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<a href="#">Main Page</a> <
<a href="#">Front Page</a> <
<a href="#">Metro</a> <
<a href="#">Business</a> <
<a href="#">International</a> <
<a href="#">Sports</a> <
<a href="#">National</a> <
<a href="#">Editorial</a> <
<a href="#">Op-Ed</a> <
<a href="#">Home</a> <
<a href="#">Timeout</a> <
<a href="#">Letters</a> <

## Swimming against the rising tide

Brian D Smith and Elisabeth Fahrni Mansur of the Bangladesh Cetacean Diversity Project write about the array of threats confronting freshwater cetaceans in the Sundarban mangrove forests

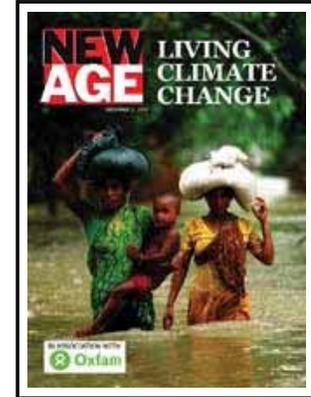
photos by RUBAIYAT MANSUR and ELISABETH FAHRNI MANSUR



Declining freshwater flows and sea-level rise profoundly threaten the world's aquatic biodiversity. Whales, dolphins and porpoises, known as cetaceans, living in freshwater affected areas are especially at risk due to their particular environmental needs. The Sundarban is the world's largest contiguous mangrove forest and its network of waterways supports globally significant populations of two freshwater dolphins that are highly threatened in other areas of their range. The first is the Ganges River dolphin or Shushuk, found in rivers below the foothills of the Himalayas in Nepal and throughout much of the Padma-Jamuna-Meghna river system in India and Bangladesh. The second is the Irrawaddy dolphin, found in coastal waters near river mouths in the Indo-Pacific from Indonesia to the east coast of India, and far upstream in three large rivers: the Mahakam, Mekong and Ayeyarwady. Growing threats to ecology of the Sundarban mangrove forest include declining freshwater flows from upstream extraction (including flows diverted by the Farakka Barrage) and sea-level rise resulting from global climate change. The sensitivity of shushuks and Irrawaddy dolphins to environment change makes them ideal sentinels for understanding and monitoring deeper level ecological changes to this river-sea interface – changes that have critical implications for the survival of millions of people that depend on the living resources brought by flowing waters.

According to simulation models reported by the Intergovernmental Panel on Climate Change (IPCC) (an organization which shared the 2007 Nobel Peace Prize with Al Gore for its groundbreaking work on climate change) average sea-surface temperature will increase by 1.1-6.4°C resulting in a globally averaged sea-level rise of 18-59 cm by 2090-2099. However, these figures could potentially be much higher because these models do not incorporate indirect factors such as carbon-cycle feedback. An alternative model estimated that sea levels could rise by as much as 1.4 m over the same

## LIVING CLIMATE CHANGE



### Headlines

- CLIMATE SNIPPETS  
[by Alizeh Ahmed](#)
- AN A-Z OF CLIMATE CHANGE  
[by Alizeh Ahmed](#)
- A CLIMATE CHANGE CHRONOLOGY
- Outline of Bangladesh's position in Bali  
[by Shahidul Islam Chowdhury](#)
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[by Chowdhury Sajjadul Karim & Shahidul Islam Chowdhury](#)
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[by Mubin S Khan](#)
- Adaptations strategies  
[by Mubin S Khan](#)
- The glacier's warning  
[by Mahtab Haider](#)
- Swimming against the rising tide  
[by Brian D Smith & Elisabeth Fahrni Mansur](#)
- Oxfam looks ahead to Bali
- Climate change, poverty and geopolitics  
[by Shahidul Islam Chowdhury](#)

period. According to calculations from hydrology models reported in a paper submitted to International Global Change Institute by Dr MQ Mirza, a 10-45 cm sea-level rise will cause inundation of about 15 per cent or 750 square kilometres of the total land mass of the Sundarbans. The Bangladesh Institute of Water Modelling (IWM) states that a rise of 50 cm would cause salinity to increase by about 2 ppt during the dry season in the far west, with an increasing extent of sea water intrusion until a maximum is reached in the channels of the Passur and Sibsar rivers – which is a 'hotspot' of abundance for both Irrawaddy and Ganges River dolphins.

A study conducted by the Bangladesh Cetacean Diversity Project (BCDP) used data from dedicated surveys and a dolphin sighting network established among nature tourism vessels of The Guide Tours Ltd to investigate the potential effects of declining freshwater flows and sea-level rise on Shushuk and Irrawaddy dolphins in waterways of the Sundarban mangrove forest. The study found that salinity is the dominant factor affecting the downstream distribution of Shushuk and upstream distribution of Irrawaddy dolphins. Statistical models based on information from The Guide Tours sighting network also revealed a strong dependency on river confluences which create counter-currents that concentrate fish prey and provide refuge from strong downstream and tidal currents.

In the mouth of the Mirgamari River, a distributary of the Passur River where high concentrations of Ganges River dolphins are observed, the IWM recorded a substantial decline in channel width in 1995-2000. If current trends continue, the Mirgamari River and the upper reaches of the Sela Gang River may soon become dewatered. Declining freshwater flows and sea-level rise will increase sedimentation, especially in smaller channels, thereby reducing the availability of counter-currents at confluences.

Habitat for the dolphins, and associated fish and crustacean diversity critical to the lives of millions of Bangladeshi people, will be lost.

Information on the habitat and movements of freshwater dolphins can provide important insights on the broader scale impacts of human-caused changes to the ecology of the Sundarban mangrove forest. Actions taken to conserve their habitat will benefit the greater overall biodiversity that depend on similar environmental conditions. The BCDP is committed to saving these amazing animals as sentinels of ecological health for the waterways of life flowing through human communities, the forest and the sea.

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