

SOME FISH SPECIES OF THE NORTHERN ATLANTIC ATTACKED  
BY COPEPODS OF THE GENUS *SPHYRION*  
AND THE PATHOLOGICAL ALTERATIONS IN REDFISH FILLETS  
CAUSED BY *SPHYRION*-INFESTATION

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**Introduction**

The female of *Sphyrion lumpi* is a conspicuous parasitic copepod which frequently attacks the Redfish. This copepod anchors with its hammer-shaped head (cephalothorax) in the fillet of the host. The neck is partly in the fillet of the host and penetrates the skin. The trunk with the appendices abdominales are visible outside the host. The head, neck and trunk are several centimetres long. When the eggstrings are present, it is one of the largest parasitic copepods on fishes in the northern Atlantic.

**Host range**

The fish species which have so far been described as hosts of *S. lumpi* are listed in Tab. 1.

The Blue ling (*Molva dypterygia*) was recently recorded as a new host. This infested Blue ling was caught in the sea off eastern Greenland in 1983. The cephalothorax of the parasite was located in the degenerated left eyeball of the fish.

**Intensity of attacks on various fish species**

Of all economically important fish species, the Redfish is most frequently attacked by *S. lumpi* in all fishing areas. Although the two types of Redfish (*Sebastes marinus* typus *marinus* and *S.m.* typus *mentella*) have a different biology, both are hosts of *S. lumpi*.

The extensity of invasion of Redfish population can exceed 40%. We have counted up to 10 parasites on one Redfish.

TABLE  
List of fish species described as hosts of *Sphyrion lumpi*

Fish species	Fishing area	Author
Lumpfish <i>Cyclopterus lumpus</i>	North Sea, Iceland	Krøyer 1845
Cod <i>Gadus morhua</i>	Norwegian Coast	Wilson 1901 Berland 1969
Hake <i>Merluccius merluccius</i>		Wilson 1901
Blue hake <i>Antimora rostrata</i>		Wilson 1901
<i>Nematonurus armatus</i>		Wilson 1901
Wolffish <i>Anarhichas lupus</i> <i>Anarhichas denticulatus</i>	North Sea, Iceland, Greenland	Scott 1905 Leigh-Sharpe 1928
Redfish <i>Sebastes marinus</i> t. <i>marinus</i> <i>Sebastes marinus</i> t. <i>mentella</i>	Eastern and Western North Atlantic	Wilson 1919, 1931
Grenadierfish <i>Macrourus berglax</i>	East Greenland	Templeman, Squires 1960, Priebe 1980
Greenland halibut <i>Reinhardtius hippoglossoides</i>	Norwegian Coast, Labrador	Berland 1969 Rokicki 1982
Grey sole <i>Glyptocephalus cynoglossus</i>	Newfoundland	Tomasiewicz 1982
Blue ling <i>Molva dypterygia</i>	East Greenland	1983

The "pointed headed" Grenadier fish (*Macrourus berglax*) is the second most frequently attacked commercial fish species (ca. 1%). Except for the Redfish and the Grenadier fish, the other hosts are seldom attacked by *Sphyrion lumpi*. It is my opinion that these fish species are only occasionally hosts.

**Comparison of the morphology of *Sphyrion* specimens which appear on Redfish and Grenadier fish**

Long- and short-necked *Sphyrion* specimens can be distinguished on Redfish. It was assumed that these two kinds of *Sphyrion* were different parasites. It was discovered that the length of the neck depends on which body region the parasite has attacked. Short-necked *Sphyrions* are usually present on the lateral side of the fish's body where the thick musculature is located under the skin.

Long-necked *Sphyrions* are located near the bones of the fins, gills or head. The proximity of bones determines the growth of an individu-

al *Sphyrion's* neck. This explains why long- and short-necked *Sphyrions* appear on the same host. The same phenomenon is observed in the case of Grenadier fish.

By comparing the width of the head and trunk, remarkable differences are discovered on Redfish and Grenadier fish (Tab. 2).

