Hvat vita vit um virusið handan ILA ?

Debes Hammershaimb Christiansen

deildarleiðari & granskari

Mynd: Peter S. Østergaard

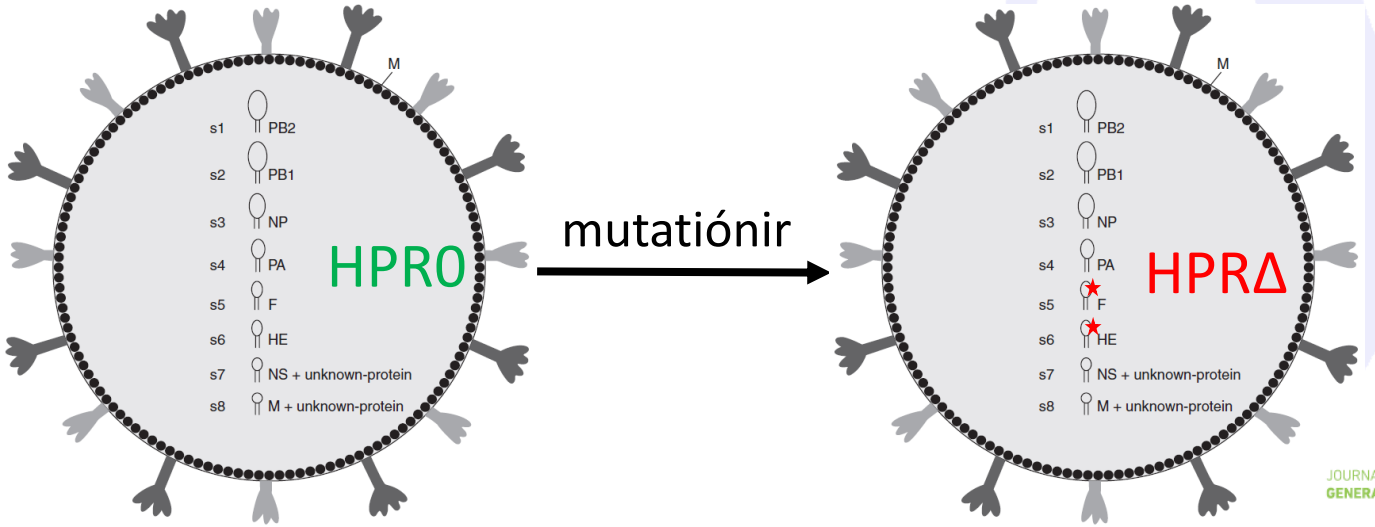
Skrá fyri framløguna

1. *Hvat er munurin á HPR0 og HPRdel ?*
2. ILA útbrotini í Føroyum
    1. ILA er sníkjandi og strongd spælir ein týðandi leiklut
3. *Hvat vita vit um HPR0 ?*
    1. *Hvussu smittar HPR0 ?*
    2. *Etablerar HPR0 hústammur á smoltstøðunum ?*
    3. *Hvørjir aðrir vandar kunnu standast av HPR0 ?*

Mynd: Peter S. Østergaard

Tað finnast tvær høvuðstypur av ILA virus

- ILAV-HPR0
  - Ikki sjúkuelvandi
  - Smittar bara táknur og húð á laksinum
  - Er upprunin til allar sjúkuelavndi HPRdel
- ILAV-HPRΔ
  - Sjúkuelvandi
  - Smittar øll innaru gøgn á laksinum



