

# The Maldives: A Measure of Sea Level Changes and Sea Level Ethics

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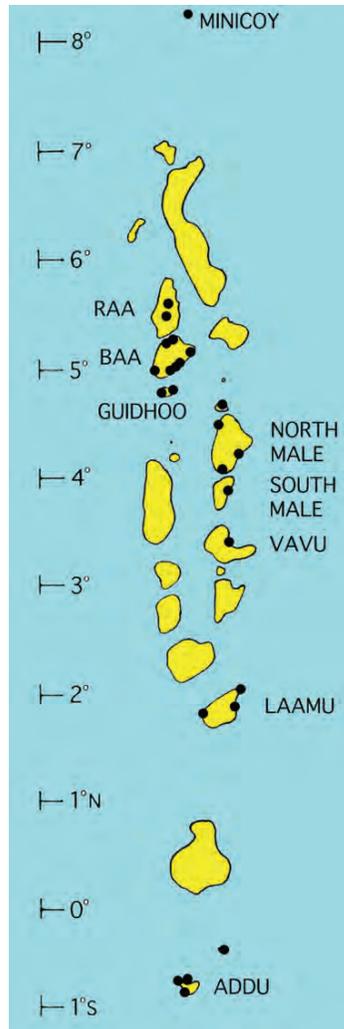
## Chapter Outline

<b>1. Introduction</b>	<b>197</b>	<b>4. Field Evidence in the Maldives</b>	<b>204</b>
<b>2. The Maldives Sea Level Project</b>	<b>199</b>	4.1. The Sea Level Fall in the 1970s	204
<b>3. Problems</b>	<b>200</b>	4.2. The Stability of the Last 30 Years	204
3.1. A Tree Cannot Lie	200	4.3. Tide-Gauge Records	204
3.2. Vandalism in 2003	201	4.4. Minicoy, Just North of the Maldives	206
3.3. The Governmental Attitude in Male	201	<b>5. Comparisons</b>	<b>207</b>
3.4. "Confirmed in Private"	202	<b>6. Conclusions</b>	<b>208</b>
3.5. The Moscow Meeting in 2004	202	<b>Acknowledgments</b>	<b>208</b>
3.6. The President Enters the Scene	203		

## 1. INTRODUCTION

The Maldives is an island nation in the Indian Ocean. It consists of some 1,200 low islands arranged in some 20 larger atolls. The islands extend from Latitude 7° N to Latitude 1° S (Fig. 1). Like any coastal nation, it has always been threatened by great waves at extreme storms or, even worse, at tsunami events

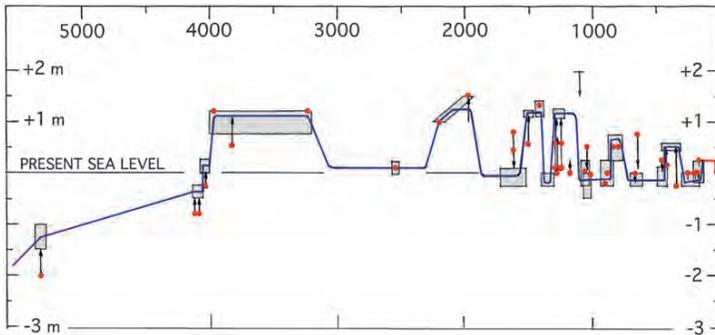
**FIGURE 1** The Maldives and its main atolls. Black dots mark sites studied by our group. The Island of Minicoy belongs to the Laccadives.



(Mörner et al., 2008). In the past 4,000 years, it has experienced several short-term sea level highs in the order of +0.6–1.2 m (Fig. 2; Mörner, 2007a). We do not blame glacial eustasy for those oscillations, rather ocean dynamic factors like drastic changes in evaporation/precipitation or redistributions of the water masses. The islands have been inhabited for, at least, 1,500–2,000 years.

In the media, we read about the Maldives; either as “the paradise” for tourists, or as the nation soon to become flooded by a rapidly rising sea level as a function of global warming (e.g., IPCC, 2007).

