# Negotiating the Indian Ocean Whale Sanctuary<sup>1</sup>

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#### ABSTRACT

This paper provides an overview of the establishment of the International Whaling Commission's Indian Ocean Sanctuary in 1979. The International Convention for the Regulation of Whaling enables the IWC to designate sanctuaries as well as open and closed areas for whaling. The author reflects upon the background to the issue of whale sanctuaries within the IWC and the particular role of the Seychelles Government in the development of the proposal for a sanctuary in the Indian Ocean. He notes the political, scientific and practical factors surrounding the acceptance of the proposal by the IWC and briefly discusses subsequent events.

KEYWORDS: MANAGEMENT; SANCTUARIES; INDIAN OCEAN

### INTRODUCTION

The year 2009 represented the thirtieth anniversary of the establishment of the Indian Ocean Whale Sanctuary (IOWS)<sup>2</sup> by the International Whaling Commission (IWC). In 1979, a truncated form of a proposal by the Republic of Seychelles was adopted and incorporated into the IWC's Schedule<sup>3</sup>. It was truncated in the sense that the southern boundary of the sanctuary was set at 55°S rather than at the ice-edge of the Antarctic continent as originally proposed. This compromise ensured the requisite three-quarters majority since it allowed Japanese and Soviet pelagic whalers to continue pelagic whaling for Antarctic minke whales in the southern zone of the Indian Ocean. The boundary was effectively moved southward to the ice-edge when the entire Southern Ocean was declared as an IWC Sanctuary in 1994. The IOS was at first a temporary measure with limited existence, but after two reviews (IWC, 2003; Leatherwood and Donovan, 1991), the IWC Schedule was amended to read that 'in 2002 the Commission agreed to continue this prohibition [of commercial whaling] but did not discuss whether or not it should set a time when it should be reviewed again' (Busby and Holt, 2008).

This account derives from a longer study by the author, reviewing the history of the idea and efforts to implement international sanctuaries for cetaceans, especially whales (Holt, 2009a) and a shorter booklet published by IFAW (Holt, 2009b), as well as an earlier account in Holt (1983) and material from a booklet entitled 'Whale Sanctuaries and the South Atlantic' written by Leslie A. Busby, to be published by IFAW during 2012.

The idea of international sanctuaries for whales, on the high seas, was introduced in the League of Nations in 1929 by a committee of international lawyers, led by Sr José Leon Suárez of Argentina. International whaling conferences in 1938 and 1939 recommended to participating governments that they take powers to establish sanctuaries, particularly in the Antarctic seas, but action was delayed by the Second World War. After the War, an appropriate provision was written into the International Convention for the Regulation of Whaling 1946 (ICRW, Article V (c)) and authority to designate sanctuaries was invested in the IWC.

A sanctuary for baleen whales in the southeastern sector (70°W–160°W) of the Southern Ocean south of 40°S was incorporated into the first IWC Schedule, adopted by the ICRW negotiators in 1946. This was suspended in 1955, after several years of debate, in which Japan, especially, repeatedly sought its abolition. This was understandable; Japan, as an occupied country, was not permitted to attend the 1945 Conference in Washington DC and could not join the IWC until the signature of the Peace Treaty with the USA. The occupying power did however permit - even encourage - Japanese pelagic whaling fleets to resume Antarctic whaling. These fleets entered the Antarctic region via the Pacific in contrast with those from Europe and the USSR that entered that region through the Atlantic and Indian Oceans, thus the sanctuary was considered to put Japan at a disadvantage. However, the reasoning used by those who wished to open the sanctuary to whaling was that this would relieve the whaling pressure in the other Antarctic sectors. The IWC scientists consistently opposed this, recommending instead that the arbitrarily set 'Blue Whale Unit' (BWU) catch limit set for pelagic catching of baleen whales be drastically reduced. Their pleas failed and eventually, in 1955, they reluctantly recommended the suspension of the sanctuary to the Commission as a hard compromise. This was accepted by the Commission notwithstanding the offer of Japan to agree to continuation of protection of a part of the sanctuary area (IWC, 1956a; 1956b).

The suspension was initially for three years with the provision for automatic closure after that time although this did not occur. In subsequent years various proposals for sanctuaries were put forward by groups of interested member states including the Northwest Atlantic, the Northeast

<sup>&</sup>lt;sup>1</sup>This paper is a shortened and edited version of a presentation to the opening session of the Indian Ocean Cetacean Symposium held in the Republic of Maldives, 18–20 July 2009.