JOURNAL OF GENERAL VIROLOGY

RESEARCH ARTICLE

Christiansen et al., Journal of General Virology 2017;98:595–606

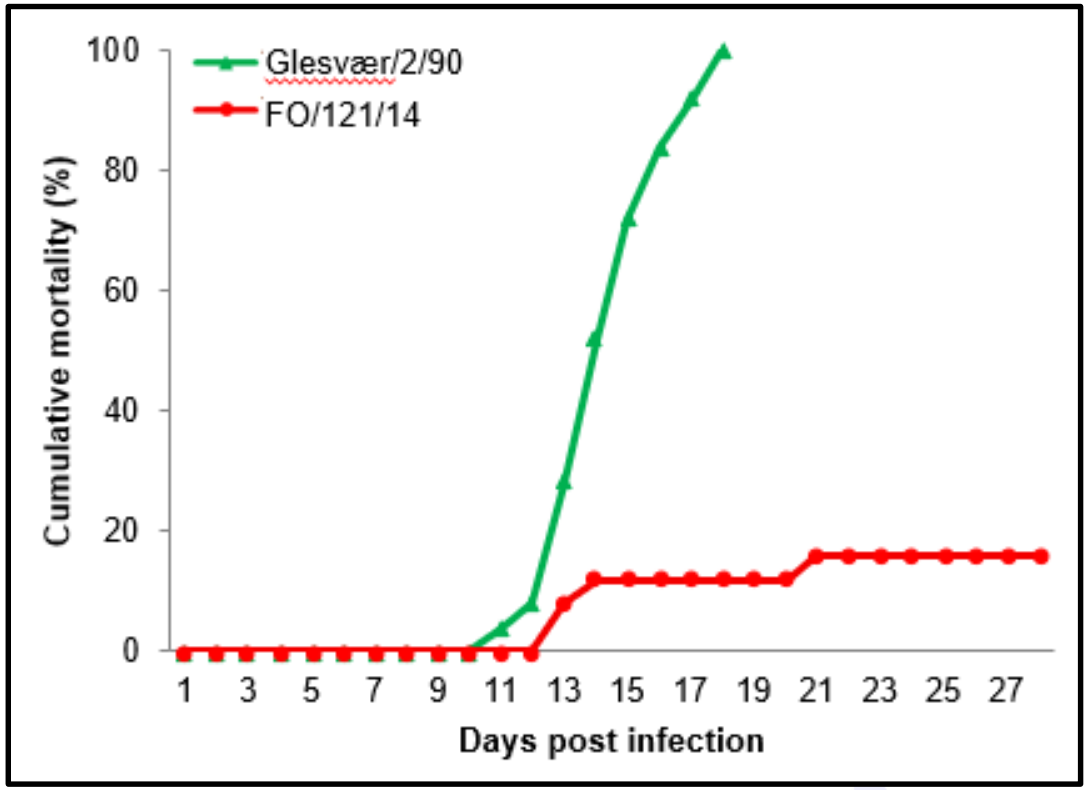
DOI 10.1099/jgv.0.000741

MICROBIOLOGY SOCIETY

First field evidence of the evolution from a non-virulent HPR0 to a virulent HPR-deleted infectious salmon anaemia virus

Debes H. Christiansen,[1,*] Alastair J. A. McBeath,[2] Maria Aamelfot,[3] Iveta Matejusova,[2] Mickael Fourrier,[2] Patricia White,[2] Petra E. Petersen[1] and Knut Falk[3]

HPRdel kann vera meira ella minni sjúkuelvandi



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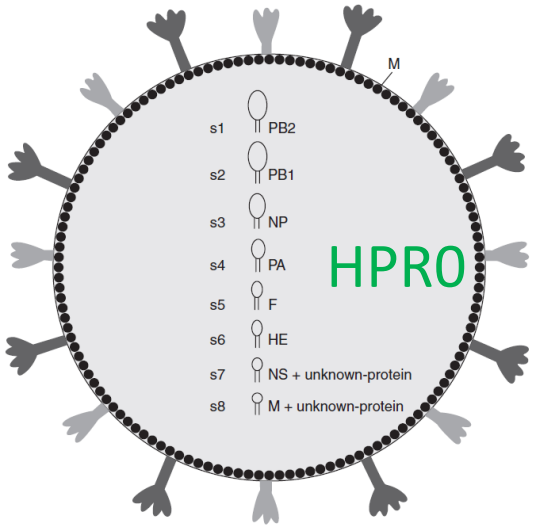
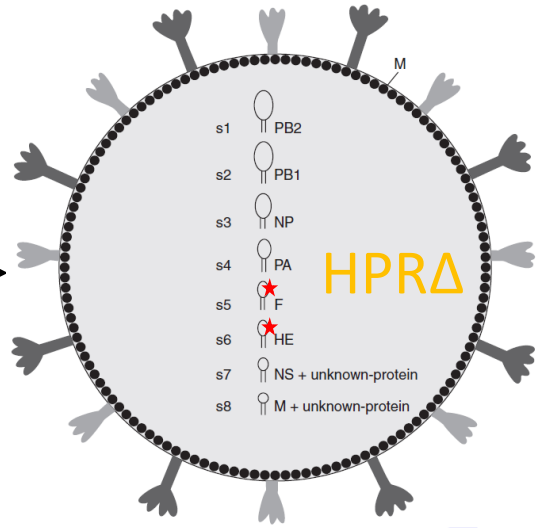
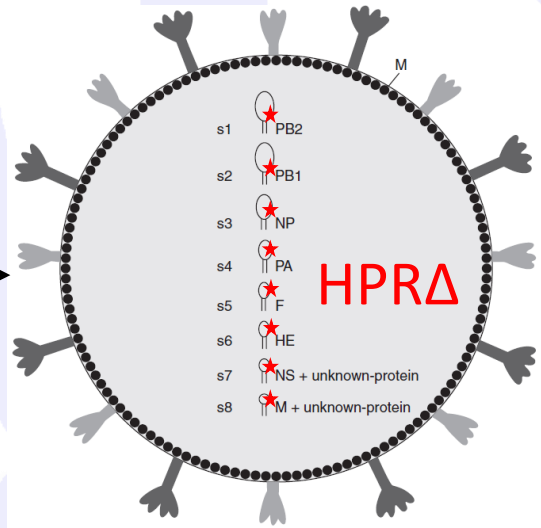
Menningin av virulens er stigvíst



