REPORT ON ECTOPARASITIC INFECTIONS OF FRESH WATER FISH IN AFRICA*

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Introduction

The extension and improvement of inland fishing, as well as the development of fish culture, is now becoming an important item in development programs designed for African countries. Extensive development of water resources has resulted in the formation of large numbers of small and large water reservoirs, which have also become available for fish culture.

Parasites, particularly ectoparasites, are an important limiting factor in the development of intensified fish culture. Under over-stocking conditions and in nurseries, parasite populations quickly build up and may cause heavy mortality in the stocked fish.

The study of fish parasites and diseases in Africa is still in its preliminary stage and has mainly been concerned with the parasites of fish in natural lakes and rivers. There is a great deal of information on parasitic crustacea (Capart, 1944, 1956, Fryer, 1956, 1959, 1960, 1964, 1965 a & b, and others,) and lately also on monogenetic trematodes (Paperna, 1965 & in press, a, b, Paperna & Thurston, in press a, b, c,). More meterial on ectoparasitic protozoa and Cnidosporidia is now being collected and processed.

In natural waters, some balance is usually achieved between the fish-host and the parasite, and it is difficult to predict the potential pathogenic effect of the parasites under conditions of intensive culture. Fish culture in Africa is still at an early phase of development, breeding is still far from being intensive, and often, particularly in dam reservoirs, the fish population is still under-stocked. It is

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therefore difficult to attempt to predict and evaluate the potential pathogenic parasite species in the African fauna. Moreover, the establishment and adaptation of parasites to pond environment may be a long process.

Some of the information and experience available in Israel can be applied. African Cichlidae are common in Israel, and they are cultivated in fish ponds. Fish culture is highly intensified and both Cichlids and carp are bred under the local warm climare conditions.

A. Parasitic Protozoa

The available data on parasitic protozoa are limited and fragmentary. Recently, a survey of ectoparasites was carried out in fresh water fish in Ghana. Infections of skin and gills with Cnidosporidia were very common in fish in the Volta Lake as well as in the coastal plain streams. Cysts of Myxobolus were found on the gills as well as in the skin and the superficial muscular tissue. Infection occurred in Cyprinidae, Cichlidae, Characidae and Siluroidea. Cysts containing Henneguya (in Cyprinidae) and Thelohanellus (in Citharinidae), were also collected from the gills.

Trichodina spp., occurred frequently on the studied fish and a few individual fish were found with extremely heavy infections. Such fish, Cichlidae, and Alestes leuciscus, were collected from stagnant pools in drying river-beds. Tilapia spp., Hemichromis bimaculatus, Barbus spp. and species of Cyprinodontidae were found to become heavily infested when introduced into laboratory aquaria and maintained there, crowded, for some weeks. In such fish, in addition to Trichodina, a species of Castia was found, which was possibly different from C. necatrix. The Barbus (B. Sublineatus) maintained in the laboratory aquaria also developed large subcutaneous foci of Myxobolus. All these infections were pathogenic, and the affected fish died. In East Africa, Baker (1960) found some Myxosporidians in internal organs of cichlids: Fryer (1961) found microsporidian cysts on fins and other superficial tissues of Tilapia variabilis in Lake Victoria.

B. Monogenetic Trematodes

Early surveys and collections, carried out by several workers in different parts of Africa, failed to recover monogenetic trematodes from the gills and the skin of the studied fish. No monogenetic trematodes were found in fish collected at the future Kainji dam site on the Niger (Ukoli, 1960a), only one species from the Volta river fish (Thomas, 1957), and none later in the newly formed Volta Lake (Prah et al., 1966). Some four species were described from African fish, collected from casual checks of fish in museums, aquaria or fish markets (Malberg 1957, Prudhoe, 1957, Gussiev, 1960, and Fischthal & Kuntz, 1963).

Our recent studies of fish, simultaneously in Uganda and Ghana, quite suprisingly in view of the existing information, resulted in the recovery of over 50 endemic species belonging to 13 genera, (Dactylogyridae and Diplozoon), of which 9 are endemic to this continent, (Paperna, 1965, in press a, b, Paperna and Thurston, in press a, b, c,) of these, 2 genera occur also in fish of African origin (Cichlidae and Clarias lazera) in Israel (Paperna, 1964a).

