA II. Japan collects earplugs, nothing is learned, none of the stated objectives of JARPA II are met, Japan continues to collect earplugs.

(FN) Please put in FN101 from Submitted Speech: Gales, Expert Statement, paras. 3.46-3.47.

62. The evidence is plainly insufficient to allow Japan to get home on earplugs. What other body parts are available to it? It invokes the use it has made of the *stomach content* of dead whales and of *blubber thickness*. These, it says, are indispensable to understanding how whales feed, and their nutritional condition[91]. With respect, we fundamentally disagree that this data provides any useful information. The analysis carried out is not required for the RMP, a point accepted by Professor Walløe[92]. To the extent that it wants to use the data for that purpose, the approach is manifestly inadequate, given that it is claiming to study the whole of the Antarctic ecosystem.

63. There are other problems with Japan's approach to data on stomach content and blubber thickness. The data that is collected is recognized as being unreliable, as it has not been obtained by a properly random sample. At the 2012 Scientific Committee meeting, when stomach content and blubber thickness were addressed, serious questions were raised about the unreliability of the data[93]. Japan has since tried to fix the problem, at least in relation to blubber thickness data, at the

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[88]CMJ, para. 4.66.

[89]*Ibid.*, paras. 4.118–4.124.

[90]*Ibid.*, para. 4.66 and footnote 436. For authority see MA, in particular para. 5.70.

[91]CMJ, para. 4.72.

[92]Walløe, Expert Statement, p. 11.

[93]Report of the Scientific Committee (2012), *J. Cetacean Res. Manage. 14 (Suppl.)* 2013, p. 51.

recent 2013 Scientific Committee meeting. But the Committee concluded that the problems had not been resolved. As to stomach content data, at the most recent meeting, Japan did not even attempt to show that it had tried to fix the problems. Finally, I must mention that Professor Walløe has asserted that non-lethal means — namely, studying the krill directly[94], and modelling based on the size of living whales[95] — are not available and cannot accurately ascertain feeding ecology and habits. Dr. Gales has provided clear evidence directly rebutting that statement[96].

64. What have we learnt from Japan's analysis of stomach contents? Seven thousand whales killed, two things learned: (1) they eat krill; (2) estimates of daily food intake are no more precise than previous estimates based on metabolic calculations. As Dr. Gales states, we have learned nothing that we did not already know[97]. More important questions on feeding remain completely unanswered and cannot be answered by lethal take[98].

65. Japan claims to obtain much biological data from body parts; none of it is needed for the RMP[99]. What is needed is not addressed by lethal data.

(iii) The absence of peer review confirms JARPA II is not science

66. I turn to the third issue that illustrates the manifest difficulty for Japan's case: total absence of peer review. Professor Mangel has made it clear that a program for "scientific research" should receive — and then take account of — comments from independent reviewers, at the design stage and in its implementation of a program[100]. There is no dispute between the Parties that JARPA II did not integrate external comments at the design stage: Japan did not bother to wait for the outcome of the Scientific Committee's review of JARPA, in 2006, before moving on to JARPA II. It just conducted its own review, in a manner that was not independent. It relied on its own and closely aligned scientists.

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[94]Gales, Expert Statement, para. 6.15.

[95]Gales, Expert Statement, fourth dot point of para. 5.8, eighth dot point of para. 5.9; Mangel, Supplementary Expert Opinion, para. 3.28.

[96]Gales, Response to Prof. Walløe, paras. 4.5-4.14.

[97]Gales, Expert Statement, paras. 3.48, 4.10, fourth dot point of para. 5.8, eighth dot point of para. 5.9; see also: Gales, Response to Prof. Walløe, paras. 4.7-4.8.

[98]Gales, Response to Prof. Walløe, paras. 4.7-4.8.

[99]MA, paras. 2.75, 5.10, 5.47; Mangel, Original Expert Opinion, paras. 3.25-6, 5.16-18; Gales, Expert Statement, para. 3.4.

[100]Mangel, Original Expert Opinion, para. 4.26.

67. The JARPA II Plan was presented to the Scientific Committee in 2005, a year before the IWC's planned review of JARPA. Sixty-three members of the Scientific Committee — a large and unprecedented number — presented a paper, which you will find at tab 89, which they stated they were "unable to engage in a scientifically defensible process of review of the JARPA II proposal", because JARPA had not yet been independently reviewed[101]. The consideration of the JARPA II Plan that followed, without any input from the 63 objecting scientists was limited to a "brief discussion within a small and non-representative portion of the Scientific Committee"[102]. No peer review of design.

68. Peer review has fared no better with respect to the implementation of JARPA II[103]. Japan claims ample peer review both of JARPA and JARPA II[104]. It cites a total of 107 peer-reviewed papers published in the period 1988 to 2009, with more papers after that. Please look at those papers very carefully, as I have done and as the Australian team has done. Of the total, 51 appear in peer-reviewed literature *and* are potentially relevant to the vague objectives of JARPA and JARPA II[105]. Some 40 per cent of the peer-reviewed articles — 39 out of 107 — have nothing to do with the stated objectives of JARPA and JARPA II[106]. Only about 15 per cent of the papers produced in relation to JARPA and JARPA II are relevant to stated objectives[107].

69. How many of these peer-reviewed papers relate to data essential for the conservation and management of whales that could only be obtained by lethal data? None. Not a single one.

70. How many peer-reviewed publications have been produced under JARPA II, since its launch in 2005? Japan says there are two papers[108]. And it says, hopefully perhaps, that "a larger

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O1 (the letter, not number).

[101]Childerhouse, S. *et al.* (62 other authors). 2006. "Comments on the Government of Japan's proposal for a second phase of special permit whaling in Antarctica (JARPA II)". App. 2 of Ann. O1. "Report of the Scientific Committee". *Journal of Cetacean Research and Management* 8:260-261; see also, Gales, Expert Statement, para. 3.38.

[102]Gales, Expert Statement, para. 3.39.

[103]Mangel, Original Expert Opinion, para. 4.2.

[104]CMJ, paras. 4.112-114 and 5.99.

[105]Mangel, Original Expert Opinion, para. 5.58.

[106]*Ibid.*, para. 5.59.

[107]*Ibid.*, para. 5.62.

[108]CMJ, para. 5.99, footnote 774; Institute of Cetacean Research, "Data available for JARPA II Review Workshop" (presented as paper SC/65a/O08 to 2013 Scientific Committee meeting; available at http://iwc.int/sc65adocs), p. 6.

number . . . are expected", once the program has been reviewed in 2013-2014[109]. (Tab 90) [Screen on — footnote 774] We invite you to look carefully at those two papers, as Professor Mangel and Dr. Gales have done. You can see references to them on the screen — they are footnote 774 of the Counter-Memorial. They are about biochemistry and heart anatomy, two matters that are irrelevant to the conservation and management of whales, and equally irrelevant to the stated objectives of JARPA II[110]. [Screen off]

71. Professor Mangel has also looked at some more recent papers that have been prepared using JARPA data, JARPA, not JARPA II — 15 peer-reviewed papers produced between 2010 and 2012. Of the 15, 12 do not appear to have been intended for wide circulation and are inaccessible to most in the scientific community only for reasons of linguistic difference: one is in Norwegian and 11 are in Japanese. We took the trouble to get them translated into English and provided them to Professor Mangel for his consideration, and he took the view that many of them don't contain any substantive analyses at all — of the 11 in Japanese, seven are two pages long, and one is three pages long. You can hear more from him, in due course, on these matters[111].

72. Japan is very defensive on the subject of peer review. It asserts — without any evidence — that documents submitted to the Scientific Committee are more important than peer review[112]. That claim is misconceived: the function of the Scientific Committee is not to provide peer review of JARPA II, for reasons explained by Dr. Gales[113]. Japan has tendered no evidence in support of its argument on peer review. Dr. Walløe has absolutely nothing to say about peer review. What he does say corroborates the widespread critique that Japan's decision-making on other matters is unclear and lacks transparency.

73. In any event, submissions to the Scientific Committee lack the essential elements of peer review, and cannot replace it. The function of peer review is to assess whether scientific objectives

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[109]CMJ, para. 5.99.