mutatiónir



mutatiónir



Ikki sjúkuelvandi

minni sjúkuelvandi

Sera sjúkuelvandi

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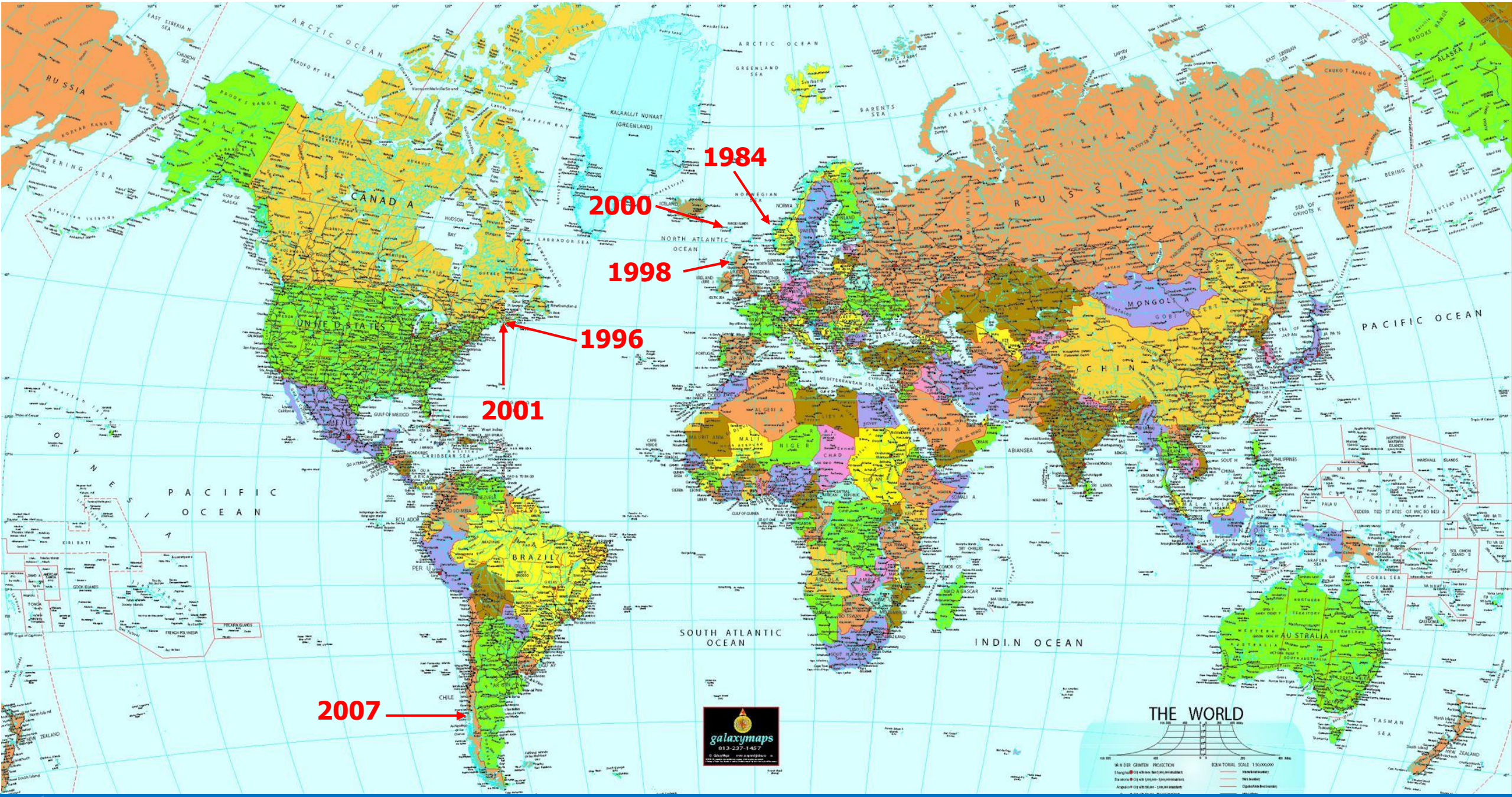
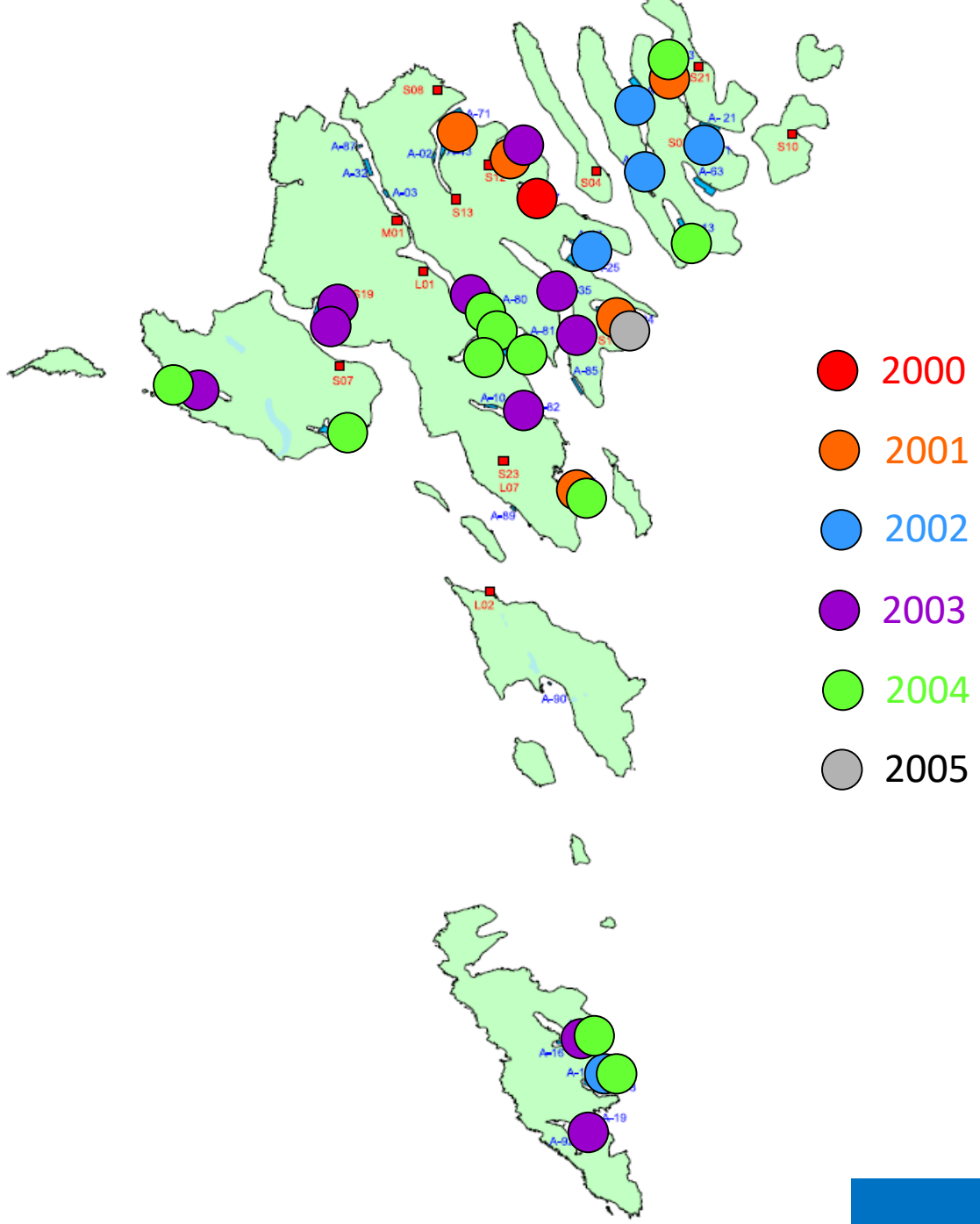
