Anemones are closely related to scleractinian corals as they are similar in structure. However, anemones lack a hard skeleton formed of calcium carbonate and are not colonial. Like scleractinian coral polyps, the tentacle of anemones contains single-celled symbiotic dinoflagellate called ‘zooxanthellum’, which imparts the brown colour. These symbionts living within the cells of anemone are essential to the host as they are responsible for producing high-energy substance (glucose) through photosynthesis, that leaches into the host tissue and forms an important dietary supplement. Hence, the growth of anemone depends on their relationship with its symbiotic alga. Besides the symbiotic relation with zooxanthellae, anemones from the genera *Heteractis* and *Stichodactyla* are also well known for mutualistic relationship with clownfish, *Amphiprion* sp. Even though the anemones are equipped with microscopic stinging cells called nematocysts located at the end of their tentacles, the associated clownfishes secrete special mucus substance to avoid stinging by their host. In addition to their ecological significance, sea anemones are reported to produce many biologically active polypeptides and proteins, like green fluorescent protein, which are used as pharmacological and biomedical tools and are of commercial importance.

Middle and South Andaman Islands have a fairly good fringing reef ecosystem, particularly the North Bay, Chidiyatappu, Ross and Havelock Islands. These reefs are dominated by *Porites lutea*, *Porites nigrescens* and *Acropora* spp. The appearance of corals or part of them in white (bleaching) is known to be associated with stress, which may be induced by sudden increase of sea-surface temperature (SST). The bleaching is caused by the expulsion of the symbiotic algae, zooxanthellae from coral polyps. Coral bleaching was observed in Andaman Islands from April to July 2010. During this period, almost 74% of live corals appeared to be in bleached condition at North Bay, Chidiyatappu, Ross and Havelock Islands (Figure 1). SST rose from 30.5°C to 34°C (April to May 2010) within the bays of Port Blair during this period. Rainfall data of the India Meteorological Department (IMD) have shown that due to delayed onset of the southwest monsoon, the summer period got extended beyond the normal cycle and caused rise in SST of study area. Moreover, the reason for this unusual SST observed in the summer of 2010 has been reported to be a combination of El Niño followed by La Niña, which was caused by climate change. The SST data of the National Environmental Satellite, Data and Information Service of NOAA (NESDIS) have shown 1–2°C increase above the normal level in the Andaman and Nicobar (A&N) Islands during 1 April to 24 May 2010. There were three bleaching events reported in the A&N Islands prior to this current event, i.e. in 1998, 2002 and 2005 (ref. 9).

Sea anemones of these reef ecosystems have also undergone bleaching similar to coral bleaching. The extent of anemone bleaching and percentage of recovery were estimated following Line Intercept Transect method on the GPS-fixed transect coordinates. During the study period, 100% of the anemones were recorded in bleached condition. Three different species of anemone, *Heteractis magnifica*, *Heteractis aurora* and *Stichodactyla* sp. hosting clownfishes were found to be bleached in all the three places studied from April to July 2010 (Figure 2 and Table 1). It was also observed that there was slight reduction in the clownfish numbers between the 2010 bleaching event and its corresponding recovery period. Similarly, there was significant reduction in clownfish numbers due to complete disappearance of several sea anemone species during the 1998 bleaching event reported from Sesoko Island, Japan. It was also reported that such bleaching event could affect the ability of the clownfish to detect chemical signals essential for locating their alternate anemone homes, which will ultimately affect their survival. However 100% recovery of *H. magnifica* in the North Bay and 80% recovery of *Stichodactyla* sp. at Chidiyatappu were

**Figure 1.** Study sites at South and Middle Andaman Islands.
Table 1. Status of sea anemone and associated clownfish during the bleaching (July 2010) and recovery (January 2011) periods

<table>
<thead>
<tr>
<th>Location</th>
<th>Anemone species</th>
<th>Cover (%)</th>
<th>Crown width (cm)</th>
<th>Bleaching (%)</th>
<th>Recovery (%)</th>
<th>Number of clownfish</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Bay</td>
<td><em>H. magnifica</em></td>
<td>0.5</td>
<td>35</td>
<td>100</td>
<td>100</td>
<td><em>A. ocellaris</em> – 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Havelock</td>
<td><em>H. magnifica</em></td>
<td>0.7</td>
<td>40</td>
<td>100</td>
<td>100</td>
<td><em>A. ocellaris</em> – 4</td>
</tr>
<tr>
<td>Ross Island</td>
<td><em>H. aurora</em></td>
<td>0.5</td>
<td>25</td>
<td>100</td>
<td>100</td>
<td><em>A. ocellaris</em> – 1</td>
</tr>
<tr>
<td>Chidiyatappu</td>
<td><em>Stichodactyla</em> sp.</td>
<td>1.25</td>
<td>25</td>
<td>100</td>
<td>80</td>
<td><em>A. clarkii</em> – 3</td>
</tr>
</tbody>
</table>

recorded during a subsequent study made in December 2010.

The mean SST observed during the recovery period (December 2010–January 2011) was 29.5°C and the transparency was in the range 8–10 m. NESDIS has shown that SST observed was 1°C less than the normal SST during December 2010 at South Andaman Islands. These conditions have helped to rebuild the zooxanthellae population and the normal brownish hue over time. This process may take three months or longer. At least five different types of cellular mechanisms of symbiont loss (expulsion, *in situ* degradation, digestion, exocytosis, and apoptosis and necrosis) from anemone host have been reported. A maximum of 100% and a minimum of 80% recovery have been recorded in sea anemones in the present study. Such a high rate of recovery suggests that the present bleaching was due to the elevated SST recorded during the summer months and the type of bleaching was a consequence of simple expulsion of zooxanthellae due to the stress induced by the elevated SST.

Description and phylogenetic characterization of common hydra from India

Hydra, a freshwater polyp belonging to phylum Cnidaria and class Hydrozoa, is globally distributed except in the Antarctic region and Oceanic islands. Although this organism has been extensively used as a model system in biology, there has been considerable uncertainty over its taxonomy, primarily due to lack of taxonomically distinct features. This created a doubt whether to put different hydra species under the genus Hydra, which was first reported by Carl Linné, or to refrain from naming any species, as a model system, it is necessary to describe the taxonomic position and phylogenetic relationship of Indian hydra with other species of hydra.

Polyps collected from a local pond were cultured by standard method. Live polyps were collected randomly from the glass beaker containing the animals. Hydra at various stages of budding were cultured overnight at 4°C (ref. 14). The pattern of budding distance using MEGA 4.0 software

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SCIENTIFIC CORRESPONDENCE


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