oxygen diffusion, Laing[8,9] supplied aquatic plants with an atmosphere of nitrogen and showed that some species, such as pickerel weed (*Pontederia cordata*), grew well, whereas reedmace (*Typha latifolia*) did not, again confirming the interspecific differences in anoxia tolerance. But the nitrogen supply used by Laing could not be regarded as totally oxygen free,so his results still did not establish how long various plant species could survive in strictly anoxic conditions.

R.M.M. Crawford has long maintained that the tolerance of a plant species to flooding is a function of its metabolic adaptation to the low oxygen tensions in its tissues. One obvious effect of oxygen scarcity on a non-adapted plant is the build-up of ethanol to toxic levels in its cells, this being the end point of glycolysis in anaerobic conditions. Crawford was able to show that flood tolerance involved the control of ethanol production[10] and with McManmon[11] he proposed that in anoxic conditions, the glycolytic pathway is diverted to oxaloacetate and (non-toxic) malate which, if the activity of malic enzyme were impaired, would accumulate and a return to pyruvate and ethanol production would be prevented. In flood-tolerant species such as *Glyceria maxima* and *Iris pseudacorus*, they found that malic enzyme was indeed inactive and malate accumulated. Subsequently, Crawford has shown that in tolerant trees, malate accumulates in response to flooding and ethanol production is controlled[12], and that in pea seedlings anoxic death is closely related to the build-up of ethanol, an internal concentration of 60 μM being apparently the critical survival threshold[13].

If the response of a plant species to flooding indeed depends on its metabolic adaptations rather than its efficiency in translocating oxygen from another part of its body, then one should be able to observe interspecific differences in survival under strictly anoxic conditions. It is precisely this experiment that Barclay and Crawford[14] have now carried out to vindicate the metabolic theory. They have grown a range of species under an oxygen-free nitrogen atmosphere (85 per cent N_2, 10 per cent H_2 and 5 per cent CO_2) in the presence of a palladium catalyst to ensure a total absence of oxygen. They found that some species, for example the bulrushes *Scirpus lacustris* and *S. maritimus*, not only survived but continued to grow over 14 days, whereas others, such as *Phragmites* and *Iris*, survived but showed no growth after 7 days, and another group, for example *Glyceria maxima* and *Juncus effusus*, failed to survive the week. This latter group included, rather surprisingly, rice (*Oryza sativa*) which has previously been regarded as particularly anoxia tolerant.

The capacity of some wetland plants to survive in conditions of strict anoxia, together with the degree of variation found among the species tested, strengthen very considerably the assertion that flood tolerance can, at least in part, be explained at the cellular, metabolic level. □

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100 years ago

NEW OR RARE ANIMALS IN THE ZOOLOGICAL SOCIETY'S LIVING COLLECTION

THE PIGMY HOG (*Porcula salvania*). — Few additions to the Zoological Society's living collection of late years have attracted more attention than the Pigmy Hogs of Nepaul, of which the first specimens ever imported into Europe reached the Gardens in May last.

For our first knowledge of the existence of this diminutive form of the pig-family in the sub-Himalayan forests we are indebted to the researches of Mr. Bryan H. Hodgson, formerly Resident at the Court of Nepaul, who described the Pigmy Hog so long ago as 1847, in an article published in the Journal of the Asiatic Society of Bengal. While the Wild Boar, or a species closely resembling it abounds all over India, the Pigmy Hog is exclusively confined, as Mr. Hodgson tells us, to the deep recesses of the primeval forests of the Terai of Nepaul and Bhotan, where it roams about in herds. It is very rarely seen even by the natives. A well-known hunter informed Mr. Hodgson that during fifty years' abode in the Saul forests he had obtained but three or four of these animals to eat, partly owing to their scarcity, and partly to the speed with which the females and young disperse, and to the extraordinary vigour and activity with which the males defend themselves while their families are retreating.

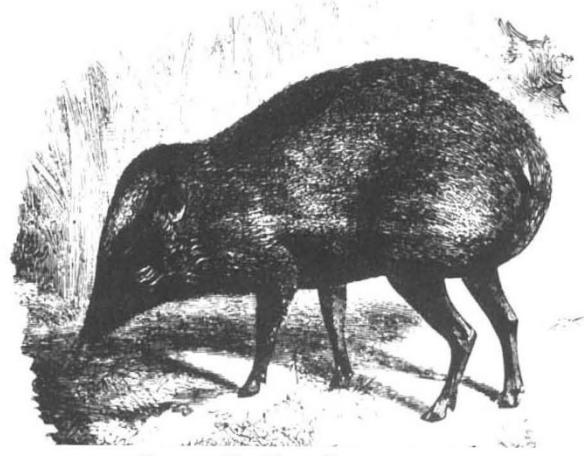

FIG. 23.—The Pigmy Hog.

THE CABOT'S TRAGOPAN (*Ceriornis caboti*). — The Tragopans, or Horned Pheasants, constituting the genus *Ceriornis* of naturalists, must be ranked amongst the finest and most brilliantly coloured representatives of the splendid group of Indian game birds. Two of them — the Crimson Tragopan of the Central and Eastern Himalayas, and the Black-headed Tragopan of the Western Himalayas and Cashmere, are well known to Indian Sportsmen, and are familiar objects of pursuit, though we believe, by no means easily procured. The Crimson Tragopan was introduced into Europe by the Zoological Society in 1859, and has frequently bred in their Gardens, as has likewise the Temminck's Tragopan (*Ceriornis temminckii*), first received by the Society in 1864.

Between the furthest known eastern range of the Crimson Tragopan and the frontiers of China a fourth species of *Ceriornis* has its home — Blyth's Tragopan (*C. blythii*).

The fifth and last species of Tragopan, lately acquired by the Zoological Society, is still more rare and little known than the four above-mentioned members of the genus. Cabot's Tragopan, as it is called, was described in 1857 by the late Mr. Gould, and subsequently figured in his great illustrated work on the Birds of Asia. Its habitat is South-Eastern China, but little is yet known of its exact range. The only naturalist who has met with it in its native wilds is the celebrated Chinese explorer, M. le Père David. M. David, in his "Oiseaux de la Chine," tells us that he found this fine Gallinaceous bird rather common in the wooded mountainous range which separates the provinces of Folien and Kiangsi, when he traversed this district in the autumn of 1873.

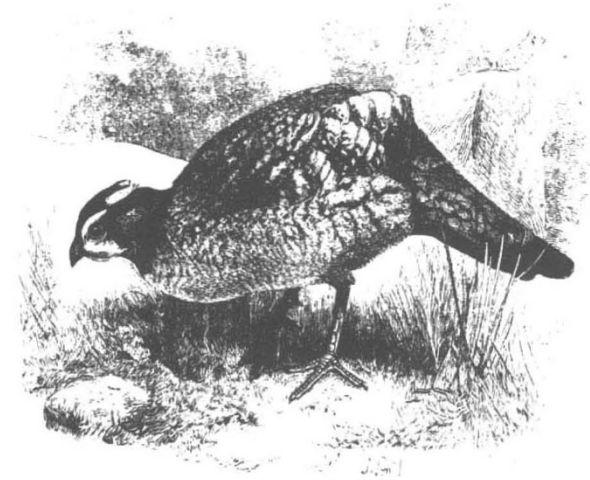

FIG. 25.—The Cabot's Tragopan.

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