When I, in 1999, became president of the INQUA commission Sea Level Changes and Coastal Evolution I launched an international sea level project in



**FIGURE 2** The new sea level curve of the Maldives (Mörner, 2007a). The recorded oscillations were driven by regional oceanographic-climatic factors. The islands have been inhabited since about A.D. 400–500 (the last 500 years are enlarged and simplified in Fig. 7A).

the Maldives partly because this is an area where multiple sea level parameters interact (Mörner, 2000) and partly because this was a key area for the proposed sea level rise as a function of global warming (IPCC, 2001). We have made three major expeditions to the Maldives and three shorter visits. Quite rapidly, we were able to conclude that sea is not at all in a rapidly rising mode over the Maldives.

When I launched the project, I could read on the web that the Maldives was on its way to become flooded, and that this was a general consensus and that “2500 scientists cannot be wrong”. This was most surprising, as very few if any proper sea level investigation had been performed in the area. This meant that none of the 2,500 scientists had actually been there, and none of them was a true sea level specialist. A true sea level study at the spot itself was obviously urgently needed; hence our multi-parameter sea level project.

When I, as expert reviewer, reviewed the sea level chapter of the IPCC assessment (2001), I was struck that none of the 33 authors was a sea level specialist (INQUA, 2000). Therefore, this chapter was not a product of the international sea level community but rather of selected persons who had “the correct believe” and hence could be expected to provide the answer wanted (today we may call it a “*sea-level-gate*”).

Whilst most changes have pros and cons, there is nothing good that can come out of a sea level rise. Therefore, this poses the only real threat. This is probably why this question attracts so much emotion and remarkable behavior.

## 2. THE MALDIVES SEA LEVEL PROJECT

We had major research expeditions in 2000, 2001, and 2005, and shorter visits in 2000, 2001, and 2003. Our group consisted of a number of international sea level experts. We had very good collaboration with the local people who helped us very much. Our results have been published in solid peer-reviewed papers

(Mörner et al., 2004; Mörner, 2007a) besides several reports elsewhere. Our findings with respect to paleo-tsunamis are presented separately (Mörner et al., 2008; Mörner and Dawson, 2011). Our new sea level curve of the Maldives (Fig. 2) is closely discussed elsewhere (Mörner, 2007a). In this paper, I will deal with some of the findings with respect to the present, on-going sea level situation.

The composition of our research team is given in the Acknowledgments.

### 3. PROBLEMS

Contrary to our expectations, we came to face several problems in our research project in the Maldives. Some of those will be exposed here because they have a message to tell of how complicated it is to present data that do not concur with the scenario of IPCC.

#### 3.1. A Tree Cannot Lie

The island of Male is the capital of the Maldives. Close-by lies the island of Viligili, former an island for prisoners. At the shore, there was a tree well off the coast in a very delicate growing position (Fig. 3). Any rise in sea level would have destroyed it. We were struck by its position when we saw it for the first time in 2000. It gave evidence against any rapid rise in sea level.



**FIGURE 3** The tree on the island of Viligili in 2000 (cf. Mörner, 2007b). It has a very delicate position. This position has remained since the early 1950s (maybe late 1940s). In 2003, the tree (held by us as a strong evidence of 50 years of sea level stability) was vandalized “by a group of Australian scientists” (as observed by local people from the house in the background).

Then local people told us that this tree has been in the same position since late 40s, and that it had been a marker for prisoners returning to freedom. This means that the tree had remained in its delicate position for, at least, 50 years. Consequently, sea level cannot have risen in any significant amount for the last 50 years.

This was a hard fact against the IPCC sea level scenario.

We discussed it with local people in the government (very much pro-IGCP), included it in our research reposts and on the web (INQUA, 2000).

### 3.2. Vandalism in 2003

In 2003, we returned to produce a TV-documentary of our observational field evidence of a non-rising sea level in the Maldives (Mortensen, 2004). To my disappointment, I found the tree fallen down at the shore, still green. Finally the sea had taken it, I assumed. Soon, I learned the truth, however. A nearby restaurant had a nice view of the tree, and we used to rest there and watch the tree. The people running the restaurant told what actually had happened with the tree: *“it was pulled down by a group of Australian scientists”* (Mörner, 2007b; Murphy, 2007).

When an issue has gone so far away from reality that you allow yourself to destroy a piece of evidence just because it contradicts your own believe, we are indeed far away from the normal ethics and theory formulations of science (Mörner, 2006, 2008).