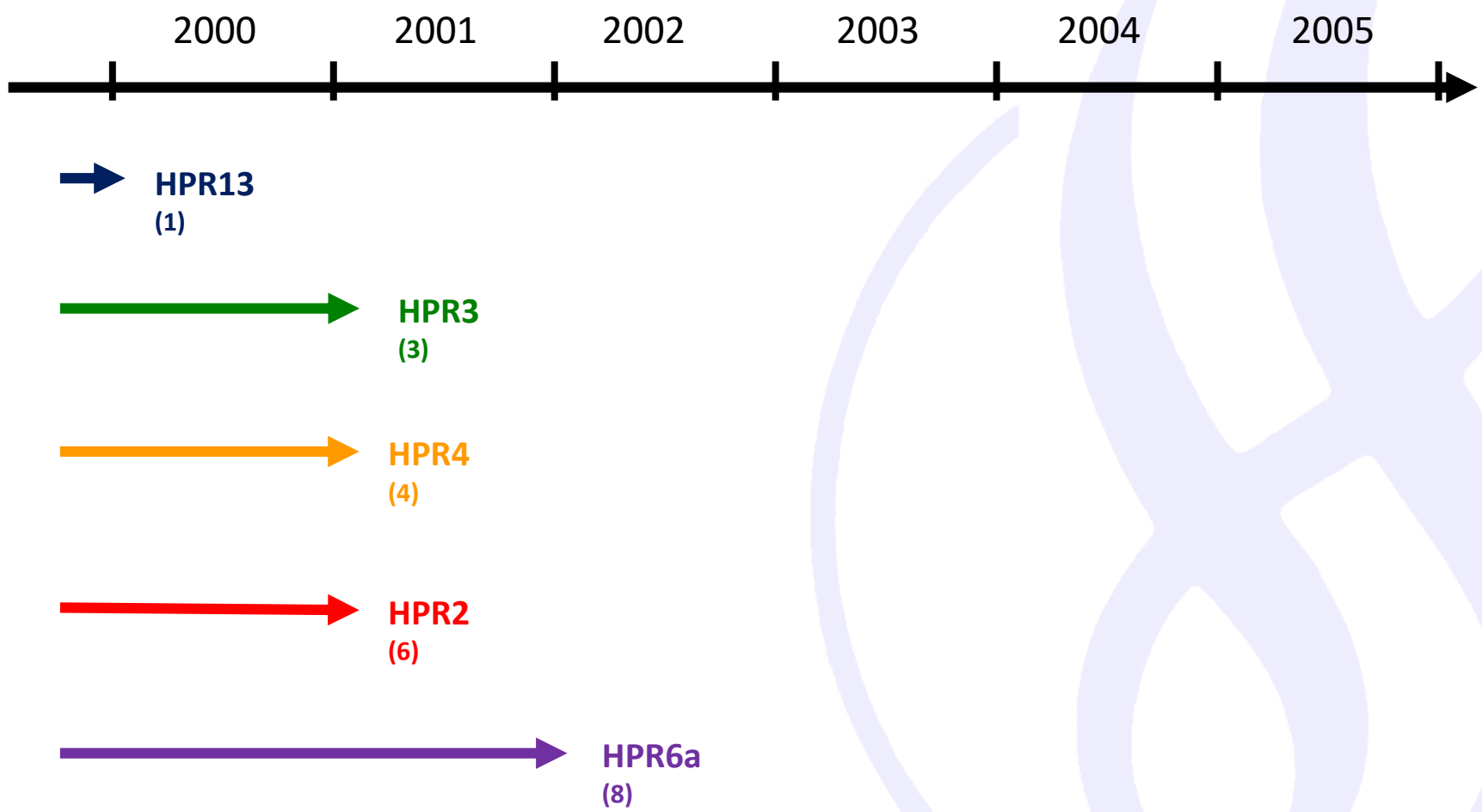
Tað eru nú 20 ár síðani vit høvdu tað fyrsta ILA útbroti í Føroyum