Only a few fish species were found free from any gill monogenea: species of Mormyridae, Cyprinodontidae, some species of Barbus and the fresh water clupeid Cynotrissa mento.

In the Volta lake as well as Lake Victoria the /that other species of fish/ were examined, with the exception of Cichlidae and the pelagic populations of Barbus macrops and juvenile Pelonulla afzelius in the Volta, were usually found all infected. The parasite load in the fish in these lakes was also found to be very high, usually more than 20 per fish, and more than 200 per fish on Bagrus docmac in Lake Victoria.* In some of the other habitats studied, the infection rate in the collected fish was very low (in certain dam reservoirs, streams etc.). In Cichlidae, the prevalence of infection varied from 10%-90%, with the different habitats and parasite species. The

*According to Greenwood (1966), these parasites may be a contributing factor in the periodic mass mortalities of Bagrus docmac in Lake Victoria.

worm load per fish was usually only in the range of 5-10. Earlier observations on the infection of Cichlids in Israel showed that there is a certain mechanism which controls the growth of the monogenean population even under over-crowding conditions (unpublished data).

Gyrodactylus and allied viviparous genera were found on the skin of Cichlidae, Cyprinidae, Characidae, and Cyprinodontidae as well as on Ophiocephalus, Clarias spp and Polypterus (in the latter species, of the genus Macrogyrodactylus Malberg, 1957). Another skin parasite is Onchobdella pterigyalis recently described from Hemichromis spp. (Paperna, in press b.). These skin parasites, with or without the association of skin protozoa, often cause severe damage and death to fry and fingerlings under experimental conditions of over-crowding; these parasites may be a potential pest of hatcheries and nurseries.

Carp have been introduced to some parts of the continent. When first introduced into Uganda, there were heavy losses in carp fry at Kajansi, due to Dactylogyrus infection (Pruginin, 1965). Parasite specimens collected from carp in these ponds, at a later date were identified by Dr. A.V. Gusseiv as Dactylogyrus minutus.

C. Metacercariae of Digenetic Trematodes

Infections with metacercariae in fish are common. Pigmented cysts on the skin, known as "The Black Spot Disease" (most commonly caused by Diplostomatid metacercariae), are common, particularly on fingerlings of Cichlidae in many lakes in East Africa (Fryer, 1961 b, and Thurston, 1967). These metacercariae are occasionally found also in young Cichlids in Ghana.

Other metacercariae, forming non-pigmented cysts on the skin and the gills (Hetrerophyidae, Diplostomatidae and Echnostomatidae), are common too in East African fish (Thurston, 1967) and were occasionally found in our surveys in Ghana.

In East Africa, Strigeiid and Diplostomatid metacercariae frequently penetrate the eyes of cichlid fish (Thurston, 1967). Such infections are potentially dangerous if fish cultures become affected.

Cysts of Clinostomum and Euclinostumum are common in fish in East Africa (Thurston, 1967) as well as in Cichlids and Barbus spp. in Ghana and Nigeria (Ukoli, 1966 b, c,). Metacercariae were located in the superficial and pharyngeal muscles of the host. Infections with Clinostomum tilapiae, Ukoli, 1966, were particularly high in Tilapia zilli (prevalence rate of 63%) and T. houdeloti (p.r. 37.5%) reared in Dungua farm fish ponds near Accra (Ukoli, 1966 b,).

D. Parasitic Crustacea

In the African continent, the fauna of Crustacea parasitizing fresh water fish is extremely rich in species and genera. Genera such as Lernaea, Ergasilus, and Argulus, species of which are common pests of fish in countries of long established fisheries, are very prevalent in African fish.

Lernaea cyprinacea and Lernaea barminiana occur in many morphological varieties; different populations show marked variability in host specifity, or host preference, as well as in the site of attachment on the infected host. Also the separation between these two allied species is occasionally difficult, in view of the above mentioned morphological and physiological variability (Fryer, 1961 ac).

Whereas in Israel, Cyprinidae (Barbus and Varicorhinus) and particularly Carp in ponds are the most prefered host, and Cichlidae are found only rarely heavily infected (Paperna, 1964 a), in Africa heavy infections are common in Cichlids.