### 3.3. The Governmental Attitude in Male

Our sea level research program in the Maldives started as a collaboration program between INQUA and the Government in Male. When our observational facts accumulated and started, with increasing strength, to indicate that sea was by no means in a drastically rising mode in the Maldives, we started to get into trouble with the governmental agencies.

The president of the Maldives was putting much effort into the international claim that the west had polluted the air so that the globe was heating up, the glaciers were melting, and the sea was rising, soon to flood the islands of the Maldives. Therefore, the west had to compensate with money and investments. Our findings were interpreted as violating their claims and hence negative, not to say anti-governmental.

When we in 2000 had become convinced by our own observational facts that sea was not at rapidly rising, but virtually stable for the last 30 years, we wanted to share those very good news with the people of the Maldives. A reporter at the Male-TV shot an interview but it was censored by the government and not to be shown in TV (Mörner, 2007b).

Our subsequent studies were performed with an uneasy relation to the governmental agencies. The people of the Maldives, however, helped us in all

kind of ways, and we were able to conduct our programs, make the observations wanted, and collect the samples needed (Mörner et al., 2004; Mörner, 2007a).

### 3.4. “Confirmed in Private”

SASNET (South Asian Studies Network) is a part of the Swedish governmental agencies for international assistance SIDA/SAREC. Our Maldives Research Project has obtained funding from SASNET for the 2001 expedition and I have published some reports on our findings in their journal “South Asia”. In 2009, Lars Eklund of SASNET made an official visit to the Maldives. In his report from the visit (Eklund, 2009), he has a passage on “Flooding or not?” ending with the following both interesting and revealing paragraph:

“In June 2004, Prof. Mörner published his research results in an article titled “*The Maldives Project: a future free from sea-level flooding*” in the Contemporary South Asia magazine. However, the Maldivian government did not react positively to these findings since they went against the official policy, even though the facts presented seem to be beyond dispute and are confirmed in private by individual Maldivian researchers”.

### 3.5. The Moscow Meeting in 2004

An English delegation under the leadership of Sir David King set out to “reform” the Russians in the issue of global warming and related problems. A meeting at the Russian Academy of Science was arranged. The chairman of the session, Andrei Illarionov, had some external experts to join the meeting. I was one of the invited. When King, in his talk, slipped into a quite unfounded picture of global sea level change, I, of course, had to object. The sea level picture was later highlighted in my own talk entitled: “Flooding concept called off – New facts from the Maldives”. Whilst Illarionov and most others gave vivid appreciation of my talk, the English delegation was silent and obviously disturbed.

Quite some time later, my attention was called to a letter available on the Web from John Clague, president of INQUA, to Yuri Osipov, president of the Russian Academy of Science. In this letter, it was said that I had been “claiming that I was president of the Commission on Sea Level Changes of INQUA” by this “misrepresented his position”. Furthermore, Clague stated that “nearly all of the researcher” in INQUA “agree that humans are modifying Earth’s climate, a position diametrically opposed to Dr. Mörner’s point of view”.

Clague had not contacted me on the issue, just sent his mail with copy to David King. The fact, however, is that I very clearly on the first power-point picture (which I still have) has stated “President (1999–2003) of the INQUA Commission on *Sea Level Changes and Coastal Evolution*”. When I pointed this out, he promised to withdraw the letter from the web (but gave no apology).

What concerns the view “of nearly all researchers of INQUA”, our commission had a network of some 300–400 sea level specialists. The issue of present sea level movements and expected changes by year 2100 had been up at five of our international commission meetings, and being up on our web for discussions for several years (INQUA, 2000). Still, our commission agreed on a “most likely” estimate of sea level change by year 2100 of  $+10 \text{ cm} \pm 10 \text{ cm}$  (i.e., quite different to the values given by IPCC). Another fact with respect to Clague’s statement “nearly all” comes from a meeting by the European Science Foundation on Glacial–Interglacial Sea level Changes in Four Dimensions, held in St. Andrews in 2001. At this meeting there were some 100 sea level specialists, when Titus (a proponent of large-scale flooding) asked for a vote on how many were for vs. against the IPCC sea level scenario, only one was for and all the rest (some 99) against. So, when Clague talked about “nearly all”, he was by no means anchored in facts.

