

## **Description of Additional Supplementary Files**

**File name: Supplementary Data 1**

**Description: Coral reef data that comprise coral community and environment data from 1990s to 2020.**

**File name: Supplementary Data 2**

**Description: Socioeconomic data that comprise socio-economic data in the southeastern region of Hainan Island and Xisha Islands from 2000 to 2020.**

**File name: Supplementary Data 3**

**Description: Panel model analysis of ecological factors affecting live coral coverage in different subregions.**

**File name: Supplementary Data 4**

**Description: Parameter estimates and standardized coefficients for the best SEM model.**

**File name: Supplementary Data 5**

**Description: The Multi-paths integration restoration of coral reef based on Integrated Coast-Reef Management (ICRM) framework.**

**File name: Supplementary Data 6**

**Description: Parameter estimates from the scenario analysis of local reef management based on Integrated Coast-Reef Management framework.**

**File name: Supplementary Data 7**

**Description: Parameter of factor variance analysis (Phase and subregion two-factor analysis of variance) in coral reef biome.**