

INTRODUCTION

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Recognising the importance of Western Australian coral reefs and the lack of knowledge about the reef systems, the marine group (now the Department of Aquatic Zoology) at the Western Australian Museum embarked in 1972 on a major program of documenting the fauna of coral reefs in the State. The first coral reef surveys were undertaken as a three-year program in the Dampier Archipelago from 1972 to 1974. Since then a series of expeditions has been made to various parts of the north coast of the State, including North West Cape, Shark Bay, and the Houtman Abrolhos Islands. Later grant funds were made available for offshore work, and there was a series of major expeditions to oceanic atolls: Rowley Shoals (1982); Scott and Seringapatam Reefs (1984); and Ashmore Reef and Cartier Island (1986).

In 1987 the survey work was extended to Christmas Island in the Indian Ocean, followed two years later by an expedition to the Cocos (Keeling) Islands. More recently the focus shifted to a series of expeditions to the Kimberley region in the extreme northeast of the State. In addition, major expeditions were made to the Muiron Islands off Exmouth and Bernier and Dorre Islands in Shark Bay in 1995. An international marine biological workshop was held in the Houtman Abrolhos Islands in May 1994. A major multi-year study of the Dampier Archipelago was commenced in 1997, made possible by substantial sponsorship support by Woodside Offshore Petroleum Pty. Ltd. In addition, numerous small-scale (1–3 people) surveys of individual areas were undertaken whenever possible.

The coral reef survey program has resulted in a major series of technical reports and published compilations describing the reefs examined on the

expeditions and reporting on the fauna collected (a complete list is in Berry and Wells, 2000). In addition, there have been numerous scientific papers on various phyla by authored by individual expedition members.

The present report on the Christmas Island Expedition is thus part of a major, long-term program by the Western Australian Museum to document the fauna of coral reefs in Western Australia and adjacent areas. Previously published reports in the series include: Rowley Shoals and Scott Reef (Berry, 1986); Ashmore Reef (Berry, 1993); Cocos (Keeling) Islands (Woodroffe, 1994) and the Montebello Islands (Berry and Wells, 2000). Other reports are currently being prepared on the Kimberley region, the Muiron Islands and Exmouth Gulf, and Bernier and Dorre Islands in Shark Bay.

Christmas Island

Christmas Island lies in the eastern Indian Ocean, between 10°25'S and 10°34'S and 105°34'E and 105°46'E. It is approximately 290 km south of Java, 850 km east of the Cocos (Keeling) Islands and 1400 km northwest of Australia.

Gray (1981) summarises the historical background of the island. Investigations of the marine fauna prior to the present survey are summarised in Table 2. Most early information resulted from the ten months spent at Christmas Island by C.W. Andrews of the British Museum of Natural History from July 1897 and collections made by C.A. Gibson-Hill, while he was medical officer on the island from September 1938 to November 1940.

There are several well-illustrated accounts of the physical features, geology and climate of Christmas Island: Wharton (1888), Andrews (1900), Gibson-Hill (1947a), Jongsma (1976), and Gray (1981). The

Table 1 Comparison of the fauna recorded at Christmas Island with that recorded by similar surveys by the Western Australian Museum. Data in parentheses are total numbers of species known from the areas.

Group	Christmas Island	Rowley Shoals	Scott Reef	Ashmore Reef	Cocos (Keeling) Islands	Montebello Islands
Hermatypic corals	88	184	213	247	99	141 (150)
Molluscs	313 (510)	261	279	433	380 (610)	633
Decapod crustaceans	127 (204)	—	56	99	150 (198)	—
Echinoderms	87	90	117	135	82 (89)	164 (170)
Fishes	294 (575)	485	483	559	245 (533)	457

series of limestone cliffs and terraces of varying heights and widths that characterise the above water topography of the island continues underwater. Narrow coral sand or rubble beaches occur in Flying Fish Cove and a few other beaches and small coves. Along most of the shoreline of Christmas Island, vertical or undercut cliffs with a height of between 5 m and 50 m drop straight into the sea to a subtidal terrace or fringing reef. The reef runs around almost the entire island, varying in width from a few metres to up to 150 m. At some places, such as Flying Fish Cove, Waterfall and Ethel Beach the terrace is divided into an intertidal platform which drops off, usually steeply to about 4-6 m, then continues as a gentle slope to between