[110]Mangel, Supplementary Expert Opinion, para. 3.35; Gales, Expert Statement, para. 5.9. See Yunoki, K., Ishikawa, H., Fukui, Y. and Ohnishi, M. 2008. Chemical properties of epidermal lipids, especially sphingolipids, of the Antarctic minke whale. *Lipids* (2008) 43: 151-159 (on biochemistry); Ono, N., Yamaguchi, T., Ishikawa, H., Arakawa, M., Takahashi, N. Saikawa, T. and Shimada, T. 2009, Morphological varieties of the Purkinje fiber network in mammalian hearts, as revealed by light and electronmicroscopy. *Arch Histol Cytol.* 72(3), 139-149 (on heart anatomy).

[111]Mangel, Supplementary Expert Opinion, para. 3.39.

[112]CMJ, para. 4.90.

[113]Gales, Expert Statement, Sect. 3.

are relevant, significant and attainable, having regard to the methods proposed, and that they can contribute to the problem being addressed[114]. The complete absence of peer review in relation to JARPA II fatally undermines Japan's claim to scientific purpose[115].

74. Japan asserts that it has addressed recommendations of the Scientific Committee in relation to JARPA and JARPA II[116]. This is plainly not correct as Dr. Gales makes clear in his evidence. (FN) Gales, Expert Statement, para. 3.28 (please insert FN 137 of submitted speech).

75. The evidence before the Court provides no support for Japan's contentions on peer review. On JARPA II, Japan asserts that it has addressed recommendations made by the 2006 IWC JARPA Final Review Workshop[117]. If you go through that text, which you will find in the pleadings, you will see that the annotations merely indicate that most of the recommendations were "to be considered". That Report was adopted six years ago, what's the evidence to show that Japan has followed through on it? There is, again, none before you.

76. The conclusion on peer review is simple. There was no peer review of design or objectives of JARPA II before it commenced. There has been no peer review of any of the research purportedly based on data collected under the JARPA II program that is relevant to the stated objectives.

Part 6. Conclusions

77. Mr. President, I can now conclude. Japan has collected data, mainly from the body parts of a large number of minke whales killed over the last 26 years, purportedly in the name of "scientific research". It asserts, without much evidence, if any, that that data provides new and useful knowledge in the service of conservation and management of whales[118]. But what has Japan actually achieved in 26 years of its so-called scientific programs? The evidence is extraordinarily limited.

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[114]Mangel, Original Expert Opinion, para. 5.52.

[115]*Ibid.*

[116]CMJ, para. 4.110.

[117]*Ibid.*, para. 5.18; App. 3 of Ann. O of the *Report of the Scientific Committee* (2007), *J. Cetacean Res. Manage. 10 (Suppl.)*, 2008, p. 349.

[118]See CMJ, paras. 5.28, 6.22, 9.21, 9.27, 9.30.

78. It cannot rely on any positive statement by the IWC or the Scientific Committee that its research has contributed to any scientific knowledge.

79. It has relied upon the expert evidence of a single individual, closely associated with the whaling program of another State. Professor Walløe's expert evidence provides limited support for some of Japan's claim, contradicts other parts of the claims, and is totally silent on yet other parts. On the crucial issue of sample size and on the adequacy of peer review of JARPA II, he frankly does not offer any support for Japan.

80. Japan is able to point to no peer review of the design of the JARPA II program and not a single peer-reviewed article of research carried out under JARPA II that relates to the stated objectives of that program.

81. Japan offers no claim that JARPA II has assisted in meeting the requirements of the RMP. It has offered no evidence to show that JARPA II has been integrated into any other research programs that seek to contribute to scientific knowledge about the Antarctic ecosystem.

82. It offers no evidence that JARPA II is based on any testable hypotheses, the prerequisite for any program of science.

83. It has produced body parts from more than 10,000 whales killed over a period of 26 years. The data offers no assistance to the review processes built into the RMP, and will not result in any improvement to management. None of the research recommendations in the Scientific Committee's annual reports refer to the product of JARPA II, or the need to collect lethally acquired data. JARPA II does not meet research needs identified by the Scientific Committee, and it is not premised upon research objectives or methodologies that meet minimum standards for sound science, as laid down in general scientific practice.

84. Despite all of this, Mr. President, Japan asserts before this Court that its activity under JARPA II is for "purposes of scientific research". The evidence before you does not come close to supporting that claim. Twenty-one distinguished scientists made that very clear, more than a decade ago. It's not designed to answer scientific questions they said, it has no scientific need they said, it has no testable hypothesis, they said[119]. Nothing has changed in the intervening decade.

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[119]CR 2013/8, pp. 64-65, paras. 23-24 (Sands).

What you have before you is not a scientific research program, it is a heap of body parts taken from a large number of dead whales. *C'est un tas de pierres, ce n'est pas une maison.*

85. Mr. President, Members of the Court, I thank you for your attention, and now invite you to proceed to the next stage of the proceedings.

The PRESIDENT: Thank you, Professor Sands. The Court will now proceed to the hearing of the experts called by Australia.

I will first explain the procedure to be followed during the examination of experts.

At my invitation, the Agent of the Party calling the expert will introduce him. The expert will then take his place, and I will ask him to make the declaration set down in Article 64, subparagraph *(b)*, of the Rules of Court.

Thereafter, the Agent or counsel of the Party calling the expert will begin the examination-in-chief, which will last up to a maximum of 30 minutes. The expert may give his evidence in the form of a statement and/or as replies to questions put to him by the Party having called him, at the option of that Party. The other Party will then be given an opportunity to cross-examine the expert, for a period not to exceed 60 minutes. The scope of this cross-examination shall be confined to written and oral statements already made by any of the three experts.

The Party calling the expert will then be asked by me if it wishes to re-examine him. The attention of the Parties is drawn to the fact that any such re-examination may not exceed 30 minutes and must be limited in scope to issues already dealt with in cross examination. Thereafter, Judges could put questions to experts.

I now give the floor to the Agent of Australia to introduce the first expert, who I understand is Professor Mangel. Mr. Campbell you have the floor.

Mr. CAMPBELL: Mr. President, Australia calls, as its first expert, Professor Marc Mangel of the University of California. Professor Marc Mangel will be examined by Professor Philippe Sands. Thank you, Mr. President.

The PRESIDENT: Thank you, Mr. Campbell. Professor ~~Mark~~ Marc Mangel may now take his place at the rostrum and I call upon you to make the solemn declaration for experts as set down in Article 64, subparagraph *(b)*, of the Rules of Court. Professor Mangel you have the floor.

Mr. MANGEL: I solemnly declare upon my honour and conscience that I will speak the truth, the whole truth and nothing but the truth and that my statement will be made in accordance with my sincere belief.

The PRESIDENT: Thank you very much. I now give the floor to Professor Sands to begin the examination of Professor Marc Mangel. You have the floor.

Mr. SANDS: Professor Mangel, welcome to The Hague. If you could begin by telling the Court your name and current occupation.

Mr. MANGEL: Mr. President, Members of the Court, it is both a great honour and privilege for me to be standing here in front of you. My name is Marc Mangel, I am a faculty member at the University of California, Santa Cruz campus.

Mr. SANDS: If you've got the tab folders in front of you, if I can just take you to tab 1, which should be a copy of your expert opinion, dated April 2011. Could you confirm that you are the author of this opinion?

Mr. MANGEL: I confirm that this is my scholarship and my ideas, I am the author.

Mr. SANDS: If you could turn to the next tab, tab 2, that should be your supplementary expert opinion dated 15 April 2013. Could you confirm that you are the author of this opinion?

Mr. MANGEL: I also confirm that I am the author of this opinion.

Mr. SANDS: If you turn to the next tab, tab 3, which should be a copy of a document entitled "Response to Professor Walløe", dated 31 May 2013. Could you confirm that you are the author of this opinion?

Mr. MANGEL: I also confirm that I am the author of this opinion.

Mr. SANDS: I finally take you to tab 6 of the folder. There is a copy there of Professor Walløe's statement. Could you confirm that you have read this document and that you are familiar with its content?

Mr. MANGEL: I confirm that I have read this document very carefully.

