2. CLASSIFICATION SYSTEM DESIGN

The rationale behind, and the design of the classification system are described in Kuchler (1986b). To make this presentation more meaningful, a brief reiteration is given here.

The classification system was devised for the following two reasons;

- to provide a standard for classifying and labelling geomorphological information on reef covers and zonation. Such information may be derived from remotely sensed data or from field observations,

- to provide a standard which allows the comparison and evaluation of interpretations of different types of remotely sensed data.

The system is built on information needed by the potential user and is based on the logical division approach to classification (Ryerson and Gierman, 1975). It has both primary and secondary categorising structures.

2.1 Primary categorising structure

The classification system has five levels which form the primary categorising structure. Each level attempts to categorise reef features according to different criteria which are important to mapping of the GBR using remotely sensed data. Thus, the classificatory form and purpose are inextricably bound together. The criteria chosen for each level are as follows:

Level I : Zones
Level II : Features
Level III : Composition and/or position
Level IV : Condition and/or pattern and/or morphology
Level V : Presence

Table 1. Full listing of data categories as used in this classification system.

LI: ZONES	LII: FEATURES	LIII: COMPOSITION POSITION	LIV: CONDITION, PN, MORPHOLOGY	LV: PRESENCE
5 Ocean	5 Slope	5 Upper	5 Steep	5 0-10%
6 Off rf floor	6 Moat	6 Middle	6 Gentle	6 10-20%
7 Rf shoal	7 Smarine moat	7 Lower	7 Live state	7 20-30%
8 Rf flank	8 Patch rf	8 North	8 Dead state	8 30-40%
9 Mtple reef front	9 Coral Head	9 South	9 Mixed state	9 40-50%
10 Spur groove	10 Coral pool	10 East	10 Aligned Pn	10 50-60%
11 Rf slope	11 Microatoll	11 West	11 Truncated Pn	11 60-70%
12 Rf rock slope	12 Pool	12 Windward	12 Patched Pn	12 70-80%
13 Back rf z	13 Rock	13 Leeward	13 Reticulate Pn	13 80-90%
14 Patch rf z	14 Ridge	14 Phosphate	14 Dispersed Pn	14 90-100%
15 Rf rim	15 Rim	15 Reef	15 Remnant Pn	15 <.5m
16 Rf flat	16 Rampart	16 Rampart	16 Deltaic Pn	16 .5-1m
17 Rf top	17 Bassett edge	17 Beach	17 Sheet Pn	17 1-2m
18 Rf flat	18 Bank	18 Boulder	18 Circular	18 2-3m
19 Outer rf flat	19 Tongue	19 Algal coating	19 Oval	19 3-4m
20 Inner rf flat	20 Platform	20 Algae macro	20 Continuous	20 4-5m
21 Living coral z	21 Boulder tract	21 Algal encrust	21 Intermittant	21 5-6m
22 Dead coral z	22 Wedge	22 Seagrass	22 Isolated	22 6-8m
23 Aligned coral z	23 Terrace	23 Coral	23 Turbid state	23 8-10m
24 Rubble z	24 Shoal	24 Rubble	24 Moderate state	24 10-15m
25 Sand z	25 Chute	25 Shingle	25 Calm state	25 15-30m
26 Seagrass z	26 Sand patch	26 Sand	26 Coarse grained	26 30-35m
27 Lagoon	27 Rf rim lagoon	27 Sediment	27 Med grained	27 >30m
28 Shal lagoon	28 Lagoon wall	28 Conglomerate	28 Fine grained	28 Var depth
29 Med lagoon	29 Lagoon floor	29 Living margin	29 Supra tidal	29 Lgt cover
30 Deep lagoon	30 Beach	30 Dead surface	30 Inter tidal	30 Med cover
31 Blue hole	31 Dune	31 Breaking waves	31 Sub tidal	31 Hvy cover
32 Cay	32 Spit	32 Part vegetated	32 Single level	
33 Island	33 Spur	33 Clear vegetatn	33 Mtple level	
34 Cloud	34 Groove	34 Dune vegetatn	34 Enclosed	
35 Shadow	35 Perimeter	35 Mangrove	35 Part open	
	36 Vegetated	36 Mangrove swamp	36 Fully open	
	37 Unvegetated	37 Ponded water	37 Narrow gutter	
	38 Chnl btwn rf	38 Boat	38 Shal wide dep	
	39 Chnl rf top	39 Wharf	39 Perm feature	
	40 Chnl deltaic Pn	40 Building	40 Temp feature	
		41 Walking track		
		42 Engin Constr		
		43 Wreckage		

FOR ALL LEVELS

X Data anomaly
? Field data req
N Level not used

FOR ALL LEVELS

X Data anomaly
? Field data req
N Level not used

The categorising criteria are not strictly hierarchical, so decisions are not hierarchically dependent when classifying a mapped unit into more than one level.

