Dark spots in salmon fillets

Current knowledge and future direction of research

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Mørke flekker i laksefilet 2012-2015

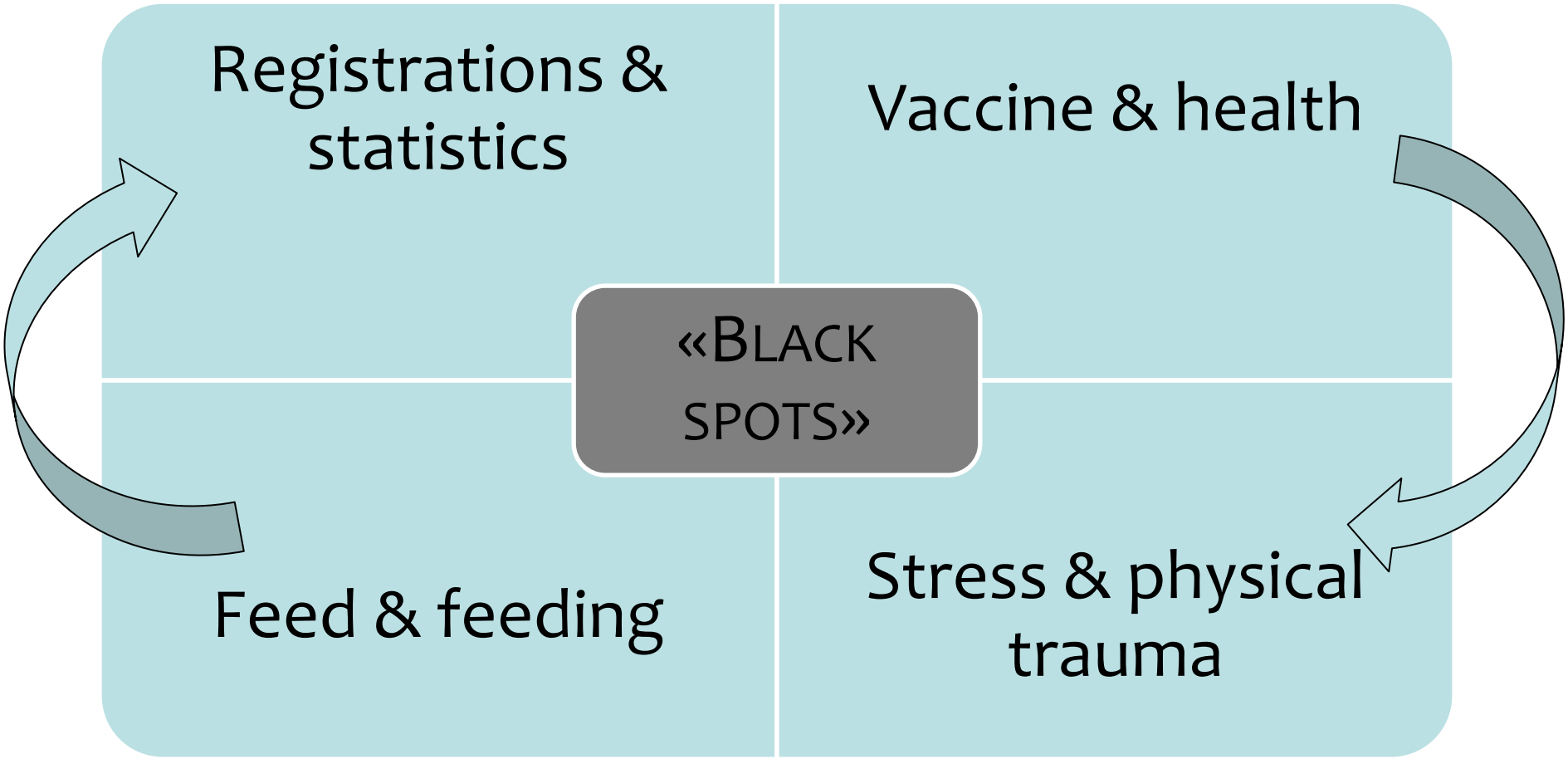
-Årsaker til forekomst og forebyggende tiltak

Prosjektbeskrivelse

Sammendrag:	*Går til:*
Det overordnede målet er å forhindre dannelse av mørke flekker i laksefilet. I dette ligger en søken etter årsaker til at flekkene oppstår for at kunne anbefale tiltak som kan bidra til å løse problemet. Aktivitetene i prosjektet er delt i fire arbeidspakker (AP): [1]Kartlegging, [2]Vaksine og helse, [3]Fôr og [4]Sortering og skade. Det vil være et nært samarbeid mellom AP1-4, som vil gå parallelt i perioden 2012 og ut 2014.	Fiskeri og havbruksnæringens forskningsfond