Mr. SANDS: Could you please briefly explain to the Court, Professor Mangel, how you went about the task of preparing your three written statements and your interaction with representatives of the Australian Government?

Mr. MANGEL: Certainly. I took this on as a major research project and consequently I read an enormous amount of literature, both about the process of science and then literature of the IWC understanding how it currently operates. I have followed the work of the IWC for many years but I basically went back all the way to the beginning to completely understand this. It was a major research project and I actually put aside some other research projects in order to do that. I write scientific papers which are very different, I have learned, than papers for the law. And my interaction with lawyers associated with this case has been to get editorial guidance so that I can make what I wrote most valuable for you.

Mr. SANDS: Could you tell us about your professional training and experience?

Mr. MANGEL: You already have my CV, so I won't repeat that. And in fact, in general, since I'm speaking extemporaneously to you, I will not generally repeat what I have written because I haven't tried to memorize anything. Essentially, I have done 36 years of policy-relevant science, I do modelling, field work and experiments. And the field work and experiments sometimes involve lethal take. I have worked in this period on dolphins and seals and sea lions and most recently blue whales. And I have reviewed for all the major granting agencies in North America, and many in Europe and in the UK. And I have also have been a reviewer and editor of major scientific journals.

Mr. SANDS: Professor Mangel, what's been the nature of your engagement with the work of the IWC and its Scientific Committee in relation to the issues raised in this case?

Mr. MANGEL: Because of my work, particularly on Southern Ocean krill and some of my dolphin work, I have observed the IWC from one step removed for a very very long time, going all the way back to graduate school in the 1970s.

Mr. SANDS: On what basis do you consider yourself to be qualified to express opinions on specific issues relating to the programme for the purposes of scientific research in the context of scientific whaling under the Convention?

Mr. MANGEL: As I just described, I have observed the IWC one step removed for a very very long time. I have thought about these issues. I served on the Committee of Scientific Advisers for the US Marine Mammal Commission for six years in which I was very familiar with the development of the RMP and followed it closely. But I have always been one step removed and of course I am a practising scientist.

Mr. SANDS: Hopefully on the screen now will come up some criteria. I wonder if you could just take a minute to look at those. Are these the criteria you have identified in your expert opinion?

Mr. MANGEL: They are indeed mine.

Mr. SANDS: If you could tell us briefly about the basis upon which you identified the four criteria you referred to in your original expert opinion?

Mr. MANGEL: As I mentioned previously, I took this as a major research project so the first thing I did was a broad survey of the practice of science as a it is done generally today. At the same time I was reading IWC literature. So in fact, if you look in my original opinion, you will see, first I have a general set of criteria for science as practice, and second I have a set of criteria specialized for consideration of conservation and management of whales, using what I have learned from the IWC.

Mr. SANDS: Given your background and your experience through your career, is it your view that these are criteria generally accepted by independent members of the scientific community for determining whether a programme is for the purposes of scientific research?

Mr. MANGEL: Yes. I think that the general criteria will be broadly accepted by the scientific community. And that the specific criteria will be broadly accepted by the marine mammal community.

Mr. SANDS: You have at tab 6 — I will invite you to go to it now — the expert opinion which was produced by Professor Walløe in relation to your statements and the criteria that you have identified. I wonder if you could tell the Court what your reaction was when you read what Professor Walløe had to say about these four criteria?

Mr. MANGEL: We've already heard a lot about peer review and Professor Walløe's document is actually the first peer review of what I had written. In that I found what we usually find with peer review: he agreed with some things I said, he disagreed, and did not comment on others.

Mr. SANDS: In relation to his comments on the criteria, I wonder if you could say anything more about what your reaction was to his critique, such as it is, of your criteria?

Mr. MANGEL: I noted that Professor Walløe did not reject my criteria, or the criteria in my original report. I think that is a better way to put it. He did not reject those criteria, nor did he offer alternatives.

Mr. SANDS: The views that he has expressed in his opinion which you've looked at, have they in any way caused you to reconsider the criteria that you would apply in determining whether the JARPA II programme is a programme for the purposes of scientific research?

Mr. MANGEL: After reading Professor Walløe's report and thinking about it carefully, I decided that it has no cause for me to change my assessment.

Mr. SANDS: Let me turn now to a different subject, namely the role of defined and achievable objectives that aim to contribute to knowledge that is important to the conservation and management of whales. I wonder if I could ask you this question to begin: why are defined and achievable objectives necessary for a programme for the purposes of scientific research?

Mr. MANGEL: It is almost a definition of science that we have to begin with a meaningful question and a means to answer it. Very often in the scientific literature you will see this called a "testable hypothesis". When I wrote my document, I called them "defined and achievable objectives", to some extent to use language that was similar to what is in the IWC literature.

Mr. SANDS: Could you elaborate a bit on one aspect of what you've just said. What is the relationship between defined and achievable objectives and a "testable hypothesis"?

Mr. MANGEL: The "testable hypothesis" will be a subset of the objectives. One could imagine many objectives and ~~then~~ that the objective as an overarching framework leads to specific hypotheses which one would then evaluate and test.

Mr. SANDS: Professor Walløe has expressed the opinion that the JARPA II programme does include data collection to test what he calls "specific hypotheses". Do you agree with that view?

Mr. MANGEL: I do not.

Mr. SANDS: Could you explain why you don't agree with that view?

Mr. MANGEL: To begin I would note that Professor Walløe did not mention any of the specific hypotheses in his expert opinion, even though I explicitly stated that the krill hypothesis was the only one that I could find. And I consider that to be untestable.

Mr. SANDS: In your view, is the JARPA II program designed to test any hypotheses whether general or specific?

Mr. MANGEL: No, it is not.

Mr. SANDS: In his statement, Professor Walløe offers two examples of scientific research projects which he says do not seek to test any specific hypotheses. Do you agree with the two examples he has given?

Mr. MANGEL: I disagree with the two examples.

Mr. SANDS: Could you explain why?

Mr. MANGEL: The first example offered by Professor Walløe is that of Gregor Mendel, the founder of genetics. Professor Walløe and I read the history of science quite differently in this particular case, and I read that Mendel began with hypotheses, conducted experiments to test them, used the experimental results to develop another hypothesis and proceeded like that. The second example offered by Professor Walløe is something called the "Surface Waters Acidification Programme" which was conducted in the late 1980s. It was a joint effort between the United Kingdom and Norway, concerning acid rain; it began with very specific hypotheses, particular questions and went on to answer those particular questions.

Mr. SANDS: And now to a slightly different topic, namely, the topic of methods used to achieve stated objectives, and in particular, appropriate methods. Could I ask, for a program for the purposes of scientific research, how are appropriate methods to be chosen?

Mr. MANGEL: One cannot begin to choose a method until you have a question. So we have to begin with a meaningful question. Once we have a question, we can begin to ask what tools are available to help us answer that question, and proceed in selecting the tool based on a range of criteria associated with the answer to the question.

Mr. SANDS: One method that arises relates to the subject of sample size. Could you tell the Court what you understand by the term "sample size" in the JARPA II program?

Mr. MANGEL: I understand that in JARPA II, sample size is the number of whales to be taken.

Mr. SANDS: In a program for the purposes of scientific research, how should sample sizes be set?

Mr. MANGEL: Because we live in a world in which there is natural variability, when we go to answer a question, we compute how many samples we need to take to answer that question, given the variability of the world.

Mr. SANDS: Do you consider that the method for setting sample sizes in relation to the JARPA II program is scientifically sound?

Mr. MANGEL: I have been unable to understand how sample sizes have been set in JARPA II.

Mr. SANDS: What are the principal concerns that you have with the information which has been made available to you on that question?

Mr. MANGEL: Although there are some technical details given to compute a range of sample sizes, what happens is a range is given and then a particular number is picked without any explanation for that number.

Mr. SANDS: Professor Walløe has said in his report "Japanese scientists have not always given completely transparent and clear explanations of how sample sizes were calculated or determined" for JARPA II. Do you agree with that statement?

Mr. MANGEL: Yes, that is one of the things that I noted when I read Professor Walløe's report about agreement between his peer review of my report and ~~why~~ mine.

Mr. SANDS: Is Japan's approach to setting a sample size of 850 minke whales for JARPA II scientifically justifiable in your opinion?