Long later (in 2008), was I to learn that Clague is a very strong proponent of IPCC. This may explain his action, but can hardly excuse it. It seems appropriate to pose the question: “who misused his position?”

I considered all this to be nonsense up to recently, when I understood that it provides an interesting piece of information of how the debate was twisted in the most questionable spirit that “the end justifies the means”. The same is the case with the tree (Fig. 3), vandalized in 2003 “by a group of Australian scientists”. With respect to recent talks about a “climate-gate”, we may speak about a “clague-gate” and “tree-gate”, too.

### 3.6. The President Enters the Scene

In 2009, the new President of the Maldives, Mohamed Nasheed, entered the scene with very firm statements on his nation soon to be drowned, and with noticeable (not to say “exhibitionistic”) official actions like standing in the sea saying “we are drowning” or having a submarine cabinet-meeting supposed to illustrate the flooding to come.

I tried to communicate the observational fact that sea is not at all in an alarming rising mode in the Maldives, and I even sent an open letter to the President (Mörner, 2009) – but no reply.

The reason behind the president’s fixation on the rising sea level concept is economical, and certainly not scientific. From the previous president he inherited the idea that “the west” would provide extensive economical support to their “drowning nation” because it was the fault of their overuse of  $\text{CO}_2$  producing industrial activities, and, indeed, a lot of money have “flooded” the nation.

For the people of the Maldives, the situation is another. They have to live, work, and raise kids under the false conception that there is no future for them on their own islands. This is an immense psychological burden. In the name of decency, this burden must be lifted from their shoulders now when we know that the rising sea idea does not concur with observational facts.

## 4. FIELD EVIDENCE IN THE MALDIVES

When we, in 2000, saw the tree (Fig. 3) standing nearly “with its feet in water”, we started to realize that there was, indeed, no on-going alarming sea level rise in the Maldives. When we began to examine the coasts of the individual islands, this picture was strengthened.

### 4.1. The Sea Level Fall in the 1970s

We soon found clear evidence of a significant and rapid drop in sea level. On island after island, we observed a recent redeposition of sand graded to a lower level than previously. In Addu, we studied (cored and leveled), a lake named “Queen’s bath”, and were able to distinguish the present high- and mean-tide levels and an elevated “sub-recent” high-tide level. On the island of Guidhoo, we drilled two fens and established rise in 1790 to a level 20–30 cm above the present zero. This level was kept up to the 1970s, when sea fell causing some lakes to dry out. On the island of Lamuu, we established a very clear picture with respect to morphology; an old rock-cut platform, now at +20 cm is today abundant and a new and lower platform is in the process of being cut. Maps drawn in 1922 give the higher, now abundant, sea position. From local fishermen, we were informed that sea fell in the 1970s, because a previous sailing route became too shallow in the 1970s. We have presented our observational data in two papers (Mörner et al., 2004; Mörner, 2007a) and one booklet in color (Mörner, 2007b, pp. 9–11).

### 4.2. The Stability of the Last 30 Years

The fact that sea level fell by 20 cm in the 1970s implies that we got a fresh zero-level to explore for possible traces of movements. Nowhere, do we see any trace of a tendency of a change in sea level over the past 30 years. Wherever we look (i.e., lagoonal environment, rock-cut platform shores, sandy beaches, singly beaches), we find nothing but clear indications of a post-1970 stability in shoreline position and sea level (e.g., Mörner, 2007b, pp. 10–11). One example of this stability is shown in Fig. 4 from an erosive sandy beach environment.