<sup>&</sup>lt;sup>2</sup> This abbreviation is used here to avoid confusion with another IWC action – the International Observer Scheme (IOS).

<sup>&</sup>lt;sup>3</sup> The Schedule to the Convention contains the rules that govern the conduct of whaling. It can be amended at meetings of the Commission provided a proposed amendment obtains three-fourths of the votes of those voting for or against.

Pacific, the Mediterranean and Black Seas, the South Atlantic, the Southwest Pacific and – somewhat obliquely – the entire High Seas. To date only the Indian Ocean (in 1979) and Southern Ocean (in 1994) proposals have been adopted by the IWC. Their adoption has involved the general support for the concept, in both regions but especially in the Indian Ocean, of many states that are not members of the IWC or that joined the IWC after the IOWS had been established.

# THE BEGINNINGS

In 1965, in a little known Sri Lankan journal, a Sri Lankan scientist, Dr P.E.P. Deraniyagala (Deraniyagala, 1965), suggested that the Indian Ocean between 20°E and 118°E, including the Southern Ocean sector thus bounded, be proclaimed by international agreement as a sanctuary for all cetaceans, as well as for dugongs and marine turtles. The period 1959-1965 was that in which the International Indian Ocean Expedition (IIOE), one of the largest collaborative oceanographic expeditions ever mounted, was organised by the Scientific Committee on Oceanic Research (SCOR) of the International Council of Scientific Unions (ICSU), following the first International Geophysical Year of 1957 which itself led to the negotiation of the Antarctic Treaty. Dr Deraniyagala had several arguments for his suggestion. One was that the requirement for one or two national inspectors to be placed on whaling expeditions was inadequate since in his view the fact that such officials were living with whaling crews for several months reduced the likelihood that they would provide objective reports on their ship-mates' activities. He also stated that a majority of the many dead and dving cetaceans he had studied washed ashore in Sri Lanka, especially the large whales, had suffered from harpoon strikes. He therefore believed that the number of whales that might thereby 'suffer a lingering death' might be equal to or more than the number actually secured and reported as caught. That seemed plausible to many people because the loss rate at the time was known to be substantial although reliable figures were not available. The stranded and wounded whales, especially in Sri Lanka and Southern India to which Deraniyagala referred, included blue, fin, and humpback whales, false killer whales, sperm whales and pygmy sperm whales, beaked whales of the genera Ziphius and *Mesoplodon*, although of the toothed whales only the sperm whale was a recognised target for modern whaling at the time, and bycatches of cetaceans in Sri Lankan fisheries are known that could have been responsible for some of the strandings. The author also referred to several specimens of what he knew as the slender thalmaha sub-species of minke whale found in tropical waters of the Indian Ocean.

Deraniyagala's paper was generally ignored but in 1978, the newly independent Government of the Republic of Seychelles, which was acquiring a huge Exclusive Economic Zone (EEZ)<sup>4</sup> as a result of changes in the Law of the Sea, decided to accede to all relevant intergovernmental agreements concerning the ocean. That included the IWC.

Seychelles' decision to join the IWC should be seen in the perspective of the emergence of a broader interest in conservation in the first years of independence of the Republic in 1976, which also had roots in the concern of

British scientists in colonial times for the unique natural history of many of the islands, especially Aldabra<sup>5</sup> and the birds of the central granitic islands Cousin, Bird and Aride. After the enactment of its EEZ based on UNCLOS principles, a group of Seychellois conservationists facilitated the legal protection of 42% of the new State's land, several marine parks and reserves including entire islands and the surrounding sea areas were created and specific protective legislation enacted for birds, turtles and giant tortoises. The Seychelles National Environment Commission was set up and programmes were run by the International Council for Bird Preservation (now BirdLife International) and the World Wildlife Fund (WWF) to train a new cadre of Seychellois rangers and managers. Thus Seychelles came into the IWC armed with a large array of policy and legal instruments and an advanced conservation ethic.