Mr. MANGEL: Absolutely not.

Mr. SANDS: Turn now to the question of the choice of method by reference to lethal take. In your view, can lethal take *ever* be an appropriate method in the program for the purposes of scientific research?

Mr. MANGEL: Of course lethal take will be appropriate in a program for purposes of scientific research; as I mentioned in my own work, we have sometimes used lethal take.

Mr. SANDS: In what circumstances would that happen? What do you need to know to be able to determine whether a lethal take method is appropriate?

Mr. MANGEL: Lethal take can only make sense if we have a question that needs to be answered that is a meaningful question, and for which lethal take is the best way of answering that question.

Mr. SANDS: I am going to put a slide on now, and draw you to paragraph 6.2 of your statement. Your state both JARPA and JARPA II began with an answer that lethal take is required and without clear plans of how data were to be or will be analysed or used. Could you elaborate a little on that, what you mean by that statement?

Mr. MANGEL: As I read the literature of JARPA and JARPA II, the starting-point was the decision that lethal take was required and that a certain amount of lethal take was required. Which, as Professor Sands indicated, went from 400 whales a year to 800 whales a year between the two programs. But the beginning point was, lethal take was required of a certain size and then the programs went backwards determining justifications for that lethal take.

Mr. SANDS: Putting it another way, are you saying that Japan has inverted the normal process of scientific decision-making?

Mr. MANGEL: That would be another way of putting what I am saying, yes.

Mr. SANDS: Could a lethal take be justified in a program that does not seek to test any hypotheses?

Mr. MANGEL: Lacking a testable hypothesis, it is difficult to answer whether any sample size, lethal or non-lethal, makes sense.

Mr. SANDS: Let us turn to non-lethal alternatives. What alternatives to lethal take are available and relevant to the conservation and management of whales?

Mr. MANGEL: As I have described in my original report and supplementary report, we have available now wonderful technologies of satellite tagging and biopsy genetic sampling of very small samples of skin and digital photography.

Mr. SANDS: In your opinion are these techniques practicable for the assessment of a scientific program that is concerned with minke whales?

Mr. MANGEL: Absolutely, I consider them appropriate and feasible and again, Professor Walløe and I agreed that the biopsy methods, for example, are indeed feasible.

Mr. SANDS: In your supplementary expert opinion of paragraphs 5.1 to 5.3, you note that Japan has not genuinely explored alternative non-lethal methods, and that some of the methods that you have just described are available. Could you say a bit more about your views, having read the material you have read in preparing your testimony today, as to Japan's exploration of non-lethal alternatives?

Mr. MANGEL: As far as I can tell, the JARPA program and the JARPA II program simply assume, or assert, that lethal methods are required, that non-lethal methods will not work, and so have not put any serious effort into developing such methods.

Mr. SANDS: Turning to another topic that you address in your statements, the subject of peer review. Could you tell the Court what you understand by peer review?

Mr. MANGEL: By peer review, I mean the overall process in which discovery — which is the goal of every scientist — is changed into credible knowledge — consensual knowledge — which is what we think of as science. It involves the assessment of either research proposals or results of research by experts, usually anonymously, who are one step removed from the actual work, and who may require changes before the work proceeds or the work appears in print.

Mr. SANDS: Why is peer review necessary for an activity to be characterized as scientific research?

Mr. MANGEL: The Nobel Prize winning physicist Richard Feynman once said "the easiest person to trick is yourself". When we work on a problem, and particularly when we think we have made a discovery, and this may happen in the law as well as in science, when we think we have made a discovery we are very excited about it, because that is the intellectual feast of our work and what peer review does is it allows us to have colleagues who are not as involved check on the quality of the work, as well as the conclusions we draw, as well as the communication of the work.

Mr. SANDS: In your opinion was the proposal for JARPA II subject to any form of peer review?

Mr. MANGEL: I, of course, was not at the Scientific Committee when the JARPA II proposal was discussed, but everything I read suggests that it was not subject to the kind of peer review that I just described or that I would be familiar with, say, from a big project associated with a National Science Foundation of the United States.

Mr. SANDS: As far as you are aware, from what you have been able to ascertain from the literature and from the reports, was the JARPA II program substantially reviewed within the Scientific Committee?

Mr. MANGEL: As far as I understand, and Dr. Gales can give you more details later this afternoon, no.

Mr. SANDS: As far as you are aware, did Japan respond properly or at all to any criticisms that were raised with respect to the proposal for the JARPA II program?

Mr. MANGEL: Again, as far as I understand, Mr. President, no.

Mr. SANDS: What does peer review entail with respect to the results, or the product or output, of a programme for the purposes of scientific research?

Mr. MANGEL: When one thinks one has made a discovery, one writes a paper, typically with a journal in mind; the paper describes the question, the methods, the results and what inferences about the natural world we can draw from that, and peer review assesses each phase of that. Was it a meaningful question? Were the results appropriate? Were the methods appropriate? Do the results make sense, given the method and the question, and are the inferences about the world that are being drawn by this author or group of authors consistent with what the results show?

Mr. SANDS: How many peer-reviewed papers have been prepared based on the results or product or output of JARPA II program research?

Mr. MANGEL: There are at this point two papers that are peer reviewed based on JARPA II.

Mr. SANDS: Do they relate to the conservation and management of whales?

Mr. MANGEL: Neither of those papers, one of which relates to the morphology of the heart and the other which relates to reproductive tissue removed from whales, relates to any of the objectives that are stated in JARPA II.

Mr. SANDS: I take it from the last two answers that you have given that it is your opinion that no peer-reviewed papers have been prepared based on the results of JARPA II that relate to the conservation and management of whales.

Mr. MANGEL: That would be my opinion, yes.

Mr. SANDS: In your view, for a program that has operated for over seven years, is this an appropriate outcome for a program which is for the purposes of scientific research?

Mr. MANGEL: This is a woefully low production of peer-reviewed papers over that period of time.

Mr. SANDS: Just to turn to some brief concluding questions. In your opinion, having regard to the totality of the material that you have considered, is the JARPA II program a program for the purposes of scientific research?

Mr. MANGEL: It is my opinion, as I have stated in my report, that JARPA II collects a considerable amount of data, but that it is not a program for purposes of scientific research.

Mr. SANDS: In your view, is the opinion that you have just expressed one that would be generally shared by scientists who are independent of whaling activities?

Mr. MANGEL: I believe that had another scientist of my experience assessed JARPA II in the same serious way that I have, the same conclusion would be drawn.

Mr. SANDS: You mentioned that you have had experience in advising bodies that fund scientific research programs in North America and Europe and elsewhere in the world. Having regard to that experience, would you expect any such body to provide any amount of financial support for JARPA II as a program for the purposes of scientific research?

Mr. MANGEL: I could not imagine any of the funding bodies that I know funding JARPA II, as it was first formulated or certainly on a second round.

Mr. SANDS: Thank you very much, Professor Mangel. Mr. President, I have no more questions.

The PRESIDENT: Thank you very much, Professor Sands. I understand Professor Lowe will be conducting cross-examination, but that will be after a short break. The Court will suspend for ten minutes and I ask Professor Mangel to enjoy this ten minutes to relax and certainly not to be involved in the discussions.

Mr. MANGEL: Thank you for the break, Mr. President.

The PRESIDENT: Thank you. The hearing is suspended.

The Court adjourned from 11.30 a.m. to 11.45 a.m.

The PRESIDENT: Please be seated. The hearing is resumed. I invite Professor Mangel to take his place at the rostrum and Professor Lowe you may start the cross-examination.

Mr. LOWE: *[Microphone off]*

The PRESIDENT: I think we have some technical difficulties with the microphone.

Mr. LOWE: Lest the interpreters think I was rude, I will repeat the fact that it is a privilege to appear before you and an honour to be entrusted with this part of the presentation of Japan's case.

Mr. President, the original understanding was that we would handle witnesses in one session and, on the allocation of time which you outlined before the coffee break, we would not actually finish within the normal time.

The PRESIDENT: May I interrupt you, Professor Lowe. I envisaged that we will conduct this hearing until 1.10 p.m., so you will have your 60 minutes and, if Australia needs 30 minutes for re-examination, we will finish by 1.10 p.m. and judges will put questions at the beginning of the afternoon.