Rutinemessig kartlegging av forekomst av mørke filetflekker utføres av kvalitetskontrollører ved filetanlegg med geografisk spredning. Registreringene danner grunnlag for etterrettelig statistikk samt dybdeanalyse for å avdekke årsakssammenhenger. To basispopulasjoner med PIT-tag merket uvaksinert og vaksinert (ulike regimer) laks produseres: nullårssmolt (**BP0+**) og ettårssmolt (**BP1+**). Etter vaksinering undersøkes laksen jevnlig for mørke filetpigmenter frem til slakt. Produksjonsparametere, morfometri og blod analyses også. Mørke filetflekker undersøkes ved avbildende spektroskopi, foto, histologi, sammensetning og genuttrykk. Øvrige kvalitetsegenskaper undersøkes av utvalgt fisk. **BP0+** vil i en 3 måneders periode før slakt få et sluttfôr med og uten forhøyet sink, vitamin E eller fôrtoksiner (ulike vaksineregimer blandet i merder). **BP1+** vil undersøkes mht effekt av lavt sinknivå frem til vaksinering samt fra sjøutsett til slakt. I

The project



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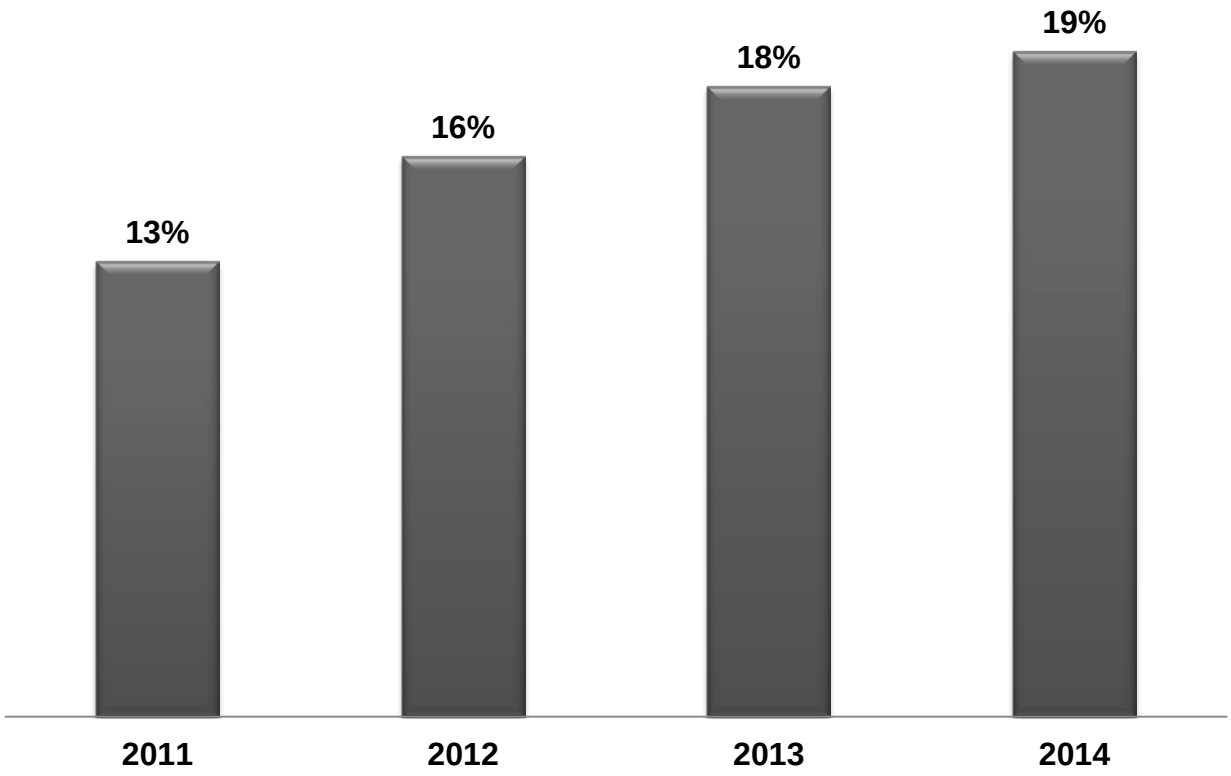
Norwegian salmon with dark spots

