MATERIALS AND METHODS

SAMPLING DESIGN

The baseline study was designed to describe spatial patterns in the abundances of benthic sessile flora and fauna, and variation within and among reefs in five bays along the south-east coast of Magnetic Island. Preliminary surveys indicated that reefs along the south-east coast were qualitatively similar to each other but distinct from other reefs around Magnetic Island. Reefs around the north-western shore of Magnetic Island (Horseshoe Bay to Cockle Bay) were found to be mostly granite reefs or shallow mud-flats and were fundamentally different in physical and biological structure from the fringing reefs along the south-eastern side of the island. They were therefore considered inappropriate for consideration in the baseline and environmental impact studies for the Magnetic Quay development.

For the remainder of this document, 'station' will be used to refer to a tract of reef extending perpendicularly to the shoreline from the shallow reef crest to the outer edge of the reef slope and approximately 200m wide. Within each station, we haphazardly chose two sites within each of two depth strata (on the shallow reef flat; and deeper, on the reef slope). Replicate sampling units (transects, quadrats, sediment traps) were placed haphazardly within each site (Fig. 2). A total of 14 stations were sampled, allocated as shown in Figure 2.

The sampling design proposed originally (following review of the PER) was modified in four ways. Firstly, the fringing reefs at Florence Bay and Arthur Bay proved too small to support two complete stations, as originally proposed. Consequently, only one station was sampled at each bay (Fig. 2), and sites were well dispersed within the bays.

Secondly, the fringing reef in Picnic Bay was unlike those at the other bays and consisted only of a turbid, coral-poor reef flat area with little or no reef slope. The peninsular of reef extending from the southern end into the middle of the bay, however, was superficially similar to the fringing reefs in other bays and all sampling (two stations) in Picnic Bay was done on this reef (Fig. 2).

Thirdly, we have surveyed an extra station at the site of the proposed development (Nelly Bay station 0) to verify whether the area slated for excavation has any biological characteristics worthy of special attention (Fig. 2).