# BACKGROUND TO THE DEVELOPMENT OF THE PROPOSAL

It is perhaps not surprising that in joining the IWC, this new state should do more than just cast its vote for or against the initiatives of others. It had before it the example of Malta that had 'made waves' by launching in the UN General Assembly a vast debate about the reform of the Law of the Sea. Seychelles was not quite so ambitious, although it was one of the main beneficiaries of the new international law. The momentum that began in 1972, with the UN call for a ten-year general moratorium to allow an interim respite from what some saw as virtually uncontrolled commercial whaling and give time for emplacement of better management, had diminished with the 1974 agreement on the Australian proposal for an 'amended moratorium' that came to be called the *New Management Procedure* (NMP) defined by paragraph 10(a-c) of the ICRW Schedule (e.g. see Allen, 1980; Gambell, 1977).

Application of the new rules in the second half of the 1970s had led to the setting of zero catch limits for most baleen whale stocks in the Southern Hemisphere, except that for the Antarctic minke whale (the smallest of the baleen whale species subject to whaling) – large-scale catching of which was begun at the opening of the decade by Japan and the USSR – and the Bryde's whale (which is not found as far south as Antarctic waters). Since the assessments of whale stocks at the time depended on long data series from commercial catches, providing reliable scientific advice on minke whale catch limits was practically impossible as reflected in the reports of the IWC Scientific Committee.

Southern Hemisphere Bryde's whales were partially protected by the prohibition of pelagic whaling in the zone north of 40°S. However, in the late 1970s, Japan had conducted large-scale pelagic whaling for that species under Special Permits allowed by Article VIII of the ICRW, south of Madagascar and on the fringe of the Indian Ocean near Indonesia, as well as near the Solomon Islands in the South Pacific. The Japanese authorities were thought to be considering two ways of opening up these resources for

<sup>&</sup>lt;sup>4</sup> The Republic of Seychelles comprises over 100 islands.

<sup>&</sup>lt;sup>5</sup> The intervention by scientists and conservationists prevented Aldabra – since 1982 a World Heritage Site – from being turned into a US military base in the 1960s, resulting in such interest being turned to Diego Garcia in the Chagos Archipelago.

systematic exploitation. One was to seek the abolition of the long-standing ban on pelagic whaling for baleen whales in tropical and temperate waters, but that would have been politically difficult, requiring a three-quarters majority in the IWC. The other was to open client land-stations in developing countries, not members of the IWC, in the Indian and Pacific Oceans near the discovered Bryde's whale concentrations - beginning with Madagascar and also Indonesia which had some small-scale 'traditional' (unmechanised) whaling. Bryde's whales in the eastern Atlantic had been taken by so-called 'pirate whalers' operating under flags of convenience to provide frozen baleen whale meat to the Japanese market. The seasonal timing would be such that the factory ships operating in the Antarctic could even pick up the frozen meat on their return journeys to Japan, thus saving transport costs and importexport inconveniences.

In 1979, Japan formally proposed an annual catch limit of 460 Bryde's whales for the putative 'Indian Ocean stock' of this species. However, the IWC's Scientific Committee did not accept the Japanese scientists' estimates of the number of whales from the surveys connected with the Special Permit catches of the previous three years, and so recommended that the Northern Indian Ocean stock be classified as an Initial Management Stock with zero catch limit pending satisfactory estimates of stock size (IWC, 1980b, pp.48–49 and pp.52–53). Two views were expressed within the Committee with respect to the Bryde's whales in the Southern Indian Ocean (including the area south of Madagascar). Most members recommended the same wording as for the Northern Indian Ocean. Others believed that satisfactory estimates of stock size had been obtained and proposed that catch limits should be 95 on the Western side and 282 in the East (where there had been successful Special Permit whaling near Indonesia). Most of the Committee noted that this would require an amendment to the Schedule to open some portion of the area between 40°S and 20°N to pelagic baleen whaling. Subsequently the IWC's Technical Committee (really a 'Committee of the Whole', not at all 'technical') recommended and the Commission Plenary (with no nation dissenting) adopted zero catch limits in both the southern and northern zones of the Indian Ocean (IWC, 1980a).

The ban on pelagic whaling in temperate and tropical waters did not apply to sperm whales. With the decline of baleen catches in the Antarctic the Soviet expeditions had steadily increased their catches of sperm whales – which yielded an industrial oil of strategic importance. Two of the Soviet expeditions were catching sperm whales in effectively unlimited numbers<sup>6</sup> on their ways to and from the Antarctic via Suez; it was not known at the time how many baleen whales the Soviet expeditions were also killing – illegally and secretively – in these waters (Yablokov, 2000). People in Seychelles believed that sperm whales were far less abundant near the islands than a few decades earlier. While the inclination was to join with those nations that still favoured a general moratorium on commercial whaling, it was thought that it would not have been possible then to

secure the necessary three-fourths majority vote for such a move. Accordingly the Government embraced a strategy and programme including as one element the declaration of the Indian Ocean as a sanctuary, from the northern coastline to the Antarctic ice.

