FRESHWATER FISH

Pollution by Introduction

from our Marine Vertebrate Correspondent

IN spite of all the recent concern over our polluted environment, there are glaring gaps in our defences. Something is now known about the pollution of the native biota in North America by the introduction of exotic animals and plants. E. A. Lachner, C. R. Robins and W. R. Courtenay jun. (*Smithson. Contrib. Zool.*, **59**, 1; 1970) show that twenty-five non-indigenous species of fish have been introduced and established in the United States and Canada. Some are imports of long standing; for example, the European brown trout arrived in the 1880s and the carp half a century before. Both these fish were officially sponsored introductions of food or sporting value, but the carp, in particular, has proved to be one of the most disastrous aquatic introductions made, and considerable sums have been spent in recent decades by some States to control the fish in their waters.

So-called fisheries management by introductions, transplantations and hatchery interbreeding of trout stocks has effectively destroyed many of the native trout populations of the west coast of the United States. At least thirty-three nominal species of trout had been described (often inadequately) and the ecology and biology of many remain unknown. Among those now extinct are the emerald trout of Pyramid Lake, Nevada (*Salmo smaragdus*), and the royal silver trout (*S. regalis*) of Lake Tahoe, California and Nevada.

Lachner *et al.* report the greatest biotic pollution in North America to be in the State of Florida, which they describe as a biological cesspool of introduced life. As many as fifty-seven species of exotic vertebrates are numbered in the fauna of Florida, ten of which are well established fish species. Several species of cichlid, from both South American and African stocks, are now widespread in the state, and are thriving, it is feared, at the expense of native fish. Some of these cichlids have been released with the object of improving sport fishing; others are the result of accidental escapes from the stock ponds of aquarium fish dealers. One of the most potentially damaging of the second category is the release of the Asiatic walking catfish, *Clarias batrachus*, a fish which reproduces prolifically, has rapid growth, maintains itself in dense populations, and can distribute itself easily through waterways or overland. A member of the Florida Game and Fresh Water Fish Commission is reported to have said that this fish is out of control, and that there is no practical method of eradication available.

Lachner *et al.* also comment on the Asiatic grass carp, *Ctenopharyngodon idella*, a gross browser on aquatic vegetation, the feeding habits of which have great international appeal as a "cheap" method of keeping open waterways. This fish has been imported into the United States and is being kept in ponds by many federal, state and other agencies. Its establishment in the open waters at least in the south would seem to be a serious possibility, and as Lachner *et al.* conclude, it could become a serious pest, perhaps more so than its near relative the carp has proved to be. It is as well to remember that the carp was introduced and protected in the eighteenth century by the then federal authorities, so the same sponsors for the grass carp are no guarantee that it could not prove to be another expensive introduction.

ORNITHOLOGY

Wild Mynah Calls

from our Animal Behaviour Correspondent

THE remarkable imitative powers of the Indian hill mynah (*Gracula religiosa*), which make this bird such a popular pet, are the subject of a recent investigation by Brian Bertram (*Anim. Behav. Monogr.*, 3 (2), 81; 1970). His study, carried out in Assam in north-eastern India, reveals some curious facts about the vocalizations of wild mynahs. For instance, although adult mynahs are seen in pairs for much of the year and pairs of birds breed together in successive years, a bird does not imitate its mate. Each mynah has between five and twelve "calls", but each member of a pair has a completely different call repertoire. Birds will, however, tend to make at least some of the same calls as those made by neighbouring mynahs of the same sex. There are thus distinct local dialects confined to one sex. Young mynahs imitate the calls of adults but, surprisingly, probably do not imitate other species, for no wild adult was ever heard to imitate any species but its own. This means that mynahs presumably have some means of recognizing the sounds of their own species in spite of the great variation from one individual to another. The fact that captive mynahs so readily imitate human noises is, Bertram believes, because human whistles and our low-pitched voices are very similar to wild mynah calls.

Variation between the calls of one individual mynah and another, combined

Arguments about Ageing

BROADLY speaking, there are two major theories about the mechanisms of ageing; one proposes that the process is genetically controlled and allied to development, and the other suggests that the major factor involved is random cell damage mediated either by mutation or through errors in protein biosynthesis. There is no conclusive evidence in support of either hypothesis and two recent reports do not really throw much light on the matter.

The evidence provided by Lints and Lints in next Wednesday's *Nature New Biology* suggests that the first idea might be the most tenable, because interference with development during the larval stage of *Drosophila* subsequently affects the lifespan of the adult. In one of their experiments batches of larvae were maintained at different temperatures and, as might be expected, because the body temperature of the larva is controlled by that of its environment, it was found that development was delayed in those batches kept at the low temperatures. The interesting point, however, is the effect which this subsequently had on lifespan, for lengthening the developmental period increased the life of the adult. They have also shown that the developmental period can be prolonged when the larval population density is high, and again this is reflected in increased longevity. Their work thus suggests that the first of the theories might be correct, but it has also been shown recently (C. M. Lewis and R. Holliday, *Nature*, **228**, 877; 1970) that cellular damage resulting from errors in protein biosynthesis can cause death.

Lewis and Holliday have shown that in two senescent mutants of the fungus *Neurospora*, death is preceded by an accumulation of altered protein, presumably resulting from errors in protein biosynthesis. The presence of amino-acid substitutions was demonstrated by an increase in the thermolability of glutamic dehydrogenase enzyme and the extent of the altered protein was determined by measuring the relative amount of immunological cross reacting material. The most interesting of their findings, however, was the association of a high mutation rate with the increasing alteration in protein and they suggested that this was mediated by changes in enzymes concerned with DNA synthesis. Death in this instance might therefore result from errors in either protein or the hereditary material.

This work with *Neurospora*, although it provides evidence that alterations in cellular proteins can accumulate and cause death, does not necessarily have a direct bearing on the mechanism of ageing in higher organisms. Neither, however, as the Lints point out, does the fact that increasing the lifespan by "stretching" the developmental programme necessarily mean that ageing is genetically controlled. It is possible that the two theories are not mutually exclusive, for a factor which has not yet been ruled out is whether the frequency of errors is under genetic control.