North-East Atlantic Commission

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Purpose and Summary

The purpose of this paper is to provide an update on the possible implications for NASCO of the recent synonymisation in the National Center for Biotechnology Information (NCBI) of the two species *Gyrodactylus thymalli* and *Gyrodactylus salaris* and their respective DNA-sequences.

It sets out the inter-sessional discussion that took place between the Members of the Working Group on *G. salaris* in the North-East Atlantic Commission Area, and the communication that the Chair of the Working Group has had with the World Organisation for Animal Health (OIE) Aquatic Animals Commission.

It concludes that what was formerly *G. thymalli* (parasites from grayling) will not be diagnosed as *G. salaris* by the OIE, and that the synonymisation therefore will have no practical consequences for NASCO Parties / jurisdictions.

Background

At the meeting of NASCO's North-East Atlantic Commission in Tromsø in June 2019, the issue of the synonymisation of *G. thymalli* and *G. salaris* was raised. The Commission asked that the Working Group on *G. salaris* in the North-East Atlantic Commission Area discuss this issue, and the implications it has, if any, for NASCO.

In November 2019, Haakon Hansen, Chair of the Working Group on *G. salaris*, wrote to members of the Group (Annex 1) inviting them to take part in a discussion on the synonymisation of *G. thymalli* and *G. salaris*. He included a background paper (Annex 2).

The Members were asked to respond to the following questions:

1. What are the implications, if any, of the synonymisation of the *Gyrodactylus* species *G. thymalli* and *G. salaris* for NASCO?
2. Do you think NASCO needs to respond to this issue and, if so, then how?

Responses were received as follows:

- Perttu Koski from the Finnish Food Authority;
- Ciaran Byrne provided a response for Irish Fish Health;
- Geir Jakobsen provided a response for the Norwegian Food Safety Authority; and
- Neil Purvis provided a response for the UK supported by Defra / Cefas, Marine Scotland and DAERA.

Responses

Finland regards the decision of OIE to keep a host-based diagnosis for the parasites to be a good one from the practical viewpoint. They hope that taxonomical research will develop new molecular tools to resolve the problem of the distinction between *G. salaris / thymalli*. While waiting for that, the OIE decision continues the *status quo*, from when two species were identified - *G. salaris* and *G. thymalli*.

Finland identifies one issue with this approach - that if grayling was to be moved to an Atlantic salmon river and the grayling would have an infection of *G. salaris* pathogenic to salmon ('old *G. salaris'*), there would be a dangerous situation. They argue that this will be a very rare situation. The logical preventive measure for that loophole could be a ban to move grayling from a zone / compartment, which has not been certified free of *G. salaris*. This would not cause major losses for the fishing industry – not in Finland anyway, although it is possible there could be a different situation elsewhere, e.g. Britain or Russia.

Finland suggests that NASCO might send a letter to OIE to express its concern about the matter. However, that may not be necessary as Haakon Hansen, NASCO's Chair of the Working Group on *G. salaris,* is also an OIE reference lab expert.

Ireland raises no issues and says it will be guided by others.

Norway states that agreements for Norway can be influenced if *G. thymalli* is synonymised with *G. salaris*. Norway uses a conservative approach to new science before a new taxonomy is implemented in the EU legislation.

Norway suggests that NASCO does not need to respond, and that it is satisfied with OIE's approach to the issue.

United Kingdom provided the following response to the discussion.

One of the consequences of synonymisation of *G. thymalli* and *G. salaris* is the extended distribution of *G. salaris*, which is identified in the paper. Further to this, and of great concern to the UK, are the consequences caused through a reduction in, or a loss of, disease free status for *G. salaris*.

Presently, having disease freedom, at the compartment or country level, permits the restriction in trade of live fish and their products to ensure the protection of disease freedom – i.e. movements are only permitted between areas of equal health status or from a high to a lower health status. Synonymisation removes the ability to enforce trade controls in susceptible species in areas which have evidence of presence of *G. thymalli* and disease freedom for *G. salaris*. This reduction in trade control puts both wild and farmed salmon at substantial and unacceptable risk through the free trade between the UK (and other *G. salaris* free areas which have recorded *G. thymalli*) and areas known to be infected with *G. salaris*.

The UK has serious concerns over this issue and would not be in a position to support synonymisation if there were consequential changes to the current regulations on trade that increased the likelihood of further spread of *G. salaris*.