L. cyprinacea causes severe damage to Tilapia spp. in Lake Victoria while anchoring on the lips of the host (Fryer, 1961 b, c,). In Ghana, heavy infections were observed in Tilapia galilaea, T. zilli and T. nilotica, stocked in small dams (of 4-50 acres). The parasites were anchored on the skin, and badly affected the fish. Significant damage was also caused to fingerlings of T. galilaea (from 20mm. long) infected, each with a single mature female parasite. The parasite proliferated deep into the host tissue and was anchored into the intestine, liver or even the brain.

L. barminiana apparently causes severe damage to Barbus spp. in the Victoria Nile, while infesting their buccal cavity walls. The parasite on the other hand is rare among the same fish species in Lake Victoria.

Ergasilus is very common on many inland water African fish, and many species are known. In the newly formed Volta Lake, infection with this copepod is highly prevalent. They are particularly common (over 50%) with frequently more than 10 specimens per fish in Synodontis spp., Pellonula (Microtrissa) afzelius and Alestes spp. In Cichlidae, infestation is far less common, with only a few specimens on each infested fish. Exceptionally heavy infections were found in Clarias lazera locked in a small pool in a drying river. Extremely heavy infections with Lamproglena spp. were also found occasionally in the Lake on individual fish (Hydrocyon sp.); in such infections the gills became significantly deformed.

Observations on gills infected with Ergasilus and Lamproglena showed that the severity of the histopathological changes in the affected gills varies in infections with different species of parasites. In severe types of infections, the gill tissue turns into an amorphous mass of hyperplastic tissue in which the parasite is deeply embedded.

In East Africa, heavy infestations of Ergasilus are found on Lates albertianus in Lake Albert. Fryer (1965 b) considered that the gills suffered little damage with this parasite, but Greenwood (1966) suggests that parasitization of the gills is one of the factors contributing to an observed periodic mass mortality of Lates in this lake.

Experience in Israel shows that when fish are acclimatized in ponds the Ergasilus normally associated with the fish in natural water may reproduce intensively in the new environment and within a few years may become a serious pest. Ergasilus became a serious pest of Mullet (Mugil spp.) introduced into carp ponds. Moreover, this parasite also became adapted to Carp, though at present infections apparently are not pathogenic in the latter host (Lahav and Sarig 1967).

E. Other parasites

Leeches were reported to attack the eyes and nostrils of Carp maintained in Mungua farm fish ponds. The fish died as a result of this infection (Ghana, 1964).

Importation and introduction of fish

From year to year there is an increase in the rate of transporting live fish into and outside the African continent. Commercial fish are introduced to African fisheries, while small aquarium fish are exported to Europe and North America. It is already evident that some Dactylogyrus species were introduced into local cultures with imported carp (Pruginin 1965). It was shown earlier that ectoparasites of fish of temperate or even cold climates may become adapted to environments of subtropical waters (Paperna, 1964 b). On the other hand ectoparasites usually successfully survive their introduction to aquariums, and some of the introduced african species, particularly Trichodina, Costia, Cnidosporidia, and Gyrodactylus, may apparently also reach local commercial fisheries and become adapted to the new environments.

As most of the transportations of fish into and inside the continent are carried out by professional international agencies (F.A.O. etc), national scientific and bilateral technical aid organisations, the imposing of sanitary measures is feasible, providing the importance of such measures is appreciated.

SUMMARY

An account is given of our present knowledge of ectoparasites of fresh water fish in Africa. Parasitic protozoa such as Trichodina, Costia and Cnidosporidia, monogenetic trematodes, and metacercariae as well as parasitic crustacea are common in local fish, and are potentially dangerous to fish cultures, now expanding in the continent. There is already evidence of serious epizootics due to Lernaea spp., some species of skin and eye metacercaria, Cnidosporidia and Leeches. Such epizootics occured in fish ponds, small dams and also in large lakes and rivers. Recent introduction and transportation of fish into and outside Africa may accelerate pathogenic infestations in fish. Species of Dactylogyrus have already been imported into the continent with carp, the fingerlings of which suffered heavy mortalities due to infection with the parasite.

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