93% of the spots located in the rib area, 2-4 cm below the backbone



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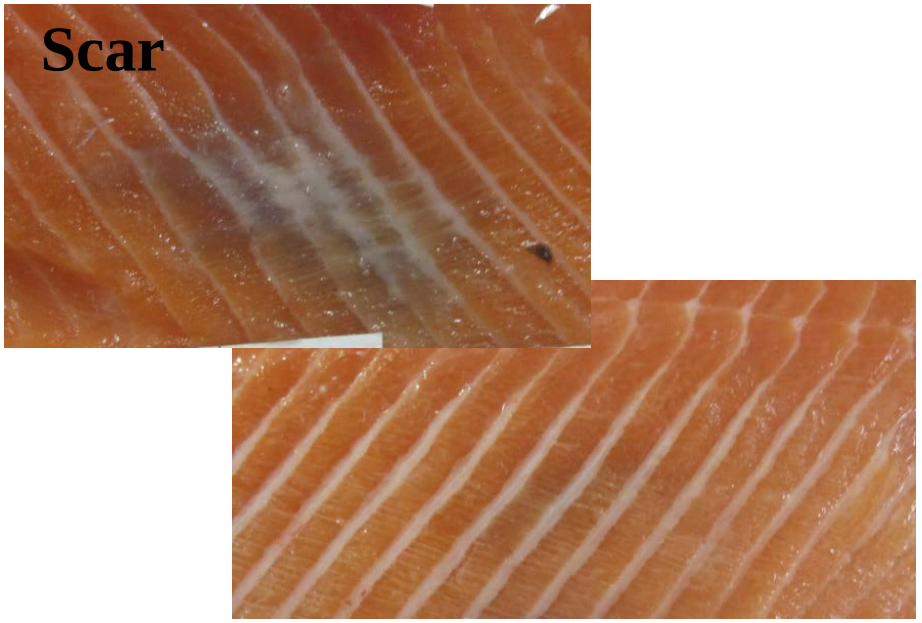
Dark pigmentation



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Challenges

Many factors vary simultaniously in commercial farming

- Fish material, feed, environment, health
- Useful to combine monitoring of practical farming with small scale experiments, under controlled conditions

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Fish experiment

Melanin in abdominal wall

- Observed before vaccination

Melanin in organs

- Observed after vaccination

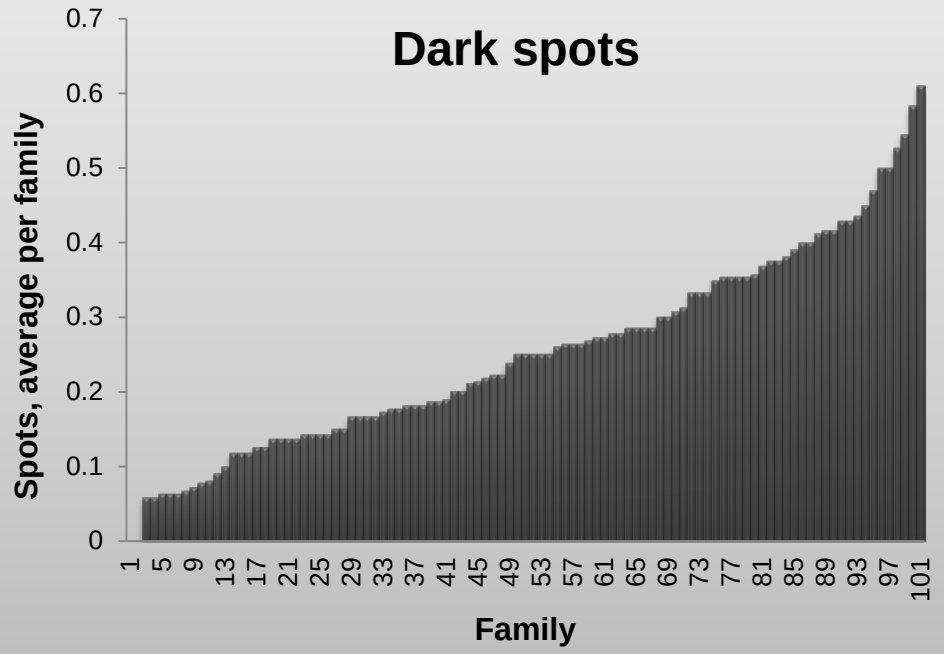
Melanin in fillets

- Observed in seawater in vaccinated and unvaccinated fish
- *½ kg 5%, 1 kg 10%, 3 kg 10-16%*

