

HIGH ALTITUDE FISHERIES WITH SPECIAL REFERENCE TO KASHMIR*

A PART from J. J. Heckel's first-hand work (1836) and G. T. Vigne's (1842) no detailed account of the fish and fisheries of Kashmir exists, except for a few reports and reviews published from time to time. The River Jhelum and its tributaries, together with the large number of lakes lying in Kashmir, afford a unique opportunity for high altitude fisheries.

McClelland (1838), Gunther (1868), Day (1877-89), Lawrence (1895) and Hora (1954) and later workers have more or less confirmed 18 species of fishes. Of these *Schizothorax* Spp. (*S. esocinus* and *planifrons*) with its ubiquitous distribution (Manasbal, Dal Lake near Naseembagh and also Nishatbagh, Anchar Lake, Tehl-Bil Nalla near Khanpur, Jhelum River near Chattabal and Sopore and Baramula, Woolar lake, Arpat River, Achabal Trout hatchery) and medium size (30-40 cm.) is probably worthwhile cultivating extensively. Like the Murrel (*Ophicephalus*) in U.P., M.P. and Bihar this Himalayan Trout *Schizothorax* may still become the poor man's food. This would entail detailed studies on the food habits, habitats and general ecology of *Schizothorax* Spp. As no sand and mud is found in the stomach, possibly it is a

mid-feeder on molluscs and insects and also plant material. This would indicate selective distribution of fry and fingerling in only the Eutrophic lakes and fertile streams. The oligotrophic lakes so characteristic of Kashmir would not give a good yield of these fishes.

The hybrids *Oreinus-Schizothorax* of Jhelum may also be investigated since they show sand in their stomachs and may inhabit the bottom niche in the same waters as *Schizothorax*, and since *Oreinus* is definitely rheobiont (running water) and not limnobiont. The feasibility of these species forming a part of high altitude fisheries elsewhere in India may also be tenable.

The genus *Oreinus* (*Plagiostomus*) is distributed in the rivers and lakes in Himalayan and sub-Himalayan regions, extending from Kashmir to Bengal. It is of moderate size (25 cm.) and may be cultivated widely in high altitude fisheries of India. Besides *Schizothorax* and *Oreinus*, the introduction of European Pike (*Esox*), Brown trout (*Salmo trutta fario*), Rainbow trout (*Salmo irideus*, *S. gairdnerii*), new fisheries could be established as in Kashmir, Himachal Pradesh and Kumaon (U.P.). Mirror carp, *Cyprinus carpio specularis* (as introduced in U.P.) may also be promising and needs consideration for oligotrophic high altitude lakes of India.

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AURORAL GREEN LINE IN METEOR WAKES

THE auroral green line 5577 Å which is emitted by metastable atoms of neutral oxygen is a prominent feature in the spectrum of the aurora and night sky. It has also been identified among the low-excitation lines of planetary nebulae.

The origin of the line in the auroral region and night sky is explained as follows: Extreme ultra-violet radiation, less than 1000 Å, ionizes $O_2 \rightarrow O_2^+$ and $N_2 \rightarrow N_2^+$. In the latter process the charge is given up to O_2 almost immediately. In dissociative recombination, $O_2^+ + e \rightarrow O' + O''$, where one or both the resulting oxygen atoms may be in an excited state (1S 4.17 ev, 1D 1.96 ev). The forbidden transition $^1S - ^1D$ produces the green line.

In a recent study (*Astrophys. J.*, 1960, 131, 25) of a number of meteoric spectra which were photographed during the years 1955-58, the auroral green line 5577 Å has been found in at least 12 of the spectra. The study reveals that

the line is normally confined to the top portion of the photographed trail with an extreme height range of from 120 to 79 km., and that at times of increased solar activity the line appears to persist to lower heights.

An important result that has come out of the investigation is that all meteors showing λ 5577 have been fast meteors. Of the 12 meteors involved there are 4 Orionids (66 km./sec.), 7 Perseids (60 km./sec.) and 1 Lyrid (48 km./sec.). Although the Lyrid was quite a bright meteor, the green line in it is extremely weak.

The excitation mechanism for the auroral line in meteor trains is obscure but probably it involves ionization of either atmospheric or meteoric origin. The strong dependence on velocity also suggests some high-energy quantum processes. In any case it cannot be the same as for normal lines in meteor spectra, including some permitted oxygen lines.