There are clear phenotypic differences between *G. salaris* and *G. thymalli* demonstrated through host preference and pathogenicity and this is one of the main reasons why the Aquatic Animals Commission of the OIE does not currently support synonymisation. The phenotypic differences clearly suggest that that there are molecular differences between *G. thymalli* and *G. salaris* which are yet to be identified.

Research currently being undertaken in the UK involving genetic screening of the COI gene of gyrodactylids found on grayling (*G thymalli*) is being conducted to demonstrate any genetic relationship of this parasite compared to the 'problematic gyrodactylids' (i.e. pathogenic strains) on salmon and trout (*G. salaris*). This will be useful when defining which lineages should be regulated and in the development of diagnostic tests for their discrimination. This situation highlights the potential importance of pathogenic and non-pathogenic strain definition as an area of further research and investigation which could facilitate regulation in the future.

There should be no change to the current operational systems from an OIE and EU perspective, without any agreed definition of 'pathogenic *G. salaris*'. Prior to any change, methods for confirming new cases must be in place and operating satisfactorily in all relevant laboratories to provide effective surveillance to evidence freedom and support trade controls.

We request that NASCO accept our position and use the UK comments within any NASCO response issued. Such an approach would support the principle of prioritising the protection of stocks over taxonomic arguments to help safeguard the health of wild salmon populations in the UK, and beyond.

Communication between the Chair and the OIE Commission

Between January – March 2020, Haakon Hansen, Chair of the Working Group on G. salaris, was in communication with the OIE Commission on this issue. He was involved in discussions on the text for the new OIE manual for the diagnosis of *G. salaris*. In March, he received confirmation from the OIE Commission for Aquatic Animal Health that the GenBank synonymisation will have no practical consequences, because what was formerly G. *thymalli* (parasites from grayling) will not be diagnosed as *G. salaris*. This means that countries with a disease-free status for *G. salaris,* like e.g. the UK, will maintain their status. This will be confirmed formally when the OIE manual is published.

Conclusion

There appears to be agreement between those involved in the discussion, that OIE's decision to follow a conservative approach for the diagnosis of *G. salaris* is sound, and provides a practical approach following the synonymisation of the species in GenBank databases. The suggestion is that the diagnosis of *G. salaris* should not change, 1) without an agreed definition for pathogenic versus non-pathogenic *G. salaris*, and 2) before new diagnostic procedures for pathogenic *G. salaris* are established in relevant laboratories.

Communication between the OIE and the Working Group Chair confirms that countries such as the UK (who expressed concern) will retain their disease-free status for *G. salaris*.

Decisions

The North-East Atlantic Commission may wish to:

- accept that there appear to be no implications for NASCO of the synonymisation of *G. thymalli* and *G. salaris*; and
- agree that no further action is necessary.

Chair of the Working Group on *G. salaris* / Secretariat
24 April 2020

Annex 1

Members of the Working Group on *G. salaris*

Ciaran Byrne, Inland Fisheries Ireland, Ireland

Håkan Carlstrand, Swedish Agency for Marine and Water Management, Sweden

Seamus Connor, Department of Agriculture, Environment and Rural Affairs, UK

Eva Dahlgren, Swedish University of Agricultural Sciences, Sweden

Erik Degerman, Swedish University of Agricultural Sciences, Sweden

Geir Jakobsen, Norwegian Food Safety Authority, Norway

Anders Koed, Technical University of Denmark - Institute for Aquatic Ressources, Denmark

Perttu Koski, Finnish Food Safety Authority EVIRA, Finland

Michael Millane, Inland Fisheries Ireland, Ireland

Tor Atle Mo, NINA, Norway

Edmund Peeler, Cefas, UK

Sergey Prusov, PINRO, Russian Federation

Neil Purvis, Marine Scotland, UK

Jarle Steinkjer, Norwegian Environment Agency, Norway

David Stone, Cefas, UK

Ken Whelan, Atlantic Salmon Trust, Ireland

Annex 2

Regarding the Synonymization in NCBI GenBank of G. salaris and G. thymalli.