Breeding & genetics

Preliminary results

Selective breeding can not solve the problem with dark stained salmon fillets



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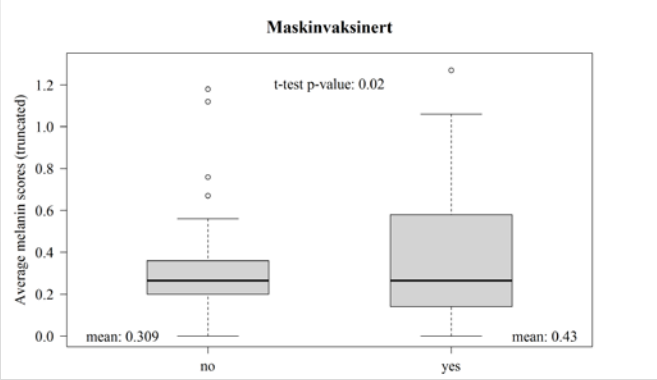
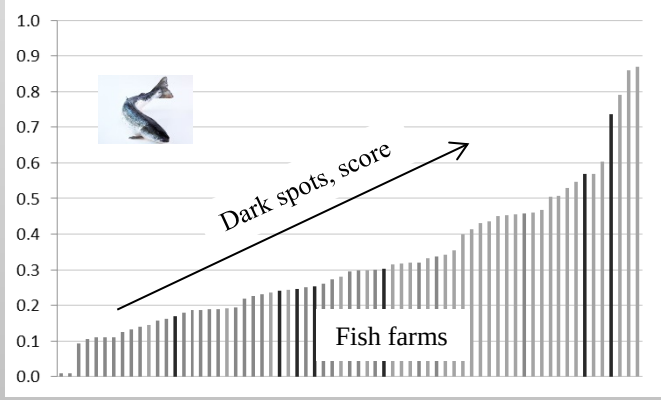
The response to inflammation is affected by

– Type of vaccine
– Vaccination
– Feed
– Rearing conditions

Primary cause ?





All background information is anonymized

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Minimize stress and physical trauma

Optimize vaccination

Pancreas disease

0+salmon smoltification

Sexual maturation, males

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FAQ, frequently asked questions (www.fhf.no)

Updated December 2013

MELANIN DEPOSITION IN SALMON FILLETS

Frequently asked questions

Dark discoloration of salmon fillets is mainly due to the deposition of melanin pigments. The discoloration may have different manifestations, from localized spots to more diffuse and widespread melanisation on the fillet side or under the skin/subcutaneously. Dark stained fillets cannot be sold as high quality products and therefore represent a significant economic problem for the salmon farming and processing industry

What is melanin?

- Melanin is a group of natural pigments found in most plants and animals
- Melanin is a powerful natural antioxidant
- In humans, melanin (pyogenic) is the primary determinant of skin colour

What causes melanin deposition in salmon fillets?

- Melanin pigments are deposited as a response to tissue damages or local inflammatory conditions
- Melanin deposition is a natural part of a fish's immune system
- Dark discoloration of salmon fillets is mainly due to melanin deposition, but dark spots can also contain blood pigments and scar tissue or a combination of melanin, blood and scar tissue.
- The causality is complex, and not related to one single cause.

Is it safe to consume fillets with melanin deposits

- Melanin is a safe and natural antioxidant
- Melanin can be used as a natural antioxidant in the food, cosmetic and pharmaceutical industries
- Dark pigments in various foods, such as caviar, are delicious

The information given in the FAQ is derived by the partners in the FHF project "Dark spots in salmon fillets. Causes and preventive measures"
For further information, please contact
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Occurrence of melanin spots in salmon fillets

- Approximately 12% of Norwegian salmon fillets have lightly stained spots smaller than 3cm in diameter and 2% of the fillets have darker spots larger than 3cm on average.
- Most spots (70%) are located in the front part of the abdomen
- Dark spots are also observed in wild living salmon, hence it is not likely that the phenomenon will disappear completely

What is being done to reduce the presence of dark fillet spots

- The Norwegian Seafood Research Fund (FHF), on behalf of the farming industry, has supported research on dark fillet spots since 2008 to reveal causes, provide reliable statistics and to define measures to reduce the problem. The research within this area was intensified in 2012, involving several industrial stakeholders and research communities.
- Reliable statistics require good, consistent, continuous and comprehensive recording of dark fillet spots. Therefore unified registrations at filleting plants along the Norwegian coast have been developed and implemented. Registrations of frequency and severity together with background data (genetics, vaccines/fish health, feed, rearing, harvesting etc.) is collected in a database to provide reliable and updated statistics. Information on fish origin is used to search for causes to the problem. However, such an epidemiological approach requires patience as the results evolve on a long-term basis. Updated statistics on the frequency of dark spots are published continuously.
- Specific ongoing research projects (apart from the registrations/ epidemiological study)
  - Vaccine and vaccination
  - Feed composition
  - Environmental rearing conditions
  - The importance of physical trauma and stress
  - In depth characterisation of fillets with dark pigmentation to improve our ability to define causes

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