Mr. LOWE: I am grateful for that, Sir. Thank you very much.

The PRESIDENT: So, you have your 60 minutes. Please proceed.

Mr. LOWE: Thank you. Professor Mangel, my name is ~~Vaughn~~ Vaughan Lowe and I am one of the counsel for Japan in this case, and I should start by thanking you for your reports and for coming to give evidence this morning. May I also say that the purpose of the cross-examination is to clarify your expert testimony, not for the two of us to have a debate. The presentation of Japan's case will come later.

We did provide Australia with a copy of Professor Zeh's critique of your report, so that you would have the opportunity to prepare yourself for any of those points that might come up. Was that passed to you?

Mr. MANGEL: Mr. President, that was passed to me but I was informed that I should treat these as observations. I read it; I did not attend to it in the same detail that I attended to Professor Walløe's expert testimony.

Mr. LOWE: Absolutely right and it was merely an indication of the points that we might raise.

The first question that I would like to raise is this, and it goes to the issue of the question that you were answering. Australia's question to you, as you recall, was to ask you to explain the essential characteristics of the program undertaken for purposes of scientific research. But in your reports you refer, in all of them, to "programs for purposes of scientific research in the context of conservation and management of whales". Why did you add that qualification to the question that you were asked?

Mr. MANGEL: Mr. President, may I ask you to turn to something in your binder? At the very back of tab 1 are the terms of reference, page 387, the penultimate page of tab 1, at the bottom it says 387. There you will see that the terms of reference I was given are actually twofold: the first is "to identify and outline the essential characteristics of a program undertaken for purposes of scientific research". That was the first task, and then basically to assess JARPA II, and using JARPA when I needed to, as programmes for purposes of scientific research given the conclusions I drew in Part A. For that reason, as I referred to JARPA and JARPA II, I used the language in the context of the conservation and management of whales because of IWC literature.

Mr. LOWE: Do you think that there is any difference in meaning between "for the purposes of scientific research" and on the other hand "for the purposes of scientific research in the context of the conservation and management of whales"?

Mr. MANGEL: There is certainly a difference in meaning of those two. However, if one looks at the current, or the most recent, which is from 2009, criteria that the IWC Scientific Committee has set for special permits, they specifically talk about the context of the conservation and management of whales.

Mr. LOWE: Australia is now using another formulation and referring to the conservation and recovery of whales, of whale populations. Do you think that that is again different from conservation and management of whales and the purposes of scientific research simplicitor, as a phrase, as a concept?

Mr. MANGEL: I believe that that phrase was used in some of the speeches yesterday morning. Some whale populations are still very, very far from what we might call "recovered" in any sense. Others are closer and consequently, depending on what one is doing, one could envision that kind of phraseology.

Mr. LOWE: When you were writing your report, did you turn your attention to the question whether there was any significance for the formulation of your views in the difference between "for the purposes of scientific research" and "for the purposes of scientific research in the context of the conservation and management of whales"?

Mr. MANGEL: As I described previously, what I tried to do in my report was first, provide a general assessment of what it means to do a program for purposes of scientific research and then by reference to the IWC's writings, the activity of the Commission and the Scientific Committee, to try to make it in some sense more operational for the context of conservation and management of whales. Essentially to help you have a better focus of the points that I was trying to make.

Mr. LOWE: Was the drafting of your report influenced by the fact that the reference to purposes of scientific research with which we are concerned appears in a legal text?

Mr. MANGEL: No it was not. I began with the terms of reference that I was given.

Mr. LOWE: So, you were not asked to address and you did not address the question whether there was any particular meaning that would derive from the fact that it was a legal text in that particular context, rather you addressed the question as it was set out in your terms of reference. Is that how I understand you?

Mr. MANGEL: I must admit that, three and a half years ago I was very much a neophyte in international law and, although I learned a little bit about international law in the course of trying to prepare my documents, I certainly did not think of the legal interpretation of what I was trying to do as a scientist for you.

Mr. LOWE: Thank you. The preamble to the 1946 Whaling Convention says that it was concluded "to provide for the proper conservation of whale stocks and thus make possible the orderly development of the whaling industry". Do you consider that that is yet again another different formulation from the formulation for purposes of conservation and recovery, purposes of conservation and management, or do you think that these phrases have no significance whatever?

Mr. MANGEL; Mr. President, Members of the Court, I do not want to dodge a question. However, I am not a historian, nor a legal scholar. There is an excellent recent book by a historian at Princeton on the history of the IWC. I was not asked to review the history of the IWC or its Scientific Committee, so I would prefer to say that that question is out of the range of my expertise for this case.

Mr. LOWE: A perfectly fair answer. Thank you for that. Let me turn then to what we might call the evidential basis of your expert report. Have you ever been a member of a national delegation to the IWC or any of its subsidiary organs?

Mr. MANGEL: I have not been a member of the United States delegation to the IWC or any of its subsidiaries, although I have been a member of the delegation of the United States to the Scientific Committee for the Conservation and Management of Antarctic Marine Living Resources.

Mr. LOWE: Sticking to the International Whaling Commission, have you ever attended any meeting of the Scientific Committee of the IWC?

Mr. MANGEL: I have not attended a meeting of the IWC, although as I mentioned earlier, I served on the Committee of Scientific Advisors of the United States Marine Mammal Commission. I was very familiar with scientific activities concerning whales in United States territorial waters because of that.

Mr. LOWE: Have you collaborated with Japanese scientists who are working specifically in the field of whale assessment and management research?

Mr. MANGEL: No, I have not.

Mr. LOWE: You referred in Appendix C to your first report to background material provided by the Government of Australia and you refer to a range of IWC documents, including "relevant extracts of the Annual Reports of the Commission and Scientific Committee from 1985-2009, including discussions on special permit whaling and the RMP". Can you tell us who selected those extracts?

Mr. MANGEL: Those extracts were selected by a combination of Australian colleagues who, I presume, consulted with Australian scientists about what the scientists felt would be most relevant to me and then by me. As I would read material, I would ask for other pieces to be sent to me as I thought certain literature would be relevant.

Mr. LOWE: Thank you. In your first report, Professor Mangel, you wrote that "workers in JARPA and JARPA II have not demonstrated an ability to respond to criticism or to admit to being wrong". And then you said: "scientists in JARPA and JARPA II have demonstrated an unwillingness to change their minds, particularly with respect to the asserted requirement for lethal take". Putting aside lethal take, which I will come to in a few minutes, what instances did you have in mind of that?

Mr. MANGEL: In general, I was thinking about lethal take when I wrote that sentence.

Mr. LOWE: And who are the Japanese scientists who have demonstrated this unwillingness?

Mr. MANGEL: Mr. President, Members of the Court, I do not have that information immediately at hand. I could get it to you tomorrow morning if you wish. The first name that comes to my mind is Dr. Ohsumi, who has on numerous occasions, I believe, simply asserted that

lethal take is required. But I would not even be confident of that but if you were to give me a day, I could provide those details.

Mr. LOWE: Are you saying that all Japanese scientists demonstrate an unwillingness to change their minds?

Mr. MANGEL: No, of course not.

Mr. LOWE: You wrote, in your first report again, that individuals participating in JARPA II are disconnected from the self-correcting community of scientists and have not demonstrated the ability to revise or correct their work or methodologies. Again, do you have any specific instances of that in mind?

Mr. MANGEL: I think that the best example of this is the fact that the JARPA II Program went forward before JARPA had even had a proper scientific review. In other words, if there were problems with things that had been done in JARPA, a proper review would have allowed one to change one's mind and go forward, but to immediately have one program follow the other continuously in time prevents that.

Mr. LOWE: Thank you. Let me turn to the themes that you develop in your reports. You say in paragraph 1.2 of your second report that the IWC Scientific Committee has never provided a definition of "scientific research". Has any other international body concerned with marine research ever provided a definition of "scientific research", or "scientific research in the context of the conservation and management of whales"?

Mr. MANGEL: Again, I do not want to sound like I am trying to dodge a question, but I was not asked to review all international scientific bodies and whether they have defined "science" or not. So I do not know the answer to that question.