2.2 Secondary categorising structure

The classification system was designed with a secondary categorising structure to allow for the classification of mixed data. Mixed data occur when a mapping unit is composed of a mixture of surface covers and/or zones. Consequently, it may classify into more than one category within any level in the classification system. Mixed areas are a significant feature of the reef surface when it is viewed from the resolution of a Landsat MSS image (1 pixel = 0.5 hectare).

One example of mixed data is the mixed pixels or 'mixels' which occur in satellite imagery because of a less than optimum relationship between the recording system resolution and target size. Another example is ground sample sites which, when determined by statistical random sampling methods, often occur on the boundaries between different reef covers or zones (Kuchler, 1984). Hallum (1972) states that, from space altitudes, many of the ground resolution elements are individually composed of a mixture of object categories and many of the data points generated by multispectral sensors are not characteristic of any single object category. Thus, the purpose of the secondary categorising structure is to allow for more than one category to be recorded for any level within the classification system. For example, a sample site on the ground corresponding to a 'mixel' on the Landsat image may be composed of both a living and a dead coral zone, so category numbers 21 and 22 of Level I would be recorded.

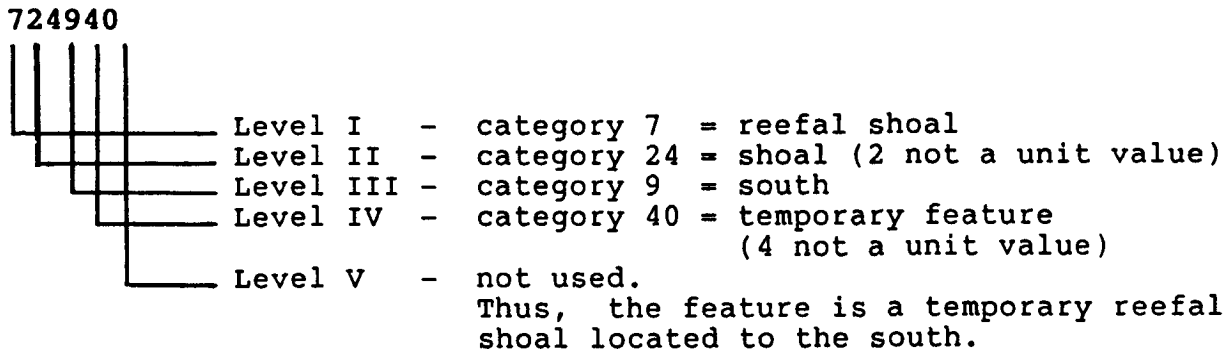
2.3 Multiple entries

The classification system also has multiple entries since some features categorise into more than one of the five levels. The term 'beach' for example, is a category of both Levels II and III. This is because 'beach' is both a reef feature (Level II) and the composition of a feature (Level III), as in the term 'beach ridge' where 'ridge' is the feature and 'beach' is the composition.

2.4 Coding symbols

The numerals 5 to 49 were chosen as the classification coding symbols for the following two reasons:

- They support a five column matrix from which original unclassified information can be systematically retrieved. Numerals 1 to 4 have not been used, and therefore are not unit value coding symbols. These numerals have been reserved for the retrieval process where they indicate that the coding symbol in the recording is a value in tens rather than a unit value. For example, the entry **724940** is retrieved as:



Numerals greater than 49 cannot be used for coding symbols because they are prefixed by numbers which are used as unit value coding symbols. The number of categories available for classification at each level is therefore limited to forty-nine.

- In transferring data between interpreter and interpreter; interpreter and recorder; and operator and computer files; a shorter, simpler and more accurate communication exists with numerals, rather than with upper and lower case alphabetic letters.