INTRODUCTION

Aquatic vascular plants hold extra-ordinary botanical interest. They comprise a perplexing assemblage of growth habits and are often astonishingly plastic in somatic organisation, so that their wide phenotypic variation creates acute problems for the taxonomists. Compared with land plants, their vegetative body exhibits numerous structural modifications. Some of these may have adaptive significance. In certain aquatic angiosperms vegetative reduction is so extreme that orthodox morphological distinctions, as of stem, root and leaf, may no longer be easily drawn. During the reproductive phase of many species, profound reduction and specialisation are again evident, often accompanying the transition from aerial to submerged flowers, from entomophily to anemophily to genuine hydrophily, and from a freshwater to a marine existence. There are also tendencies towards the replacement of allogamy by autogamy and of sexual reproduction by vegetative propagation. The natural affinities of most families of aquatic vascular plants are obscure and have long evoked immense speculation and controversy.

It is difficult to suggest a definition of vascular aquatics that is universally acceptable yet not utterly artificial. The difficulty arise mainly because aquatic habitats cannot be sharply distinguished from terrestrial ones. In most climates there is a seasonal fluctuation of the water table. Habitats with standing water for most of the year may dry out completely in the summer whilst normal terrestrial soils may be flooded during a rainy season. At no time is there an abrupt change from land to water, but rather a gradual transition from dry through waterlogged to submerged soils. The reversion of vascular plants to aquatic life has involved colonisation of all these transitional habitats as well as the water itself, and some of the marginal sites that are periodically flooded have come to possess their own distinctive plant associations (Noirfalise and Sougne, 1961).

Many woody and herbaceous plants, which are considered typically terrestrial, tolerate periods of partial or total immersion, often
developing structural modifications comparable in kind and sometimes in degree with those of a naturally submerged plant. Certain polymorphic plants exhibit quite different phenotypes in water, wet muddy soil and drier sandy soil. In monsoon climates the number of normally emergent or terrestrial plants that produce distinctive submerged foliage throughout the rainy season is legionary. In view of their morphological responses, these plants may usefully be claimed as hydrophytes, whether they reproduce during immersion or not.

Weaver and Clements (1938) regarded herbaceous vascular hydrophytes as plants growing in water, in soil covered with water, or soil that is usually saturated. Muenchener (1944) restricted this slightly to those species which normally stand in water and must grow for at least a part of their life cycle in water, either completely submerged or emerged. Similarly, Reid's (1961) concept of hydrophytes as plants 'whose seeds germinate in either the water phase or the substrate of a body of water, and which must spend part of their cycle in water' embraces an assortment of aerial-leaved plants as well as submerged floating-leaved and free-floating types. Fassett's (1957) working definition was equally comprehensive.

There are four main life forms which are related to the plants position with respect to the water surface (Sculthorpe, 1967). (a) Free-floating plants, (b) submerged plants generally attached to the bottom by roots, (c) attached plants with floating leaves and (d) surface plants with vegetative part normally emerging above the surface of the water. In the present investigation keeping in mind these four life forms, the plants have been considered as aquatic in broad sense involving the study of their seeds and seedlings with reference to taxonomy.

Seeds and small fruits exhibit a complex and high morphological and micromorphological diversity, providing valuable taxonomic information. Their overall shape, colour, size, surface pattern, and in
particular, their internal structure (including ultrastructural characters) can be of high systematic significance. Seed characters are only slightly influenced by environmental conditions. Their high structural diversity provides most valuable criteria for classification at different taxonomic levels. Seed sizes and shapes both represent complex adaptive compromises. Seed size involves a compromise with seed number (Gunn, 1972).

Mean seed weight tends to be a fixed characteristic of each species. Amongst the angiosperms it ranges over ten orders of magnitude, from the dust-like seeds of orchids which weigh about $10^{-6}$ gm, to the enormous seeds of the double coconut (Lodoicea maldivica) which weigh up to 27 kg (Harper et al., 1970). Seed size is at least partly a function of the size of the parent plant. On a world-wide basis it has been calculated that trees, shrubs and herbaceous plants have mean seed weight of 328, 69 and 7 mg. respectively (Levin and Kerster, 1974).

Seed weight in many angiosperms is phenotypically one of the least flexible characteristics. Many experiments involving plants grown under a range of different conditions (such as gradients of nutrient availability or of competition) show that while most organs can vary markedly in size, mean seed weight usually remains almost constant. As a matter of fact most taxonomists agree that data concerning the structure and microstructure of seeds are of great significance for the classification of angiosperms taxa (Barthlott, 1984). Consequently the application of seed data to taxonomy is rapidly increasing.

In taxonomic, and seedling literature remarks are occasionally found concerning the importance of seedlings for systematic considerations. Differences in seedling morphology have sometimes been a basis for rearrangement of classification. It has been assumed, sometimes tacitly, that in natural genera the seedlings must be similar (Vogel, 1980). An explicit supporter of this view was Leonard (1957), who adduced
many facts for it. In African Cynometreae and Amherstieae (Leguminosae - Caesalpiniaceae) he discovered that differences in blastogeny and morphology of the seedlings are correlated with the differences in the adult plants. This led him to the conclusion that in those groups 'the seedlings of all the species of one "good" genus have the same structure or in other words, only one type of seedlings is predominant in each "good" genus'. On this basis he developed four working hypotheses indicating the value of seedlings for classification in the groups he dealt with.

The value of seedlings for systematic considerations varies largely with the taxonomic level at which they are used. Seedlings of one species are as a rule very uniform, although they may differ in such characteristics as speed of development, measurements of the parts, etc. as these may be influenced by environmental factors.

Although the organs, and characters of seedlings are limited in number, their diversity is so great that specific combinations of morphological characteristics may serve for the purpose of identification of seedlings. This has been demonstrated by Csapody (1968) and Miller (1978), who proved that it is possible to construct keys by means of which seedlings of almost entire regional floras can be identified.

Evidently, both seeds and seedlings of angiosperms including their survey, may be of profound interest in the systematic studies which may open up new vistas of understanding of the aquatic angiosperms connected with the phylogeny and interrelationships of the investigated taxa.