1984
2000
1998
1996
2001
2007
RUSSIA
CANADA
UNITED STATES
BRAZIL
CHINA
MONGOLIA
INDONESIA
AUSTRALIA
NEW ZEALAND
ARCTIC OCEAN
NORTH ATLANTIC OCEAN
SOUTH ATLANTIC OCEAN
INDIAN OCEAN
PACIFIC OCEAN
galaxymaps
THE WORLD

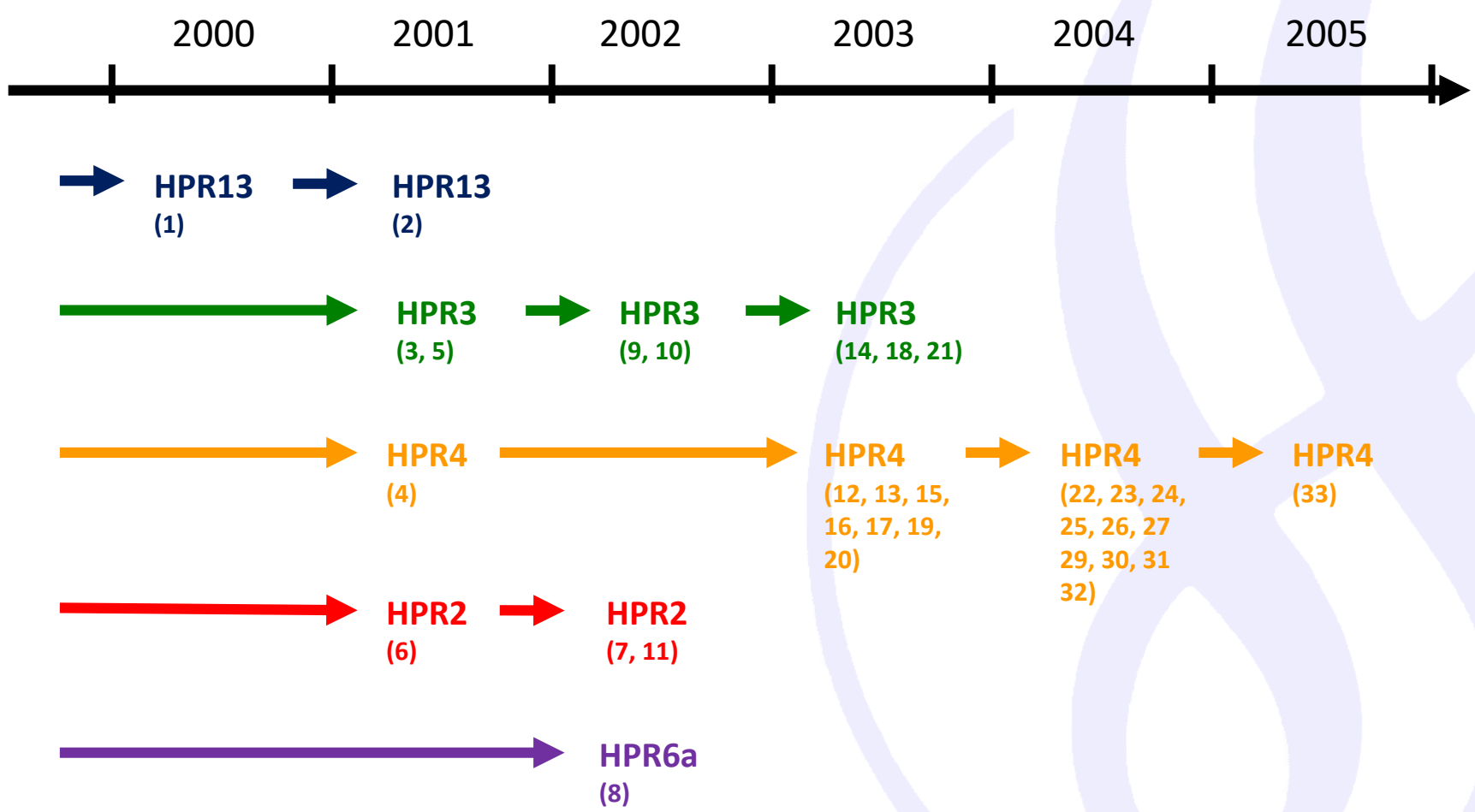
Hvussu spjaddist ILA í Føroyum ?