10 m and 15 m. At this depth the bottom then plunges vertically or nearly so to between 30 m and 35 m, where there is frequently another narrow terrace. At several high-energy localities, notably near Steep Point, North West Point and Egeria Point, the intertidal platform is well above sea level and consists of a series of splash pools with rims raised by concretions of algae and vermetid molluscs.

The present survey extends the inventory of the marine fauna of Christmas Island to cover all the main subtidal habitats to about 20 m. Except for the work of Allen and Steene (1979), earlier studies have been concentrated in the intertidal zone.

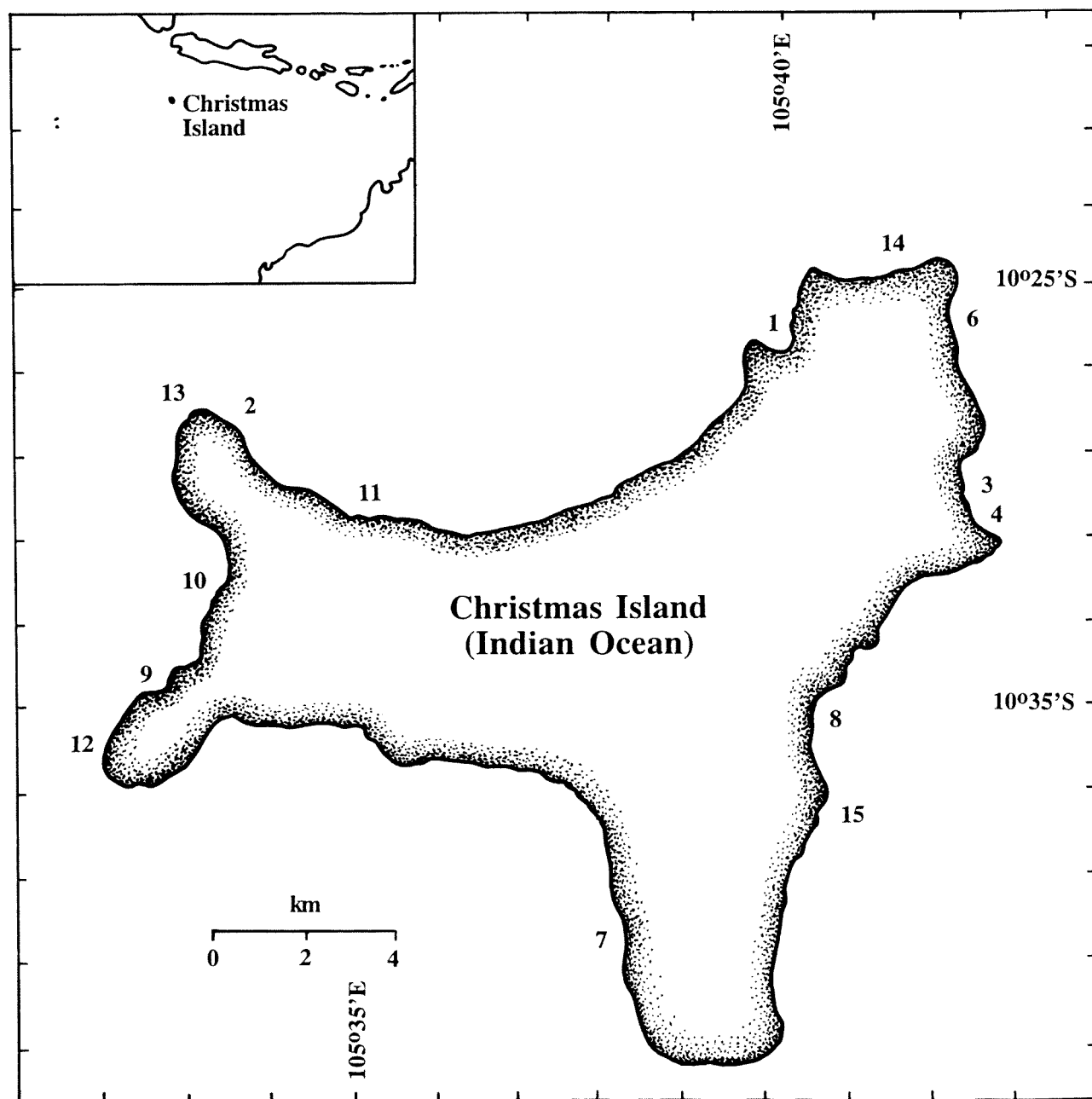


Figure 1 Map of Christmas Island showing areas sampled during the survey.

Table 2 Summary of previous expeditions and resultant publications on the marine fauna of Christmas Island.

Date	Expedition	Group	Author and Publication Date
1866	HMS "Flying Fish" (Capt. Maclear)	sponges echinoderms crinoid molluscs crustaceans	A. Dendy (1887) F.J. Bell (1887) A.H. Clark (1911) E.A. Smith (1887) R. Innes Pocock (1887)
1887 1897-98 and 1908	"Egeria" (J.J. Lister) C.W. Andrews (British Museum)	no marine specimens gephyrean worms molluscs molluscs fossil corals crustacea crustacea corals fishes sponges foraminifera	A.E. Shipley (1899) E.A. Smith (1900; 1911) T. Iredale (1917) J.W. Gregory (1900) J.G. De Man (1905) W.T. Calman (1909) H.M. Bernard (1911) C.T. Regan (1909) R. Kirkpatrick (1900; 1911) F.C. Chapman (1911)
1932	M.W.F. Tweedie (Raffles Museum)	molluscs crabs stomatopods barnacles starfish	J.R. Le B. Tomlin (1934) M. Ward (1934) M.W.F. Tweedie (1947) C.A. Nilsson-Cantell (1934) A.K. Fisher (1934)