Mr. LOWE: I hope that you do not think that this is unfair, but I am going to read you two or three definitions of "scientific research", in fact specifically of marine scientific research, which were put forward by States at the United Nations Law of the Sea Conference, and I am not asking

you anything about them, simply to hear them as definitions. For example, Trinidad says, "marine scientific research is any study or investigation of the marine environment and experiments related thereto". Canada says, "marine scientific research is any study, whether fundamental or applied, intended to increase knowledge about the marine environment including all its resources and living organisms, and embraces all related scientific activity". My question is simply that, to my ear, those definitions sound different in their nature from the definition which you have crafted on the basis of your four principles. Would you accept that that is a fair point?

Mr. MANGEL: May I ask for a clarification, in particular, I do not know who to turn to now, I turn to Professor Lowe to ask him the question.

Could you repeat the source of those; that was a United Nations Conference?

Mr. LOWE: These were proposals put by States for the adoption of a definition of "marine scientific research" in the 1982 United Nations Conference on the Law of the Sea. I am not making any point about them being put in as proposals there, it is simply the way that they have approached the question of definition.

Mr. MANGEL: I think that there are two differences here. The first is that there was a United Nations Conference on the Law of the Sea, which is again different from a scientific conference, and the second difference is that neither of those, or none of those definitions, actually are proposing that this is how one should run a program for purposes of scientific research. They are at a much higher level, kind of intellectually and embracing.

Mr. LOWE: Thank you. Can we turn now specifically to the criteria that you have set out, and first to your reference to the need for scientific research to have an initial hypothesis, so that we can make sure that I understand what you are saying. Do you accept that an initial hypothesis could be a question?

Mr. MANGEL: Yes.

Mr. LOWE: So that it may be that there is a set of phenomena that are to be investigated, there is no clear idea of why those phenomena are arising, but a scientist's hunch as to the kind of data that might be collected and might bear upon it. Is that fair?

Mr. MANGEL: In order for that kind of investigation to consist of something more than going out and seeing what is there, one needs to have a focus to the question and have a meaningful context for trying to use the question in a way that will provide an answer to something.

Mr. LOWE: Well, how about a question such as "how has Antarctic biodiversity evolved in response to past environmental change and what does this tell us about the capacity to respond to future change"? Would you think that was an acceptable objective?

Mr. MANGEL: In the phraseology that I use in my report, I would consider that to be an overarching conceptual framework. The conceptual framework is, we want to understand how environmental change has affected different components of the Antarctic, and then what we would do is use that overarching framework to get to specific testable hypotheses.

Mr. LOWE: So that would count as a properly formed scientific research project?

Mr. MANGEL: I would count that, as I said, as a properly formed overarching conceptual framework. It is in some sense too high a level to actually be used to create focused work.

Mr. LOWE: I do not want to deceive you, I actually took it from the title of a research project that was approved by the Scientific Committee on Antarctic Research. It was there and I was trying to use it in order to get to precisely the point you are raising which is, what kind of formulation is adequate to meet your requirement that there should be a conceptual framework to give point to the research.

Mr. MANGEL: Was that a question?

Mr. LOWE: No, it was a statement. If you wish to treat it as a question, you can do. Otherwise I will make a question out of it. I have a real interest in knowing what your answer to

that question is, would you say that that was or was not adequate for the objective component of your criteria — I know there are other criteria there — but in terms of the objective is that enough?

Mr. MANGEL: I think that it is very hard to answer that question just looking at the title of a proposal, that is, I could imagine — and I myself have written proposals that would have such broad titles — but then what one wants to do is have specific questions that emerge from that broad framework and that is what I consider necessary for meeting my objective.

Mr. LOWE: Thank you. So it is one of those things where people might take different views on the adequacy of that formulation, but you would pursue the point through looking at what else was done in the project?

Mr. MANGEL: I think if one submitted a proposal to the funding bodies that I know, at that level of generality — and then in the rest of the proposal did not go into any more specifics — it would likely not be funded, for example.

Mr. LOWE: Can I ask my last question in a more general sense? Thinking of your four criteria for a scientific research project, are there border-line cases where some scientists may think that a particular project falls on one side of the criteria, others may think that they fall on the other side?

Mr. MANGEL: Once again I am not familiar with the law, but as you know in universities there are different departments of science. So the first answer to that question is: certainly. Physicists will look at all sorts of biology and ecology, and say that is not science. Molecular biologists will look at ecology often, and say that is not science. Within ecology there will be individuals who will sometimes have disputes about whether something is properly formed or not, and that is exactly the point of peer review of proposals by independent experts who are not involved in the work.

Mr. LOWE: While we are touching on that, can I ask you what it is about the Scientific Committee that makes it and the scientists on it incapable of acting in the role of that peer review?

Mr. MANGEL: The Scientific Committee is not intended to be a peer-review body in the same way that I described it. In the Scientific Committee as I understand it, and Dr. Gales can give you more details later in the afternoon, review is not anonymous — which I consider to be a essential to peer review — and response is not mandatory. That is, in peer review if one submits a proposal to a granting agency and the referees say the work cannot go forward until these changes are made, or if one submits a paper and the paper could completely be declined by the journal, or the referees could say, this paper cannot be published until changes are made, that is a very different kind of peer review than people standing up and saying, "I think you should do this" and proponents acknowledging that those comments were received.

Mr. LOWE: Thank you. Could we change the focus a little from the general idea of what counts as science to JARPA II in particular? Is it your evidence that the Japanese workers who are working on JARPA II lack a conceptual framework within which they are working?

Mr. MANGEL: In my opinion, yes. That is true.

Mr. LOWE: And on what do you base that opinion?

Mr. MANGEL: I have looked through the JARPA II proposal on numerous occasions. I have read it, I have looked for questions that are sufficiently broad, let us say, that they would fit the conceptual framework in the context that Professor Lowe and I just described, as well as looking for specific hypotheses, and I find neither.

Mr. LOWE: I do not wish to, and I would not be allowed to put words into your mouth, but it sounds to me as though you are saying that the papers disclose no overarching conceptual framework and from the fact that the papers do not disclose it, you are inferring that the scientists do not have it. Is that correct?

Mr. MANGEL: Since my conclusions are based on what I read, yes. Again, Dr. Gales has spent many years interacting with the scientists and he can give you personal information this afternoon.

Mr. LOWE: Thank you. You say in your first report, and you said this morning, that the only clearly identifiable hypothesis in JARPA II is the krill surplus hypothesis. But in fact, as I think Professor Zeh pointed out, the proposal for JARPA II explicitly sets out eight other hypotheses and there are nine statements, each of which is labelled "Hypothesis 8", or whatever. Why do you not count those as hypotheses?

Mr. MANGEL: I consider that those are basically sub-hypotheses or derivative hypotheses of the krill surplus hypothesis and, in fact, they are all in an appendix with a title about krill predators and essentially they are all associated with some version of the krill surplus hypothesis.

Mr. LOWE: Could we turn briefly to the question of lethal take, which we will come back to this afternoon. There, the point is made again by Professor Zeh, that she is not aware of any general requirement in established scientific practice that lethal methods are appropriate only where the objectives of the research cannot be achieved by non-lethal means, and this morning I heard you say that the test is whether lethal research is the best way of answering a particular question. Is that your view?

Mr. MANGEL: If there is an alternative to lethal take that is workable, I would say that should be used over lethal take but if there is no alternative to lethal take and there is a question that is meaningful and cannot be answered without it, then I would consider lethal take to be appropriate.

The PRESIDENT: I just wish to remind you what was the Court's position, that statements by Professor Zeh are accepted as statements of the Government of Japan, not as expert statements.

Mr. LOWE: I receive the admonition humbly, I apologize for having raised the point. Let me turn to the question of catch limits, if I may. In your bibliography, you say that you were given various IWC documents, but the latest date that was given in the bibliography was 2009. Have you looked at any papers after 2009?

Mr. MANGEL: Yes, I have followed the literature since 2009, as I was preparing my supplemental report and my response to the review by Professor Walløe, and then in draft form some of the most recent work of the Scientific Committee.