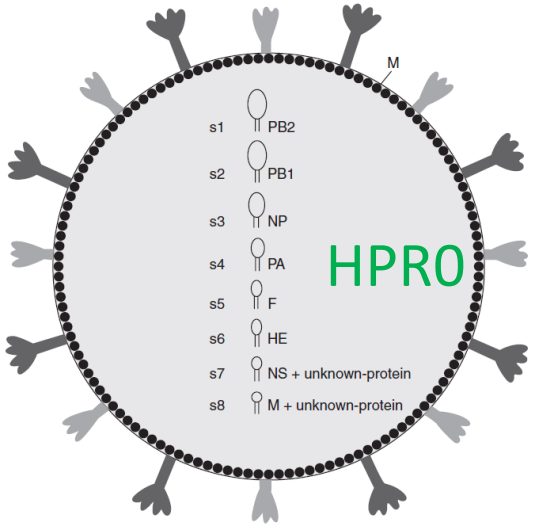
Vit høvdu 5 primer ILA-útbrot í Føroyum

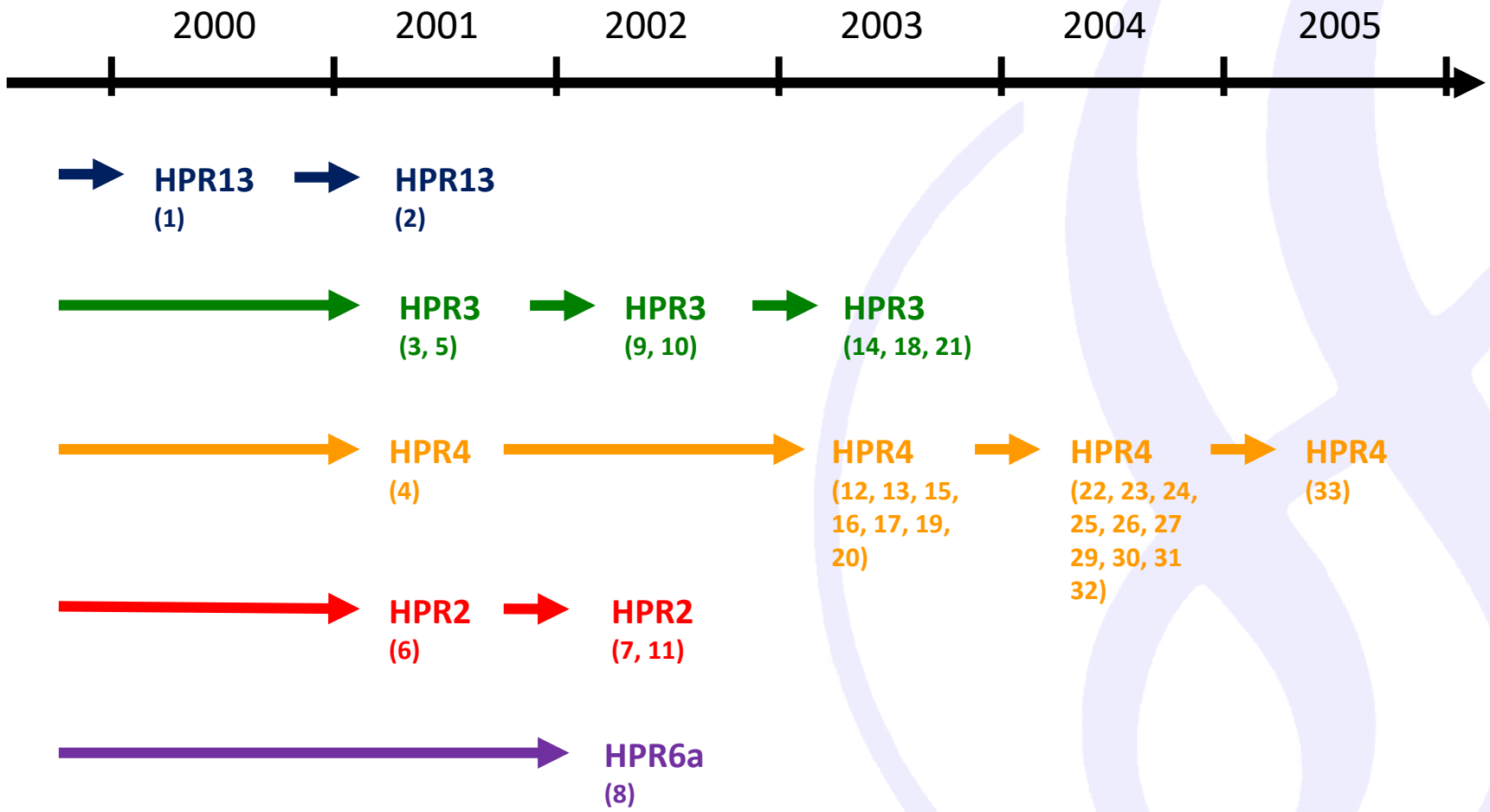


