

9. A PRELIMINARY CHECK LIST OF INFECTIOUS EUKARYOTES (PARASITES) OF FISHES FROM THE BELGIAN CONTINENTAL SHELF

9.1. INTRODUCTION

Infectious diseases and more specifically parasites play a crucial role in the population dynamics of invertebrates and vertebrates (May & Anderson 1983). The regulation and genetic selection of natural host populations is influenced by the dynamics and heterogeneity of the environment, inter-specific interactions (predation, competition, infections by viruses, bacteria and parasites) and intraspecific interactions (cannibalism and competition). Interesting is that the biology of the parasite is tightly linked to life history traits of the intermediate and final host. Co-evolution, which has been described as a continuous biological arms race, and co-speciation occur commonly.

Marine fish parasites principally belong to five taxa (Fungi, Protozoa, Platyhelminthes, Nematoda and Crustacea). Viruses and infectious Bacteria, which may be considered as parasites and play crucial roles in the marine food web, are for practical reasons excluded from this review. Since a systematic inventory of the fish parasites and their hosts of the Belgian Continental Shelf doesn't exist, we attempted to compile records scattered throughout the refereed and non-refereed (grey) international literature, including some records from last century. The checklist is complicated by the ambiguous status of many taxa.

9.2. PRELIMINARY CHECKLIST

FUNGI: There is only one species record, *Ichthyophus haferi*, which has been observed on whiting (Declerck, pers comm.)

PROTOZOA: The first records have been documented by Van Beneden (1871). His data have not been included in this review because of their historic value and taxonomic uncertainty. Many species are infected by *Glugea stephani* (Microsporidia) (Declerck 1993; 1998; Geets 1986; Van Damme 1985). *Haemogregarina simondi* (Sporozoa) infects the erythrocytes of common sole (*Solea solea*) and Atlantic cod (*Gadus morhua*) (Declerck, pers comm.). Van Damme (1985) found *Trichodina* sp. on the gills of plaice.

MONOGENEA: infect a single host. The first records have been documented by Van Beneden (1871) but his data have not been included because of their historic value and uncertainty on the taxonomy. Several genera

have been observed of which the genus *Gyrodactylus* includes more than 400 species (Malmberg 1998). The local inventory mentions *G. arcuatus* which parasitizes threespined stickleback (*Gasterosteus aculeatus*), *G. micropsi*, *G. forma minutus*, *G. forma pictus* and *G. longidactylus* which parasitize amongst others gobies of the genus *Pomatoschistus* (Geets et al. in prep.). Important spatio-temporal differences in population dynamics and host specificity have been observed. *Diclidophora* infects the gills of bib *Trisopterus. minutus* (*D. minuti*) and *T. luscus* (*D. luscae*) (Tirard et al. 1992).

TREMATODA / DIGENEA: infect an intermediate and a final host. *Cryptocotyle lingua* is a general parasite with sprat (*Sprattus sprattus*) and greater sand eel (*Hyperoplus lanceolatus*) as intermediate host and carnivorous fish and birds as final host (Declerck 1992a; 1998; Groenewold et al. 1996). *Asymphylogora demeli* is a final host of gobies of the genus *Pomatoschistus* (Hamerlynck et al. 1989). *Derogenes varicus* has been found in gobies of the genus *Pomatoschistus* (Geets, pers. comm.). *Zoogonoides viviparus* is a common parasite of plaice in the Southern Bight of the North Sea (Wickins & Macfarlane 1973). *Aphalloides coelomicola* infects the common goby (Vaes 1978).

CESTODA: are also characterised by an intermediate and final host. Pierre-Joseph Van Beneden compiled his observations along the Belgian coast in two studies (1850, 1864). The tapeworm *Bothriocephalus scorpii* infects *Pomatoschistus* as intermediate host (Hamerlynck et al. 1989) and turbot (*Scophthalmus maximus*) as final host (de Groot 1971). *B. gregarius*, which also infects turbot, shows genetic differences between the North Sea and the English Channel (Renaud et al. 1990).