It was also believed within Seychelles in 1979 that 'pirate' operators were preparing two new vessels that might be destined for the Indian Ocean, although the Governments of South Africa and others were now interested in preventing that, particularly by refusing port facilities. The 'pirate' operations in the eastern Atlantic were under threat by the actions of IWC members to impose various types of sanctions against whaling under the flags of non-member countries. Some Commission members were also concerned that if these 'pirate' operations were legitimised by the countries whose flags they flew joining the IWC, this would swing the balance of power back towards the Commission again becoming what it had often been called – 'a Whalers' Club'.

### THE 1979 SEYCHELLES INITIATIVE

Early in 1979, a Workshop on Protected Areas for Cetaceans, convened by IUCN in Mexico, with support from UNEP and WWF, had suggested that the eastern Indian Ocean be designated as a protected area. This was made feasible, it was thought, because of the recent decision by the Government of Australia for that country to get out of the whaling business and to work for a world-wide ban on whaling.

The Seychelles proposal was contained in a document entitled the Seychelles Initiative (Anonymous, 1979) and was presented both to the Scientific Committee and the Technical Committee and Plenary by the Alternate Commissioner, Dr L. Watson. I provided further technical information as observer for FAO (Holt, 1979).

The Seychelles' idea was that designation of the entire Indian Ocean would at least protect one or perhaps more of the putative Southern Hemisphere populations of all baleen species, as well as of the sperm whale<sup>7</sup> and the killer whale. Marking experiments had shown that Antarctic minke whales from a particular breeding ground such as that off Brazil could feed at longitudes as much as 54° apart in summer, while other whales also moved across longitudinal boundaries during the same summer feeding season. Individual - visual - recognition of humpback whales in some parts of the Northern Hemisphere had revealed that individuals did not always return to the same breeding area in successive seasons, and it seemed reasonable to assume that this might also be the case for other baleen whale species in the Southern Hemisphere. Nevertheless, the IWC was necessarily dealing with fixed geographical definitions for the purpose of managing whaling and assessing putative whale populations and it seemed reasonable to assume that the various exchanges, mixings and movements that had been noted were exceptions rather than the rule.

It was far from clear to the Seychelles' authorities that a three-fourths majority would be obtainable at the time.

<sup>&</sup>lt;sup>6</sup> Catch limits were set by Division in the Southern Hemisphere, i.e. south of the Equator. The Indian Ocean spanned Divisions 3–5.

<sup>&</sup>lt;sup>7</sup> Seychelles believed that the NMP was even less adequate for sperm whales than it was for baleen whales and that this species needed global protection, so a second strategic aim was to secure a long-term moratorium on all catching of this species. Its 1979 proposal did not succeed but this aim was realised in1981.

However, it seemed to be close enough that the balance could be shifted if Indian Ocean coastal states - few of which were yet members of IWC - expressed their support for such an action. Few of them had any special authority or claims under the emerging new Law of the Sea, but coastal states' special interest in areas adjacent to their expanding areas of national jurisdiction was becoming widely accepted. So the Seychelles Government discreetly consulted, at high level, governments of all the Indian Ocean coastal states and found most were favourable to the sanctuary proposal and none opposed it. Several said they would work to bring their countries into the IWC, but that could not practically be done before the 1979 meeting of the Commission. An additional move was the declaration by Seychelles of its own EEZ as a protected zone for all marine mammals and a hope that as many other Indian Ocean coastal states as possible would do likewise. Consideration was given to delaying the proposed action for a year until more Indian Ocean coastal states had joined the IWC but ultimately it was agreed that the element of surprise was very important and it was decided to proceed immediately.

The consultations also led to a suggestion that an Indian Ocean Alliance for Conservation be established, of which the proposals regarding whaling would be a part. In the background to this was the move being led in the United Nations by Sri Lanka to declare the Indian Ocean as a Sea of Peace, from which, *inter alia*, the navies of the superpowers would be invited to withdraw. Although this had support from most of the Non-Aligned Indian Ocean countries it was a practical impossibility. For example, the USA and UK (sovereign of the Chagos Archipelago, including the island of Diego Garcia) saw the Alliance for Conservation as the thin end of a Sea of Peace wedge and strongly opposed it; that initiative was pursued for a while but eventually abandoned.