1932/33	J.W. Harms	crabs crustacea	H. von Balss (1934) I. Gordon (1935)
1938-40	C.A. Gibson-Hill	echinoderms, crustaceans brachyurans	C.A. Gibson Hill (1947b) C.A. Gibson Hill (1947c) M.W.F. Tweedie (1947)
1961 1969	E.J. Car and G.F. Mees S. Slack-Smith, A. Paterson (Western Australian Museum)	fishes marine invertebrates (mainly molluscs, echinoderms)	R.J. McKay (1974) unpublished
1978	G.R. Allen, R.C. Steene (Western Australian Museum)	fishes	G.R. Allen & R.C. Steene (1979)
1978	R.W. George (Western Australian Museum)	terrestrial crabs	R.W. George (1978)
1984	Christmas Island (Natural History Association)	crabs	J. Hicks, H. Rumpff, H. Yorkston (1984)
1986	G.R. Allen, R.C. Steene (Western Australian Museum)	fishes	G.R. Allen (1988)

The objectives of the survey were to:

- describe the inshore marine habitats;
- provide an inventory of selected groups of marine organisms, particularly corals, crustaceans, molluscs, echinoderms and fishes;
- provide an assessment of the affinities of the marine fauna;
- identify marine areas of particular tourist interest or potential;
- identify inshore areas, habitats or species that may be affected by commercial or recreational fishing and development projects;
- assess measures that would be required to control possible impacts; and
- provide recommendations about the type and scale of future monitoring.

A detailed report (Berry, 1988) was provided shortly after completion of the survey to incorporate information on all of these objectives. The present publication provides details of the fauna collected during the expedition.

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