NEMATODA: : *Anisakis simplex* infects Atlantic herring as intermediate host and *A. pseudoterranova* (cod worm) whiting and cod on the Belgian Continental Shelf (Davey 1972; Rae 1972; Declerck, pers. comm.); whales are each time the final host. The intensity of the infection coincides with the occurrence of the host (Van Banning & Becker 1978). *Hysterothylacium aduncum* occurs in the abdominal cavity of *Pomatoschistus* gobies (Hamerlynck et al. 1989). *Cuculanus heterochrous* occurs in plaice and dab (*Limanda limanda*) collected in the Southern Bight of the North Sea (Geets 1986; Van Damme 1985; Wickins & Macfarlane 1973). *Contracaecum aduncum* infects the body cavity of plaice and dab (Geets 1986; Van Damme 1985) and the stomach of *Pomatoschistus* gobies (Fonds, pers. comm.). *Capillaria wickinsi* generally infects plaice (Van Damme 1985; Wickins & Macfarlane 1973).

CRUSTACEA: The first detailed observations on the crustacean parasites of the Belgian Continental Shelf have been made by Pierre-Joseph Van Beneden (1861). *Tripaphilus (Lerneonema) musteli* (Van Beneden, 1851) was observed on smooth hound (*Mustelus mustelus*) and the new copepod genus *Kroyeria lineata* on unspecified fishes (Van Beneden, 1853a). The genus *Eudactylina acuta* was observed on the shark *Squalus acanthias* for the first time (Van Beneden, 1853b). The distribution, morphometry, cycle and host specificity of *Lernaeocera branchialis* and *L. lusci* (junior synonym of *L. minuta*) has been described by Declerck (1992a,b, 1993 and 1998), Van Damme & Hamerlynck (1992), Van Damme et al. (1992, 1994, 1996 and 1997) and Van Damme & Ollevier (1994, 1995 and 1996). The infection dynamics of *L. branchialis* on O+ whiting are characterised by an infection peak in late spring and in fall. Infection of the adult sand goby *Pomatoschistus minutus* by *L. lusci* occurs in spring; in early summer the parasites become adult while most hosts die in July after spawning. There are possibly three forms of *L. lusci* (*f. lusci* on whiting, *f. minuta* on *Pomatoschistus* and *f. lyra* on dragonet) which affect the metabolism (hematocrit titre) of the final host. *Lepeophtheirus pectoralis* occurs commonly on plaice of the Southern Bight of the North Sea (Wickins & Macfarlane 1973). *Acanthochondria cornuta* is found in the gill cavity of plaice (Van Damme 1985). The isopod *Rocinela danmoniensis* occurs rarely on whiting (Declerck, pers. med.).

In total, we report 32 parasite taxa, which by no means represent the complete inventory. For comparison, Boxshall (1974) observed 39 parasitic copepods on 41 fish species in the western North Sea. Groenewold et al. (1996) observed a narrow link between parasite (22 species) and host (4 small and middle-sized fish species) from the diet of the host in the Wadden Sea.

9.3. CONCLUSION

Eukaryotic parasites may be studied from two perspectives. They regulate populations by affecting fitness and in selected cases survival, and they are markers of the host by providing insight in his historic and current movements. The latter is useful to study phylogeny, population dynamics and genetic structure (phylogeography) since knowledge of the genotypes of host and parasite provides a double marker system. Genetic research on marine parasites in the English Channel and the Southern Bight of the North Sea is limited to the Monogenea *Gyrodactylus* (Cunningham 1997; Zietara et al. submitted), the Cestoda *Diclidophora* (Tirard et al. 1992) and *Bothriocephalus* (Renaud et al. 1986, 1990). Tirard (1991) and Van Damme (pers. comm.) observed genetic differences in the copepod *Lernaeocera* without providing further details. Nevertheless, issues such as the evolution of the local fish fauna as well as genetic selection on the heavily fished fish populations could be addressed in this manner. Fluctuations in the quality and quantity of the fish fauna of the North Sea have been attributed to climate variations and overfishing. The contribution of each remains unclear, but an important structuring force of the fish populations might be apart from food, the impact of infections by viruses, bacteria and parasites. The general lack of knowledge in these fields hampers a conclusion in regards to spatio-temporal occurrence, population dynamics, ecology and population genetics.

ACKNOWLEDGEMENTS

We thank D. Declerck (Ministry of Agriculture, Dept. Marine Fisheries) for complementary information on fish parasites.