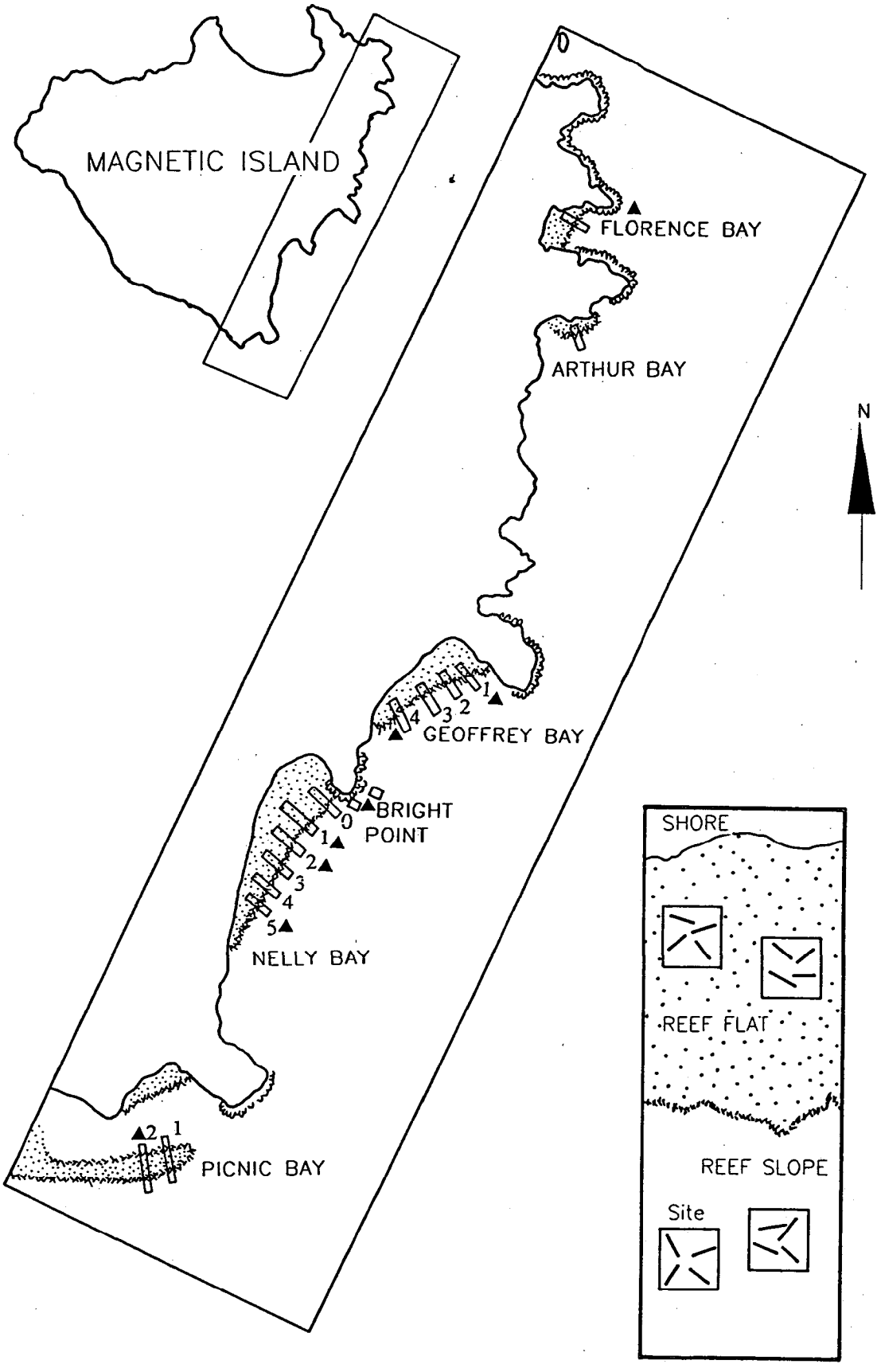

Figure 2

Detailed map of the bays sampled, showing the approximate locations of sampling stations. Numbers beside stations in Geoffrey, Nelly and Picnic are those used in the text in reference to these stations. Small open squares indicate the location of two sites at Bright Point. Triangles indicate the stations at which corals were tagged, sediment traps were deployed, and algae were collected (see text). The insert at lower right shows schematically the spatial arrangement of sites (squares) and transects (darker lines) at each station.

Finally, in both Nelly Bay (stations 0, 2, & 5) and Geoffrey Bay (stations 1 & 4), we surveyed pairs of transects oriented parallel with the shoreline at 50m intervals across the entire width of the reefs. These profiles provided a quantitative faunistic context within which to consider the data-set defined by the more structured sampling design. Water depths and times of sampling were also taken at each point across the reefs to allow approximate topographic profiles of the reefs to be drawn.

In summary, four stations were identified within Geoffrey Bay, and six were defined within Nelly Bay. Stations were equi-spaced along the reef in each bay. Two stations were surveyed at Picnic Bay but only a single station could be fitted onto the reefs at each of Arthur and Florence Bays. In addition, in accordance with specific requirements of the GBRMPA, benthic fauna and flora were sampled to the north of the proposed access channel for the marina. There was no effective reef crest between the channel and Bright Point, and so only deeper reef-slope sites were sampled to the north of the proposed access channel off Bright Point.

The above stations were chosen to represent areas of potential impact of the proposed development (impact stations) and areas expected to be free of impact (control stations). On the basis of preliminary hydrographic information (Parnell & van Woesik, 1988) and in view of their proximity to the proposed development, stations 1-5 in Nelly Bay (Fig. 2) and the southern station (4) in Geoffrey Bay were considered potential impact areas. These were the stations most likely to suffer any effects of the proposed development at the northern end of Nelly Bay. Note that station 0 in Nelly Bay will be dug up when construction begins.

The two stations nearer the north end of Geoffrey Bay (#1 & 2) and in the other three bays (Picnic Bay, Florence Bay, and Arthur Bay) were considered to be sufficiently hydrographically and geographically isolated from the area of development to have little likelihood of suffering any impact. These stations will be considered control stations against which the effects of development on reefs in Nelly Bay and Geoffrey Bay will be assessed.

Station number 3 in Geoffrey Bay (Fig. 2) was considered of uncertain status with respect to impact, and was sampled so that if an impact becomes evident at the southern end of Geoffrey Bay, the extent of that impact along Geoffrey Bay could be assessed against pre-existing conditions. Note that the sites off Bright Point are also likely to suffer any effects of development but do not fit into the general analytical framework of the rest of the sampling programme. Results from those sites will thus be compared to other stations after analysis.