# ADOPTION OF THE SANCTUARY AT THE 1979 IWC MEETING

The IWC's Scientific Committee reviewed the proposal (IWC, 1980b) both in terms of the general concept of sanctuaries and of the Indian Ocean proposal and its boundaries. There were suggestions by some that 40°S or the Antarctic Convergence may be appropriate in particular, but - as the Report of that meeting brusquely says - 'no firm conclusions were reached' (IWC, 1980a, p.27). This was essentially because of the political implications of the discussion and because some mistakenly treated the proposal as if it had been presented more for promoting research than for achieving conservation by cessation of whaling. For example, there was considerable discussion of whether the cessation of commercial whaling in the region would cut short the provision of data coming from whaling activities and which some scientists insisted were needed for setting catch limits. This apparent confusion of objectives has persisted in all later discussions of sanctuaries in the IWC (Zacharias et al., 2006). It arises from Article V.2 of the ICRW which states that regulatory - including conservation - actions to be taken inter alia 'shall be based on scientific findings'. Opponents of broad conservation measures (such as sanctuaries and moratoria) have sought repeatedly to interpret this, erroneously in my view, as meaning that regulatory measures cannot be taken unless they have been proposed or fully supported by the Scientific Committee (which almost never votes and rarely achieves consensus on issues with strong political overtones such as sanctuaries and catching under special permit). In this case as in others, the Commission acted despite a lack of consensus within the Scientific Committee.

Prior to discussions in the decision-making Commission plenary session, the proposal was discussed in the IWC's Technical Committee. It became clear that a three-quarters majority would not be forthcoming without some compromise. The Seychelles delegation amended the original southern boundary proposal to 55°S thereby excluding the major Soviet and Japanese whaling grounds for the Antarctic minke whale from the Sanctuary. Several countries spoke in favour of the proposal. Japan, as it has consistently done, argued against the concept of sanctuaries, stating that individual stock management was preferable and monitoring of populations would be reduced by any pause in whaling. The USSR put forward similar views. Panama and Australia suggested a further amendment to provide for a ten-year review period to allow sufficient time for effects of disturbance and recovery rates of depleted stocks to be followed. The amended proposal was accepted in the Technical Committee by 14 votes to four with five abstentions.

In the Plenary, this was further amended by Seychelles and Australia to provide for a reduced review period (five years) but nevertheless establishing the sanctuary for ten years. This amended proposal was adopted by 16 votes to 3 with 3 abstentions. The Commission also adopted a nonbinding Resolution proposed by Denmark instructing the Scientific Committee to look at the type and level of research needed for monitoring within the IOWS as well as to investigate whether it was necessary to initiate additional research simultaneously in areas where exploitation of whales continues, in order to make comparison possible between stocks under the two different regimes; this was a shadow of the pervasive idea that sanctuaries – if established – should be for scientific rather than conservation purposes.

Only part of that work was accomplished. With mainly NGO financing, a research plan for the Indian Ocean sanctuary was developed at a workshop held in the town of Zeist, in The Netherlands (Busby, 1981), and some expanded research on cetaceans was being promoted in several countries in the region, especially by Australia, India and Sri Lanka, where scientific symposia were subsequently held, and also – though on a very limited scale – in Oman, Kenya and Seychelles. However, the financial means to assist this work were not forthcoming either from the IWC or, as had been hoped, from UNEP, and supporters of the Seychelles initiative were subject to criticism by some opponents and skeptics who alleged that promises had not been fulfilled.

In the following years, several more Indian Ocean coastal states did join the IWC (previously only Australia, South Africa and the Seychelles were members): Egypt, India, Oman, Kenya and Mauritius. Sri Lanka, which had been enthusiastic about joining, did not do so, nor did Tanzania;

some thought that these changes of mind, along with Mauritius neither attending meetings nor paying its dues, resulted from external diplomatic pressures. But the influx of non-aligned 'developing countries', encouraged and supported by NGOs, began to prepare the IWC for the adoption of a global 'moratorium' on commercial whaling, of unlimited duration, which it did in 1982 on the basis of a specific proposal by Seychelles to set all catch limits to zero regardless of existing classifications under the NMP. It had also been envisaged that measures to protect cetaceans (as well as other vulnerable marine species in the region regarding the conservation of which several governments insisted that the IWC did not have legal competence), would be taken by other international institutions, as implied by the original Alliance for Conservation idea, but this happened only to a very limited degree. To this day there is, unfortunately, no comprehensive plan or authority for the conservation and the management of use of the marine life of the region as a whole.