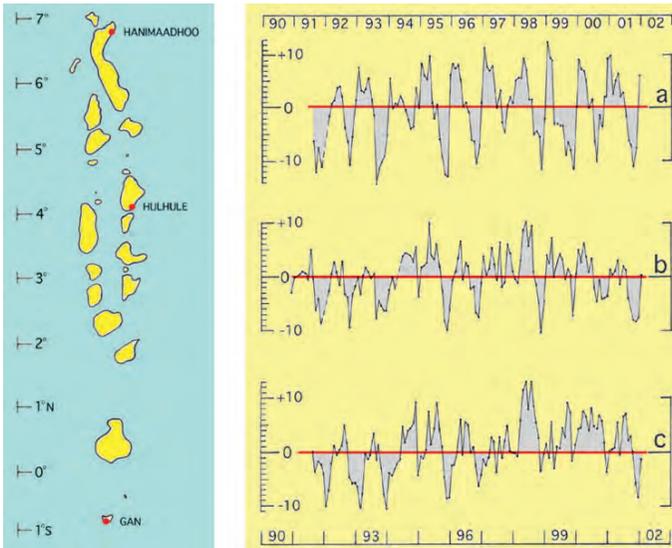
### 4.3. Tide-Gauge Records

Tide-gauges do not offer straightforward information on sea level trends, on the contrary they have to be treated with care. One set of problems comes from local compaction and ground motions. Another comes from cyclic changes (not least the 18.6-year cycle) and inter-annual signals like ENSO events.

The tide-gauge in Male is useless because of repeated ground deformations due to the loading by enormous buildings in recent years. In year 2001, there were three other tide-gauges in operation (Fig. 5). None of those



**FIGURE 4** A general characteristic of the islands of the Maldives is that there is a sub-recent (pre-1970) abandoned beach-ridge and shore plane, now starting to become overgrown (Mörner et al., 2004; Mörner, 2007a,b). At this site, there is active coastal erosion. The redeposition of sand is downward–outward to a lower sea level position. This shore (here marked by sea-weed at MHTL) has remained quite stable, at least, for the last 30 years (Mörner et al., 2004).



**FIGURE 5** The tide-gauge records up to 2001 (extended record up to 2008 discussed in Mörner, 2010a) recording an absence of any rising trend.

recorded any long-term trend; rather they all record incomplete cyclic motions with a few ENSO events superimposed. There is no rapid rise in sea level to be seen.

Today, when eight more years has been added, I have revisited the records with more or less the same result (Mörner, 2010a).

#### 4.4. Minicoy, Just North of the Maldives

The island of Minicoy (Maliku) is the southernmost island in the Laccadives, located some 120 km to the north of the Maldives. It is an atoll island very similar to the islands in the Maldives. The local people testify (1) that sea level is not at all rising (on the contrary they have gained land), (2) that they are amused to hear what the President in the Maldives keep on claiming, and (3) that they understand that “*it is all a matter of money*” (all according to personal information from the Danish social-anthropologist Nils Finn Munch-Petersen after a visit in December, 2010).

In 1992, Mr. Ali Manikfan took Dr. Munch-Petersen down to the shore and showed him that the island, in fact, had gained – not lost – land (Fig. 6). Just as in many island in the Maldives (Fig. 4), sea had fallen and left the old shore to become overgrown and invaded by land-snails (*Ipomea biloba*).

This is a good measure of value of what is politics and what are actual facts. It is, of course, also a matter of ethics.



**FIGURE 6** One of the locals of Minicoy, Ali Manikfan, showing how much the island has grown. What was once the beach is now located well above the wave-washing zone, is becoming overgrown (just as many beaches in the Maldives; Fig. 4; Mörner et al., 2004; Mörner, 2007a,b) and invaded by land-snails (photo: N.F. Munch-Petersen, 1992).

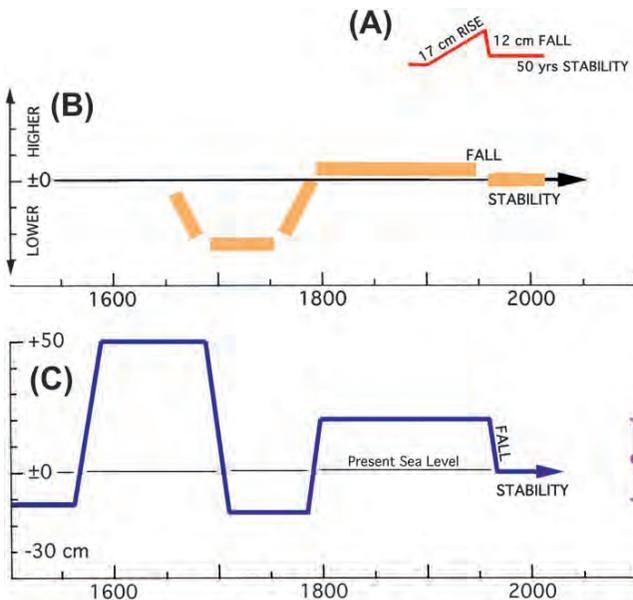
## 5. COMPARISONS

In 2009, a complimentary study was performed in Bangladesh (Mörner, 2010b). This region is notorious for its flooding disasters; fluvial flooding due to heavy precipitation as well as coastal flooding in association with cyclones. Hard observational facts indicate that there is no on-going factor of global sea level rise.