TABLE 2

Morphological comparison between adult female specimens of *Sphyrion* from redfish (*Sebastes marinus*) and from Grenadier fish (*Macrourus berglax*)

Host	<i>Sebastes marinus</i>	<i>Macrourus berglax</i>
Number of specimens examined	10	12
Range of cephalothorax width $W_c$	10–18 mm	16.5–31 mm
Range of trunk width $W_t$	12–21.5 mm	11–24 mm
Ratio of $W_c/W_t$ average	0.85	1.33
Ratio of $W_c/W_t$ range	0.69–1.08	1.11–1.56
Range of neck length $L_n$	16–45 mm	29–52 mm
Ratio of $L_n/W_t$ average	1.29	2.23
Ratio of $L_n/W_t$ range	0.67–2.09	1.5–3.5

*Sphyrions* from Redfish always have relatively small heads and large trunks. Conversely, the Grenadier fish *Sphyrion* has a large head and a small, narrow trunk. If one expresses this as a ratio of head width to trunk width, the quotient for Redfish is  $<1.1$  and that of a Grenadier fish *Sphyrion* specimen is  $>1.1$ . It seems that this difference has a genotypical cause and the *Sphyrion* specimens on Redfish and Grenadier fish are therefore different species.

Single attacks upon other fish species (including Blue ling) were perpetrated by the Redfish type of *Sphyrion*.

#### Pathological and anatomical results of *Sphyrion* attack in Redfish fillets

During filleting the heads remain in the fillet. From the standpoint of food hygiene, this means the use of fillets is reduced or excluded. Whole fillets or parts of them are not fit for human consumption. After the individual parasites have died, only the external parts of *Sphyrion* fall off: the cephalothorax remains in the fillet. A formation of oedema and demarcation walls with changes of colouration appears around the "old heads" in the musculature. Parts of the chitinous cephalothorax are often found in the degenerated material.

In older cases, the degeneration of the heads is total. One finds only necrotic material in a dry or humid state without any reactions on the muscle tissue.

Redfish populations in specific fishing areas (the Faroe Islands, Norwegian Coast) occasionally showed a nearly 100% incidence of attack with old heads. The commercial value of attacked Redfish is thereby markedly reduced.

#### Redfish fillets with diffuse black spots

Certain Redfish populations (Faroe Islands, Norwegian Coast) frequently show grey-black spots in the fillet. Their commercial value is considerably reduced because of these changes. The spots are visible mainly on the median surface of the fillet, and are therefore present in the flesh of the fillet. They are rarely visible on the subcutis surface of the fillet.

Such a change in colour has been registered with a frequency of up to 50% only in Redfish fillets.

During the histological investigation, pigmented necrotic centres were noticed in the interseptical connective tissue. These centres are numerous and are surrounded by fibroblastes. Beside these there are cells with black-brown pigment granules between the striated muscle cells. From these pigmented cells long appendices grow into the striated muscle tissue.

The pigment undergoes the same histochemical reactions (positive silver impregnation, bleaching with hydrogen peroxide) as melanin. The pigment cells are therefore melanophores.

As the existence of such melanophores in muscle tissue is associated with the occurrence of necrotic material, it can be assumed that this pigment is the residue of foreign tissue. Therefore pigmented areas in Redfish fillets are probably the residues of *S. lumpi* "old heads".

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#### NIEKTÓRE GATUNKI RYB PÓLNOCNEGO ATLANTYKU ATAKOWANE PRZEZ WIDŁONOZI Z RODZAJU *SPHYRION* ORAZ POWODOWANE PRZEZ NIE ZMIANY PATOLOGICZNE W FILETACH KARMAZYNA

K. PRIEBE

U molwińca, *Molva dypterygia* z wód Wschodniej Grenlandii stwierdzono po raz pierwszy występowanie *Sphyrion lumpi*. Podano zestaw żywicieli tego pasożyta i wywołane przez niego zmiany anatomo-patologiczne. Przeprowadzone badania wykazały różnice w morfologii między egzemplarzami *S. lumpi* z *Sebastes marinus* forma *marinus* i forma *mentella* a pasożytami zebranyymi z *Macrourus berglax*.