### ACKNOWLEDGEMENTS

Many people were directly involved in the action to designate the Indian Ocean as a sanctuary for whales; here only a prominent few can be singled out for special acknowledgement. I begin with Harold Eidsvik, of IUCN, who prepared and steered the IUCN/WWF/UNEP workshop in Baja California, Mexico, in February 1979, which set the sanctuary ball rolling again. Dr Paul Spong was the Rapporteur on that occasion.

The actions later that year, centred on the Republic of Seychelles, were supported vigorously by the then President of the Republic, M. Albert France René and led by the late Dr Lyall Watson, serving as Alternate Commissioner for Seychelles to the IWC. Others on the delegation were the Commissioner, M. Laustau-Lelanne, Ms Cornelia Durrant (Political advisor) and Mr Malcolm Forster (Legal adviser). My superiors in FAO and UNEP allowed me – then in my final year of service with the UN system – to serve unofficially as scientific and technical advisor to the Seychelles delegation.

A small, developing country such as Sevchelles could not have pursued this objective successfully without substantial outside help, both financial and personal. This was provided particularly by the Threshold Foundation, which had been established by Prince Shahram Pahlavi-nia, a resident of Seychelles, and the World Wildlife Fund International (WWF), with the dedicated involvement of two of its stars: Sir Peter Scott and Dr Sylvia Earle. Mr Harold Wicks lubricated the pipeline from Threshold, which was headquartered in London. When Threshold ran out of money a few years later, Mr Brian Davies, Founder and CEO of the International Fund for Animal Welfare (IFAW) helped to find ways to continue the necessary financial support for Seychelles' involvement in cetacean conservation. The Government of Sweden generously gave financial assistance for the convening of the Indian Ocean Alliance consultation, and the vigorous and helpful role of the Commissioner for Sweden, Dr Bertil Hägerhäll, IWC Commissioner for Sweden from when his country rejoined the IWC in 1979, must be acknowledged here.

The workshop held in Zeist, Netherlands, after the 1979 success, was funded by WWF Netherlands on the initiative of its Director, Mr. Niels Halbertsma. I was Convener of the workshop; Ms Leslie Busby organised it and wrote the Report. Halberstma, after the declaration of the IOS, also supported the voyage of the research yacht *Tulip* to conduct research on sperm whales near Seychelles and Sri Lanka, led by Dr Hal Whitehead, assisted by scientists Dr Vassili Papastavrou and Dr Jonathan Gordon, who both later served with IFAW. Simultaneously Brian Davies arranged for the IFAW twin-engined aircraft to fly to Seychelles to conduct a sperm whale survey there, a project carried out by Mr Ronald Keller; the results of that were published by the IWC (Keller *et al.*, 1982).

Several diplomats based in London at the High Commission offices served as Seychelles Commissioner to IWC in the following years, but the burden of steering the Indian Ocean Sanctuary through the IWC processes to quasipermanence was borne by Mr Robert Delpech, a brilliant diplomat, sailor and raconteur. For part of that period I served as Alternate Commissioner. After Mr Delpech's retirement the lead was taken by Dr Nirmal Shah, founder and leader of the very active and successful NGO: *Nature Seychelles*.

Among the neighbouring countries of Seychelles the delegation was perhaps closest, for many years, to the Sultanate of Oman, whose Commissioner, Mr Mohamet Al-Barwani, was particularly supportive during the critical decade after the establishment of the IOWS in 1979. Mr James Carr, who had been helping me in research at the Seychelles High Commission, served for a while on the delegation of Oman. I am indebted to Mr R.P. Kumarran for reminding me, after this paper was written, of the singular contribution made in the 1960s by the Sri Lankan scientist Dr P.E.P. Deraniyagala. Lastly I wish to express appreciation of the Work of the Editor for assistance in bringing the words of my Maldives talk into publishable form.

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Date received: March 2010. Date accepted: November 2011.