Information Paper from Haakon Hansen

One of the major threats to stocks of Atlantic salmon in the freshwater phase is the parasite *Gyrodactylus salaris* (class Monogenea). The parasite is most likely endemic to the rivers draining into the Baltic Sea but has been introduced to Norway, to Atlantic drainages in Sweden and to Rivers draining into the White Sea / Barents Sea in Russia. After its introduction to Norway in the 1970's and 1980's *G. salaris* has caused enormous ecological and economic damage and has had a negative impact on populations of Atlantic salmon in the Russian river Keret and possibly also in rivers on the Swedish west coast.

Gyrodactylus salaris was first described by Malmberg [1] from Atlantic salmon on the Baltic River Indalsälven, Sweden and has later been considered a parasite mostly specific for Atlantic salmon and rainbow trout. However, there has been a long debate in the taxonomic community whether the species *G. thymalli*, an assumed non-pathogenic[1] parasite of grayling, *Thymallus thymallus,* is actually a junior synonym of *G. salaris*. The most recent studies based on analyses of molecular data are in favour of synonymisation [see e.g. 2,3,4], and recently, NCBI (National Center for Biotechnology Information) Genbank accepted a request for synonymisation, making *G. thymalli* a junior synonym of *G. salaris* in their databases. This means that all the sequences submitted to NCBI as *G. thymalli* are now listed as *G. salaris*.

This has implications for the diagnostics of *G. salaris* as the current diagnosis for *G. salaris*, as outlined in the OIE (World Organisation for Animal Health) Manual of diagnostic tests for aquatic animals[2], is based on sequencing of two gene fragments[3] and then comparing these sequences to sequence records in NCBI GenBank. Following the synonymization, the species *G. thymalli* does not exist in GenBank databases anymore. Thus, all comparisons of obtained sequences with sequences in GenBank will give *G. salaris* as diagnosis even if the sequences are obtained from a parasite isolated from grayling.

If accepted, a synonymization of these two species will have implications outside the scientific audience. Such a synonymization would extend the distribution of *G. salaris* considerably and include all countries and areas where *G. thymalli* is present on grayling, several of which are today considered free from the parasite (e.g. the UK). However, as the parasites from grayling are assumed non-pathogenic to Atlantic salmon, this extended distribution will likely not result in an increased threat for Atlantic salmon populations.

As a solution to the above, the OIE has chosen to keep a host-based diagnosis, (in short where parasites from grayling are named *G. thymalli* and from other hosts are named *G. salaris*) until new markers that can differ between pathogenic and non-pathogenic strains are available. A database of sequences and related information (host, locality etc.) will be kept and curated by

[1] Assumed non-pathogenic to Atlantic salmon based on a small number of controlled infection experiments.
[2] http://www.oie.int/index.php?id=2439&L=0&htmfile=chapitre_gyrodactylus_salaris.htm manual
[3] Current diagnosis is based on sequencing of the ribosomal internal transcribed spacer region and the partial mitochondrial cytochrome oxidase I gene

the OIE reference laboratory for *G. salaris*[4] and, as is the practice today, a diagnosis will have to be validated by the OIE.

In conclusion, the synonymisation of *G. salaris* and *G. thymalli*, is in practice not an issue in relation to the conservation of Atlantic salmon, but is an issue for the diagnostics of *G. salaris* within the OIE framework.

Extra information on the current distribution of *G. salaris* (i.e. on hosts other than grayling): The natural distribution of *G. salaris* is assumed to lie within the eastern parts of the Baltic area including the drainages of the Russian lakes Onega and Ladoga [5,6]. It also seems to occur naturally in some Swedish and Finnish rivers draining into the Baltic Sea as it was reported in low intensities from wild salmon in two rivers in Sweden and from the River Tornio in Sweden/Finland [6]. Later it has been found in relatively high intensities in the upper parts of River Tornio [7]. *Gyrodactylus salaris* has further been reported from Norway [8,9], rivers on the Swedish west coast [6,10], Denmark [e.g. 11,12], Finland [13-17], Russia [5,18,19,4], Germany [20], Spain [21] and lately it was also detected in Italy [22], Poland [23], Former Yugoslavian Republic of Macedonia [24] and Romania [25]. Several records of the parasite have not been confirmed, and e.g. the report by Johnston et al. [26] of *G. salaris* from France and Portugal may represent another species [27]. The latest reports concern detections in Romania [25] the Swedish West coast and in River Tuloma and River Kola, Murmansky oblast, Russia (see www.vetinst.no).

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[4] The Norwegian Veterinary Institute is the reference laboratory for *Gyrodactylus salaris* and Haakon Hansen is the reference expert.

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