3. METHOD

Grigg (1965) states that classification is the grouping of objects into classes on the basis of properties they have in common. The system presented here evolved from generally accepted classification concepts, and from a combination of two approaches to land cover classification.

3.1 Classification concepts

Given the two purposes listed previously, the following concepts were used in designing the classification system:

- The concepts of land cover mapping and its classification, as outlined in Appendix I, should be followed as closely as possible.

- The system should be a utility for recording interpretations of at least, Great Barrier Reef Landsat satellite and high and low altitude airborne imagery and ground data.

- Reef cover mapping can be done at many levels of detail. Image interpretation and ground data indicate that the classification should be designed on a least five levels of detail.

- The classification categories and classes should be expressed in the coral reef nomenclature proposed for adoption by Kuchler (1986a).

- The categories and classes presented should at least include the information sought by the remote sensing of coral reefs project conducted by Jupp et al., (1981a, b) and Kuchler (1984).

- The classification should be open-ended and easy to revise, since this work should be regarded as a focus for constructive criticism which will, with recommendations, evolve after revision into a classification system which will have considered all possibilities for the GBR (cf Ryerson and Gierman, 1975). Recommendations for revision should arise from colleagues after observations on currently unvisited and undocumented reefs.

3.2 Approaches to land cover classification

The first land cover classification approach used to construct the classification system is the image or classification approach. Here a geomorphological study of the available remotely sensed imagery, available ground data, and available GBR literature determines the types of reef zones and covers occurring on the GBR. Each feature is examined individually and some property (or properties) of it is used as the criterion (or criteria) for relating it to other features.

The second approach used is the logical division approach, where the classification system is built on information needed by the potential user (Ryerson and Gierman, 1975). In the classification system a created class is sub-divided into hierarchical levels on the basis of need. In the situation considered here these comprise reef zones and covers. In this deductive process, the entire range of GBR cover types should be considered before classes are created, since this makes the classification applicable to all reefs in the GBR. However, the total applicability to the GBR of the classification system presented here is constrained by research being concentrated on the more accessible reefs, and by the lack of ground and low level aerial data for many reefs (Kuchler, 1986a).

3.3 Listing reef terms

The classification system resulted from a combination of both these inductive and deductive processes. In the inductive process, pilot interpretation studies of the color aerial photographic and orbital multispectral scanner imagery available for Arlington, Green Island, Wheeler, Boulder, Upolu, Wistari, Heron Island and Howie Reefs (Figure 1) resulted in a listing of the reef zones and reef cover classes which occurred.

The pilot studies involved constructing interpretation maps from the color aerial photographic imagery at 1:12 000, 1:25 000 and 1:50 000 scales and interpreting sample sites approximately 79 by 59m in size, on LANDSAT MSS satellite imagery. These sample sites are approximately equivalent to the smallest unit of resolution on a Landsat image (pixel). Then the available ground data, collected mainly by transect methods for Heron Island, Green Island, Escape, Peart, Feather and Cayley Reefs (Figure 1), were examined to see if any additional reef zones and surface covers could be added to the list. The GBR literature survey of reef terms (Kuchler, 1986a) was finally consulted for additional reef zones and reef cover classes.

In the inductive process, however, the entire range of possibilities of reef cover types were not included in this data list. Also excluded were all the possible properties which could be used as criteria in assigning reef covers to classes at the various levels in the classification system. This is because of three factors;

- only a small number of reefs (eight) in relation to the total number of reefs (more than 2 000 individual reefs) (Done, 1982) on the GBR were used in the pilot study;

- the inadequate coverage of the GBR in the literature (Kuchler, 1986a); and,

- the inadequate present coverage of the GBR by low level aerial photography.

The classification system may therefore need to be extended when applied to some of the presently undocumented reefs north of Cooktown on the Queensland coast and some of the Ribbon Reefs (Maxwell, 1968) on the outer barrier of the GBR (Figure 1) because the collection of data from these two regions has been neglected (Kuchler, 1986a).

Consequently, the inductive procedure frequently results in the need to re-examine the use of particular criteria so that the relative importance may be adjusted to the hierarchy created within the classification system (Grigg, 1965).

In the deductive process, information about the type of reef cover class generated in the inductive process and needed by the interpreter of the reef imagery and the collector of field data is added to the list. Thus, the initial list of reef cover classes created in the inductive process is supplemented, in the deductive process, by additional information on all possible occurrences being considered. A final list was then sub-divided as far as possible into hierarchical levels on the basis of the purpose for the classification. Witmer (1978) states that since the US Geological Survey land-use and land-cover classification system is capable of being extended to more finite levels of classification, the inductive and deductive processes meet at the particular level in which the user has the most interest.