Mr. LOWE: Have you looked in particular at the analysis of the ~~captured age~~ catch-at-age data by Professor Punt and his colleagues, as published this year, or at least presented to the IWC Scientific Committee this year?

Mr. MANGEL: Mr. President and Professor Lowe, I find myself in a somewhat uncomfortable situation here. That work has been going on since 2005, I have been familiar with it from 2005, but every paper written by Professor Punt and colleagues begins with the statement that "this paper cannot be cited except in the context of IWC meetings" and I seek your advice about how much I should talk about that paper in this context.

Mr. LOWE: Mr. President, you will respond to that question but it may be helpful to say that we checked yesterday with the people who we believe to hold the rights over the paper and they have no objection to the point being raised in these proceedings. I am told that is correct.

The PRESIDENT: May I ask counsel for Australia to explain the views of Australia.

Mr. ~~CAMPBELL~~ SANDS: Mr. President, this comes out of the blue. We are not aware of such an undertaking, we have not been provided with any prior notice about such undertaking and we raise the question of whether it is appropriate in such circumstances to proceed without us having had prior information.

Mr. LOWE: Let me say, Mr. President, I asked nothing about the content of the paper, I asked nothing that would even have touched that undertaking. I simply asked if you were aware of it as an example of a paper that fell outside the range that you had put there. But I am quite happy to drop this question and to move on.

Let me just ask one or two final questions. In the June 2012 report of the Scientific Committee it was reported there was an agreement upon revised estimates of the abundance of minke whales and, in the area where JARPA II operates, the new lowest estimates are somewhere

around 330,000 minke whales. The planned annual JARPA take of 850 whales is therefore 0.3 per cent of that lowest estimate of the whale stock. Is it your evidence that the level of catch of minke whales for which JARPA II provides would seriously endanger the Antarctic minke whale population?

Mr. MANGEL: Mr. President, Members of the Court, I was not asked to do a stock assessment, which is a scientific term to assess the distribution and health of a stock as it relates to catch, for this work. As far as I know from reading the literature, that very small take of whales will not in any way endanger this stock, but at the same time I consider that not to be the issue here.

Mr. LOWE: Professor Mangel, I have no wish to take you outside the area of your brief. Thank you very much for your answers. I have no further questions.

The PRESIDENT; Thank you, Professor Lowe. Professor Sands, would you like to conduct your examination?

Mr. SANDS: Thank you, Mr. President. It either means an early lunch or over to the Members of the Court for questioning. We have no further questions in re-examination.

The PRESIDENT; Thank you very much. I understand that Judge Bennouna would like to put a question. Monsieur Bennouna, vous avez la parole. Please give the earphones to Professor Mangel as I understand the question is going to be put in French.

Judge BENNOUNA: Thank you. I am going, Professor Mangel, to put my question in English, so I am sorry and please excuse some language mistakes if there are any. You described to us this morning the process of scientific research as a process which starts first with the adoption of what you call the specific hypothesis, and then by putting specific questions which are intended to be answered. Can you tell the Court if, for you as an expert, how this specific hypothesis is established, to start this scientific research and, particularly, what interests me personally is to know if the researcher needs materials, data, even as preliminary, in order to reach this hypothesis. Thank you very much.

The PRESIDENT: Please, you have the floor, Professor Mangel.

Mr. MANGEL: The creation of hypotheses, and now I will come back to Richard Feynman ~~who~~ whom I quoted earlier, is again one of the wonderful parts of science because it is where we get to engage our intellect and use our minds in the most wonderful way. Clearly, we need to begin with some kinds of observations about the natural world in order to ask, to begin to formulate, the question. What the source of those observations are and how we use them depends on the natural system and the question that we are moving towards. I presume you are interested in this case in the context of JARPA II, and JARPA of course, and one might say at some point one needs possibly even lethal take. But for 25 years of this to go on with no clearly-identified hypotheses coming out and I might mention that in Professor Walløe's statement, he and I disagree about something called "exploratory data analysis" which he says the use of data more or less randomly collected could be used to generate hypotheses, that a pause between JARPA and JARPA II might have been an ideal time to use and do exploratory data analysis to see what hypotheses had emerged. So yes, on occasion, even lethal data would be required to develop such a hypothesis.

Judge BENNOUNA: Thank you very much.

The PRESIDENT: Thank you very much. The next judge who is going to put a question is Judge Cançado Trindade. I give you the floor.

Judge CANÇADO TRINDADE: Thank you very much, Mr. President. Professor Marc Mangel: in your original expert opinion, there is a consideration as to resort to lethal methods only when the objectives of scientific research cannot be achieved by any other means. In respect of that, I have five interrelated questions. I will put them together, and if you want, I can go afterwards through them, one by one.

First, are lethal methods necessary to such a research at all?

Secondly, as to non-lethal research techniques in the context of conservation and management of whales, — are such techniques available to all States concerned, that is, to the States Parties to the 1946 International Convention for the Regulation of Whaling?

Thirdly, can such non-lethal techniques entirely replace lethal methods?

Fourthly, who defines, or who is to define, scientific research objectives?

And fifthly, what would be examples of non-lethal tools — you have already referred to satellite tagging — that have already actually been used for the study of whale populations? Thank you.

The PRESIDENT: Maybe we can go question by question.

Judge CANÇADO TRINDADE: With pleasure. So, first: are lethal methods necessary to scientific research at all?

Mr. MANGEL: As I said earlier, there will be cases in which lethal methods are necessary for scientific research, so I am not against lethal methods, if that is why you were asking.

Judge CANÇADO TRINDADE: Yes. And in respect of that, as to non-lethal research techniques in the context of conservation and management of whales, are such techniques available to all the States Parties to the 1946 Convention?

Mr. MANGEL: To my knowledge, yes.

Judge CANÇADO TRINDADE: They are available.

Mr. MANGEL: Yes.

Judge CANÇADO TRINDADE: Thank you. Thirdly, can such non-lethal techniques entirely replace, as time goes on, lethal methods?

Mr. MANGEL: There we come back to what is the question: that is, for example, if I say I want to age whales and today the current method for aging whales requires taking their earplug, then there is no non-lethal method. If I say, for example, I want to follow the size of livers of different whales over time, then there is no alternative to measuring the size of the liver except for removal of it. So it comes back to having a relevant question.

Judge CANÇADO TRINDADE: Yes, as to the original question. Fine. And fourthly, who defines, or who is to define, scientific research objectives?

Mr. MANGEL: As I describe in detail in my supplemental report, science is the development of consensual information. And there is an interplay and always a tension in the scientific community about that exact question. As I also said, I received editorial advice from Australia and in the supplemental report, I had pages and pages on the philosophy of science which got reduced to one paragraph. But this was an important question in the twentieth century, but it is the scientific community, broadly defined, that answers it.

Judge CANÇADO TRINDADE: Yes, the independent experts.

Mr. MANGEL: Yes.

The PRESIDENT: And the final question.

Judge CANÇADO TRINDADE: And the fifth one: what would be examples of non-lethal tools, such as satellite tagging which you mentioned, but which have already been actually used for the study of whale populations?

Mr. MANGEL: So if I could mention two examples, with the Court's approval. There was a programme in the early 1990s. Let me back up one second. Tagging, which I will talk about first, and then biopsy, tagging actually began in the late 1800s but it was not until the early 1990s when we had the revolution in technology that we all celebrate today, with our iPhones and iPads and so forth, that tags really became available that could be put on animals and collect lots of information. In the early 1990s, there was a two-year programme called the "Year of the North Atlantic Humpback Whale" — I believe Professor Sands showed us a picture of an Antarctic humpback yesterday — it ran for two years and — actually that is biopsy, I apologize. It used biopsy to study these whales. It actually had 26 peer-review papers in the first five years; 71 overall and then after a pause of ten years in 2003 another programme began, using these sort of methods. Where I live on the west coast of California, there is a programme called the "Tagging of Pacific Predators" (TOPP). It started in 2000 and it is tagging many different kinds of top-level predators and about 2,000 have been tagged now. I listed in my CV that I served on the Special

Committee on Seals for the Government of the UK and the Sea Mammal Research Unit in the UK which tags seals in order to ascertain their movements.