The sea level curve of the last 400 years is strikingly similar to the one of the Maldives (Fig. 7). Even a recent sea level lowering is recorded occurring some 50 years ago.

Having established this new sea level record, I investigated the tide-gauge records in India (Mörner, 2010b). There are records on opposite side of the Decca Plateau; a record from 1878 in Bombay on the west coast and a record from 1937 in Viskhapatnam on the east coast. Both records give a similar picture: a rise 1900–1955, a 12-cm drop 1955–1962, and stability thereafter.

The Indian records fit the new Bangladesh curve perfectly well. They also fit the Maldives record well with the difference that the fall in sea level is dated at 1955–1962 in India and in the 1970s in the Maldives. Either this is an effect of a laterally moving change or a minor dating error in the Maldives. The evidence



**FIGURE 7** At the base (C): sea level changes in the Maldives over the last 500 years (from Mörner, 2009). This curve is based on multiple sea level criteria (Mörner, 2007a). In the middle (B): the new sea level curve from Bangladesh (Mörner, 2010b). At the top (A): the tide-gauge record from Bombay (Mörner, 2010b). In all three regions, there is a sea level fall followed by 40–50 years of stability.

of a sea level fall in the Maldives is strong. The date, however, comes from observations made by local fishermen (Mörner et al., 2004) and may well be pushed back by 10–15 years.

The important thing is that a lack of a sea level rise component is now recorded in the Maldives, in Bangladesh, and in India for the last 40–50 years, and that this period of stability was preceded by a sharp sea level drop in the order of 10–20 cm.

Even on a global scale, there seems to be a striking absence of a present sea level rise component; i.e., in other key-sites like Tuvalu and Vanuatu, in “test-sites” as Venice and North-west Europe, and even in basic satellite altimetry records (Mörner, 2007b, 2010a, 2010c, 2011).

## 6. CONCLUSIONS

Observational facts do not verify the story of a rapidly rising sea level in the Maldives. On the contrary, stability in sea level is well documented for the last 30–40 years. This is our firm conclusion: sea level is not in a rising mode over the Maldives today. This is a well-known fact for the locals in the Laccadives, to the north of the Maldives. The same picture is recorded in Bangladesh and India, indicating a regional dimension of an absence of a presently on-going sea level rise.

This conclusion is opposite to the scenario proposed by IPCC. As their idea is not based on actual field studies only modeling, our observational facts should be held superior.

During our research in the Maldives, we were confronted with several “remarkable” events, and we have to draw the conclusion that some proponents of IPCC take the liberty to act in a dark Medieval way where “the goal justifies the means”.

## ACKNOWLEDGMENTS

The Maldives Sea Level research project was initiated as a part of the INQUA Commission on Sea Level Changes and Coastal Evolution. The project includes six visits to the Maldives: (1) in 2000; setting up the project, (2) in 2000; main expedition 1, (3) in 2001; the “Reef Woman” investigation, (4) in 2001; main expedition 2, (5) in 2003; recording a TV-documentary, and (6) in 2005; main expedition 3. Our research group included: N.-A. Mörner (main project leader), J. Laborel (diving leader, biozonation), M.J. Tooley (fen coring), S. Dawson (tsunami research), W. Allison, J. Collina, F. Laborel, C. Rufin, S. Islam, B. Lembke, D. Dominey-Howes, A. Dupuch, M. Banfield and our local friends from the National Centre of Linguistic and Historical Research (N. Mohamed et al.), from Ecocare (M. Zhair, M. Manik, H. Maniku), from Sea Explorer and Whale Submarine. I am indebted to Nils Finn Munch-Petersen for providing valuable information on the Island of Minicoy. For the Bangladesh study, I primarily want to thank the local guide Nazrul Islam Bachchu for very good assistance in the field.

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