resistant strains were exposed to $H_2SM$, then the drug was removed by dialysis and the sub-particle tested in the misreading system. Surprisingly, the subparticle showed the same extent of misreading as a control sample, which had $H_2SM$ added back during the misreading test. Thus, streptomycin is capable of inducing a new stable conformation of the ribosome, which persists after removal of the drug.

In spite of these interesting findings, the evidence that the SM or $H_2SM$ bind specifically to the RNA moiety of the 30S particle is still not very convincing. SM binds to 16S RNA and 30S subparticles equally well (two moles per particle), but in an earlier publication (Biswas and Gorini, *Proc. natn. Acad. Sci. U.S.A.*, **69**, 2141–2144; 1972) a significant binding to 50S particles and 23S RNA was also found under these conditions (0.7 and 1.3 moles respectively). Further, since the binding was measured after exhaustive dialysis rather than under saturating conditions, the number of moles bound are not necessarily saturation values. Garvin *et al.* showed that SM prebound to 16S RNA could prevent the assembly of proteins under reconstitution conditions when proteins from *E. coli* B were used, whereas it had no effect when proteins from *E. coli* K were used. In the latter case, the SM remaining bound was reduced from 2 moles to 0.6 to 0.7 moles. It cannot be excluded (as the authors themselves suggest in a slightly different context) that this is due to a specific protein-mediated dislodgement of the SM from the RNA followed by rebinding to the 30S particle.

The case for binding of streptomycin to the protein moiety of the 30S particle has been put by Schreiner and Nierhaus (*J. molec. Biol.*, **81**, 71–82; 1973). These authors distinguished two types of $H_2SM$ binding. "Type A" (high affinity) was exhibited by 30S particles, and "Type B" (low affinity) by 50S sub-particles, and 16S or 23S RNA. Type B binding could be suppressed by high concentrations of ammonium chloride, whereas the Type A binding was unaffected, and was always considerably higher than the Type B binding. A Scatchard plot revealed that at high ammonium chloride concentration the 30S particles bound 0.8 moles of $H_2SM$ per particle (a figure which is in close agreement with the residual binding mentioned above). Binding to 30S particles could be reduced to Type B levels by removing some of the proteins with high salt, and Type A binding could then be restored by adding back the proteins in the cold. Analysis of the individual proteins showed that S3 and S5 were the most effective in this respect. But although these experiments show a direct involvement of these proteins in streptomycin binding to the ribosome, they cannot be taken as proof that the drug binds directly to the protein moiety.

So, the question of where streptomycin binds remains unresolved. At the moment the evidence seems to favour the view that the proteins are more important than the RNA, but it may well turn out that, in the complex environment of the ribosome, both nucleotide and amino acid residues are involved.

# Aquatic biological pollution in Florida

*from a Correspondent*

Of all the ways in which man has affected the flora and fauna of the world one of the most profound has been by introducing exotic species wherever human colonies have been established. In the last century acclimatisation societies flourished with the object of introducing "beneficial" animals to various parts of the world, often with severe consequences to the native biota. Today, introductions still continue but are more often due to accidental release than deliberate introduction. A recently published study by Courtenay, Sahlman, Miley, and Herrema (*Biol. Conservation*, **6**(4), 292–302; 1974) of the exotic fishes in fresh and brackish water in Florida illustrates most graphically the extent of biological pollution in this state which now contains 38 species of exotic fishes.

Thanks to its mild climate and the supply of even-temperature water from wells, Florida is the major centre in the United States for the aquarium fish industry. Some 250 fish farms exist in the state, producing nearly 80% of the pet fish for the United States. Exotic species are often unintentionally released through unprotected effluent channels, or in times of flooding. Others are dumped into open waterways when holding pools are cleared for the reception of new stock. Courtenay and his colleagues made 62 collections of fishes in central and southern Florida between July 1970 and July 1972. Thirty-eight exotic species and several hybrids between these species were found; of these 20 species and five hybrids were found to be established as breeding populations.

Not all the established exotics came directly from fish farms: some are due to release of unwanted fishes by aquarists, research workers, and to stocking by angling interests. The spread of the pike killifish (*Belonesox belizanus*) is an example. In 1957 fifty specimens were released after a medical research project was terminated; it now occurs over some 160 square miles of Dade County, and in places makes up 20% of the fish biomass, no mean feat for a slender fish of 20 cm maximum length! Others seem to be less successful—two white piranhas (*Serrasalmus rhombeus*) were caught in an (abandoned!) swimming pool in South Miami, the survivors of several after an unusually cold winter.

The walking catfish (*Clarias batrachus*) has spread rapidly and continuously since its first escape in the mid-1960s. It is an undemanding fish, capable of withstanding almost deoxygenated conditions and moderate salinity; it is also able to tolerate dessication, as well as migrating overland during rainy periods. In the dry season catfish tend to aggregate in numbers in small ponds and kill most of the animals in the pond in a few weeks.

At least eight species of cichlid fishes have become established, while others have been found. One of them, the South American black acara (*Cichlasoma bimaculatum*) is the most widely distributed exotic fish in southern Florida, and is the only exotic in the Everglades National Park. Courtenay *et al.* have found that in the Fort Lauderdale area it is the dominant fish, comprising 64% of the total fish biomass. In one canal it formed 80%, but elsewhere its contribution to the fish biomass ranged from 5 to 30%. An African cichlid, the blue tilapia (*Tilapia aurea*) is now found over the greater part of northern Florida. This cichlid was claimed by the news media to be an excellent food and game fish, and was quickly spread by fishermen to other areas from its original site of introduction dating from 1961. Unfortunately it was found to be practically valueless as a game fish, and is only now being evaluated as a food fish. It has proved to be an extremely effective competitor for the native fishes, and in many eutrophic lakes now dominates the fauna.

Courtenay and his colleagues document these and the remaining exotic species in detail, but have little to say on the effects of this biological pollution on the native fauna. Undoubtedly it has been considerable, and possibly the full effects have not yet been established. They do, however, propose some remedies to stem the flood of new exotics, most particularly in drawing attention to the state statutes which already forbid the release of non-native species. Enforcement of such statutes from the outset would have prevented much of this pollution and it is greatly to be hoped that action now can contain the problem to its present, already serious limits.