where the plant's requirements were satisfied, and only in this linear part of the curve was the plant of value for prospecting.

When they examined nickel accumulation in *Hybanthus*, Severne and Brooks found that the relationship between accumulation and nickel concentration was hyperbolic, suggesting that the plant has a physiological requirement for nickel. Such a requirement is difficult to explain because nickel is normally regarded as a non-essential element in plant nutrition. If a need for nickel exists in this species, however, it would seem to be restricted to the Eastern Goldfields area of Australia because populations of *Hybanthus* from elsewhere in the country do not possess this capacity for nickel accumulation. It may be that the Eastern Goldfields populations of *Hybanthus* have developed this physiological adaptation as a response to a localized selection pressure. Thus although *Hybanthus* will be of limited value for the biogeochemical prospector, it poses some interesting problems to the plant physiologist and ecologist.

SERRANID FISHES

American Groupers

from our Marine Vertebrate Correspondent

It is a paradox of zoology that in general it is the largest animals which are the least known or studied, and this is particularly true of systematic studies which traditionally were laboratory based. One group of large fishes which illustrates this paradox are the groupers, or sea basses of the family Serranidae. The family forms an important component of the tropical and subtropical marine shore fauna; many of its members are large and in places are important food and game fishes. But there has remained a considerable area of doubt concerning the nomenclature and relationships of many of these fishes principally because their size has precluded the preservation of adequate material for study. The groupers (defined as the members of the genus *Epinephelus*, or its numerous synonyms) of the coasts of America have recently been critically reviewed by C. Lavett Smith (*Bull. Amer. Mus. Nat. Hist.*, **146** (2), 67; 1971) with considerable clarification of nomenclature and of their relationships.

Smith admits that the world-wide classification of the serranid fishes remains unsatisfactory, but in view of the size of the family (some 300 species are recognized) and because the physical size of many of the species makes museum collections unrepresentative, study of the forms around the American continent gives a clearer view of the

general problem. The groupers (some species are known as jewfishes and hinds) are well represented in American warmer seas, and Smith recognizes some thirty-five species. The Western Atlantic and Eastern Pacific species are intimately related, and several species occur in both oceans, for example, the jewfish, *Epinephelus* (*Promicrops*) *itajara*, which reaches a weight of more than 700 pounds (317 kg) and is the largest of all American groupers. In spite of its size this fish is found in the shallow shore zone, where it feeds mostly on crustaceans.

It is not, however, only the size of some species with the morphometric and coloration differences between young, immature and adult fishes that has caused confusion in the past. The colour of most groupers resembles that of their immediate surroundings and is accordingly variable within the species. Some species, however, assume colour patterns of vertical or oblique bands during sleep or anoxia, and these have in the past been assumed to be taxonomically significant. Another species, the coney, *E. fulvus*, has a very distinctive excitement colour phase which is totally different to its normal colour, and other species have highly distinctive deep-water and shallow-water colour phases (the deep phase is usually bright red). Not surprisingly, such variations in colour have been faithfully recognized in the past as taxonomically important and in the case of the black grouper (*Mycteroperca bonaci*) one nineteenth century worker gave this species six separate names each based on different colour phases.

Smith's revision removes confusions such as these, and is a major contribution to a better understanding of the groupers of the Americas. He also attempts a phylogenetic analysis of the species in the area and discusses barriers to dispersal and methods of transport available to this group. This study shows that although conventional taxonomic methods based on museum material may be difficult when the animals involved are large, when museum collections are supplemented by extensive field observations a clearer synthesis of the group is possible.

EXPERIMENTAL PSYCHOLOGY

Flashes of Brilliance

from a Correspondent

It seems that some more clues are emerging to clarify the connexion between intelligence and the electrical activity of the brain. Although electroencephalographic (EEG) techniques, in association with psychological tests, have been used successfully for some time to indicate brain damage and

mental retardation in patients, the precise relationship between the EEG and normal intelligence is still not clear. Conflicting evidence has been accumulating ever since Berger demonstrated in 1929 that the EEG could be used to monitor neural activity in the central nervous system.

Three years ago H. Weinberg (*Nature*, **224**, 813; 1969) showed that neural responses in the cortex (known as the visual evoked potential), as measured by the EEG, to brief flashes of light correlated with verbal intelligence; and more recently D. Shucard and J. Horn working at the University of Denver have found (*J. Comp. Physiol. Psychol.*, **78**, 59; 1972) that the latency of visual average evoked potentials (AEPs) also correlates with intellectual ability; thus long AEP latency was associated with low ability, and short latency with high ability.

To ensure satisfactory variance in both ability and AEP measurement, Shucard and Horn used subjects varying in occupation, age (16 to 18 years), sex and socio-economic status, and gave them a series of tests designed to measure different kinds of intelligence, including apprehension-span tests, visual speediness (as measured, for example, by the number of errors a subject makes when crossing out target numbers from a list of numbers), visualization tests, in addition to comprehensive measures of general ability. Subjects were later tested for AEP latency in several experimental conditions in which they were asked to respond to a light stimulus by pressing a button, simply by counting the flashes, or just by passively attending. Although correlation between these evoked cortical potentials and human abilities was significant, it was relatively small.

It was particularly interesting, however, that the correlation was greatest in conditions of low alertness rather than in conditions of higher enforced alertness, for example, when the subjects were pressing a button. These results support earlier work, for example, by Lansing, Schwartz and Lindsay (*J. Exp. Psych.*, **58**; 1959), and one interpretation of the data implies that the evoked potential represents a degree of intellectual arousal in which more intelligent subjects can maintain their alertness even during boring conditions, whereas duller subjects apparently cannot motivate themselves.

Shucard and Horn also point out that this ability of brighter individuals to regulate their state of alertness according to the task in hand agrees with the results obtained by Dinard and Defayolle (*Aggressologie*, **10**, 525; 1969), although this interpretation does not altogether explain this latency-ability phenomenon.