Judge CANÇADO TRINDADE: Thank you, Professor Mangel. Thank you, Mr. President.

The PRESIDENT: Thank you very much. The next judge to put questions is Judge Greenwood. You have the floor.

Judge GREENWOOD: Thank you. Professor Mangel, I would like to take up one issue that you raised in your first report. At paragraph 4.30 and the later paragraphs, you talk about — I will read the relevant passage:

> "The Scientific Committee of the IWC has spent many years considering how the broad concepts in the previous paragraphs [that is the previous paragraphs of your report] apply to scientific research in the context of conservation and management of whales. Their most recent thinking is summarized in IWC (2009)."

And then it lists what proposals for special permit research should show. I just wanted to ask you whether there had been any change, an evolution in the IWC's approach, because of course IWC (2009) postdates the start of the JARPA II program. Has it altered over time or is it more or less constant?

Mr. MANGEL: Again, I am not an expert on the history of the IWC but I think it has in fact evolved over time. So I believe your inference that those particular criteria might not have been available to the proposals of JARPA II is probably correct. Dr. Gales can answer this in more detail because he has been there. But again, if the scientific community is changing the way it thinks about a problem, one would expect that scientists would respond.

Mr. GREENWOOD: Thank you very much. I perhaps ought to put this question to Dr. Gales; I might do so.

Mr. PRESIDENT: Thank you very much. The next judge who has a question is Judge Donoghue. You have the floor.

Judge DONOGHUE: Thank you, Mr. President. Professor Mangel, I want to ask you about two things and the first question that I have relates to a statement of Professor Walløe and, if you

have his statement there, you might find it convenient to have a look at page 10 when I ask you this question. So, you will see that about midway down that page that Professor Walløe quotes from Australia's Memorial where Australia says that, "for an activity to be genuinely motivated by an intent to conduct scientific research, it must not be for any other purpose or purposes". And then in the next paragraph, Professor Walløe takes issue with that and he says no, that mixed motivations are common to, in particular, costly research programs. I wanted to ask you whether you consider that a mixed motivation is fatal to the definition of a particular activity as to the purpose of scientific research, and I have in mind, for example, a situation where a scientist has a hypothesis, has an appropriate sample size, is engaged in peer-review research, no lethal methods, no adverse impact on animal subjects, but the scientist is employed by a pharmaceutical company and the pharmaceutical company wants this research to take place so that it can make money off the sale, ultimately, of an AIDS vaccine or something of that sort. So, if you could answer that question I would appreciate it. Thank you.

Mr. MANGEL: So, may I give a short answer then a somewhat longer answer?

Mr. PRESIDENT: Please.

Mr. MANGEL: The short answer is of course mixed motivations happen. The somewhat longer answer is that every scientist, every academic in fact, has a variety of mixed motivations so that we have to be honest about that, I think. In some of my own work we actually had to lethally sample salmon in a region of the California coast that was close to fishing. We ended up with salmon carcasses and had to figure out what to do with them. We were unable to sell them, because of the controversy that would arise, so we ended up giving them away to a widows and orphans barbeque. But these kind of problems happen all the time, certainly.

Judge DONOGHUE: Thank you. My second question relates to your assertion about the need for a hypothesis and, if I understand it, your assertion is that data collection alone is not science and instead that the existence of a hypothesis is an essential element within the four criteria that you put forward. And I know that in the exchanges of the experts before us, some particular challenges have been put forward and that you have responded to those. I am still having trouble

with your hypothesis and I have another question in mind that I wanted to ask you to address, which relates to the human genome project. I assume you are not a geneticist but, like you, I am an American and probably you have heard of the project and, as I understand it, the purpose is to identify all the genes in human DNA and then store that information in databases which will ultimately then be used for other science, presumably with hypotheses. As far as I can tell, there is no hypothesis there, but it is difficult for me to think of that as anything other than science. I wanted to ask you if you could help me out in integrating that activity with your analysis. Thank you.

Mr. MANGEL: I am not a geneticist, but I come from the campus where the public part of the genome was put on the Web, so I hear a lot about this. It is true that the human genome project is collecting lots of data, and that much of those data will be subject to exploratory data analysis of the sort that Professor Walløe described, but it is also true that there are hypotheses — I do not have any specific ones at hand right now. Again, if the Court wishes, I could get some probably within two days — that would answer this, but for example hypotheses about the location of genes that lead to a higher proclivity to cancer. So I think that there are some hypotheses in there.

Mr. PRESIDENT: Thank you. Judge Keith is the next one to put a question or questions. You have the floor.

Judge KEITH: Thank you, Mr. President. Professor Mangel, I was really taken by — when I got to the second or third page of your first report — by the reference to Adam Gopnik's book *Angels and Ages* and — it is completely irrelevant to this, I think — but it deals with the interesting fact that Darwin and Lincoln were born on the same day. My question really does relate to this very broad issue of the development of hypotheses and I was thinking of that young man who got on the *Beagle* and started gathering stones — it is a variation on the Poincaré quote, perhaps. What is known about just what it was that Darwin had in mind as he started collecting all these samples? He obviously developed his hypothesis over a very lengthy period, worried in the end by someone else competing — Russell, was it?. But I can see that it is completely a different case from the current where you can have much clearer ideas about what you are trying to discover. How

absolute can you be is a matter of blue-sky thinking, about just what is the question that you are answering. I ask this partly because I have been a long-time academic in a completely different field, and sometimes I am still not sure now if I get back to that task of just what is the question I am considering. It is a rather broad question, but I would be interested in your reflections. Thank you.

Mr. MANGEL: Mr. President and Judge Keith, thank you for asking that question, particularly with the preliminary part, because in one of the early versions of my report I pointed out that Lincoln and Darwin had the same birthday and I was struck by my editorial masters, so I am happy that now everybody knows. When Darwin went to sea, he had already read ~~Wilso's~~ Lyell's book and I think at that time in the nineteenth century people were already talking about transmutation, evolution, they did not know exactly how it happened and of course he was very familiar with artificial selection. In the course of the voyage of the *Beagle* I think what happened is he sharpened this hypothesis, or set of hypotheses that he had, and then of course when he returned to the United Kingdom, he collected lots and lots of data in order to bolster his argument and he really made an argument by going from artificial selection that we do on animals and plants, to natural selection. So I think that is the answer: he had a framework that he was taking to sea with him.

Judge KEITH: Which he slowly developed, I mean, it is not a rigid framework; it is one that kept moving. Yes, thank you very much.

The PRESIDENT: Thank you. My understanding is that Judge Owada has a question. Please take the floor.

Judge OWADA: Thank you, Mr. President. Professor Mangel, I would like to ask a question in the same context as the question raised by our colleague Judge Cançado Trindade, namely the question of the lethal take. Now I understand that you said in answer to Judge Cançado Trindade that lethal take should not be undertaken unless this is an absolute necessity to clarify some concrete question. Now my question is the following: apart from, setting aside for the moment, the considerations like the ethical factors or social factors and so forth from

our consideration, as a matter of pure science, and from the viewpoint of a scientist expert on this particular question, what makes you think, what is the reason why, I would like to know, I'd like to be enlightened, what is the reason why you think that lethal take should not be undertaken, purely from a scientific point of view, in order to approach the question at issue. Could you explain why this is so, from the viewpoint of a scientist; apart from the ethical factors or social factors and all these things which you may have to take into consideration in the broader context, but purely in the context of your testimony as an expert scientist?

Mr. MANGEL: I think the answer to that question is, that if the only way one can obtain a piece of information that answers a relevant question is from lethal take, then one still has to balance the fact, and I mentioned this in my original report, that every time we conduct lethal take we lose all future information from that organism. So in my own work when we do lethal take we understand, we use the word sacrifice, we are sacrificing that organism, not only its life, but all the future information that we could possibly gain from it. And I think that is a compelling reason.

Judge OWADA: Thank you.

The PRESIDENT: So if there are no more questions, this brings us to the end of this morning sitting. I wish to thank you, Professor Mangel, for appearing before the Court and for providing answers and explanations to the questions put to you.

The Court will meet this afternoon at 3 o'clock for the continuation of presentation of a case by Australia. This sitting is adjourned.

The Court rose at 12.40 p.m.