Tey 5 primer-útbrotini vóru upprunin til øll 28 sekunder-útbrot

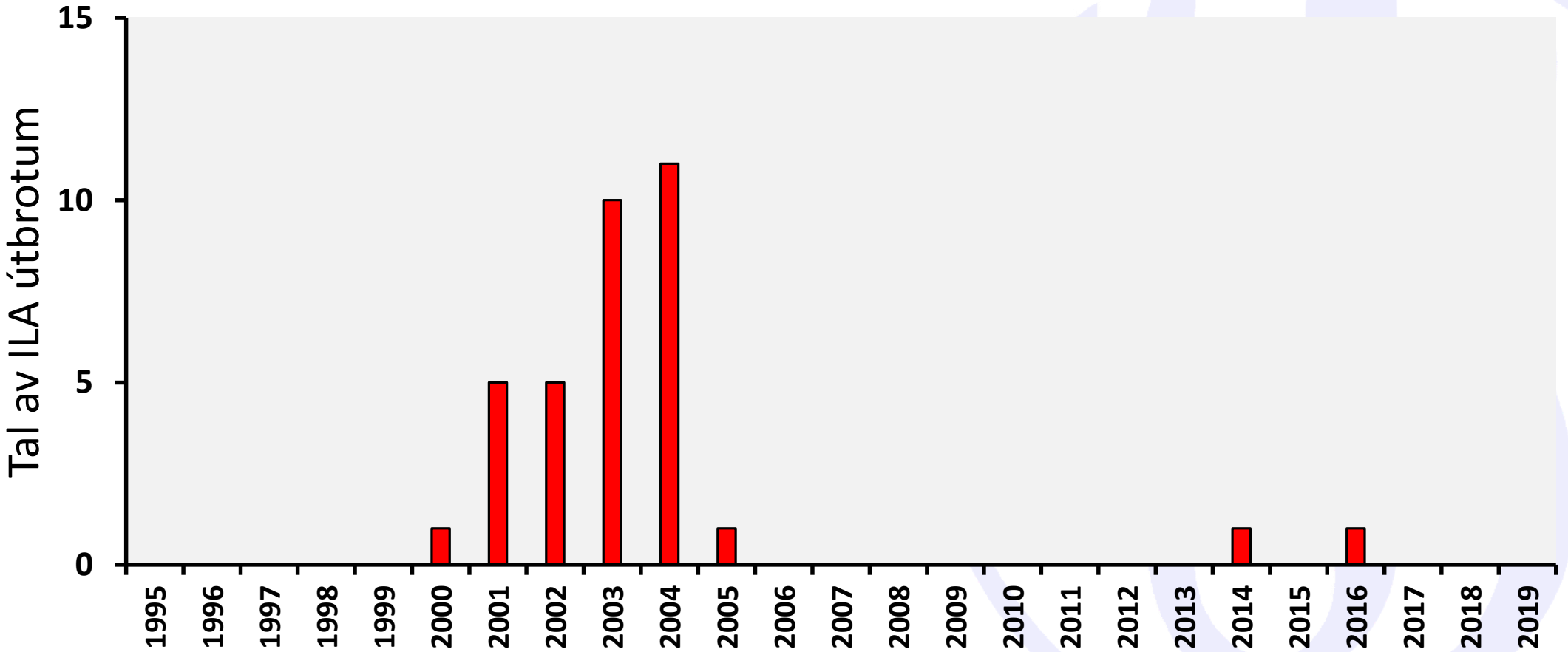


HPR0 var upprunin til øll primer ILA-útbrot

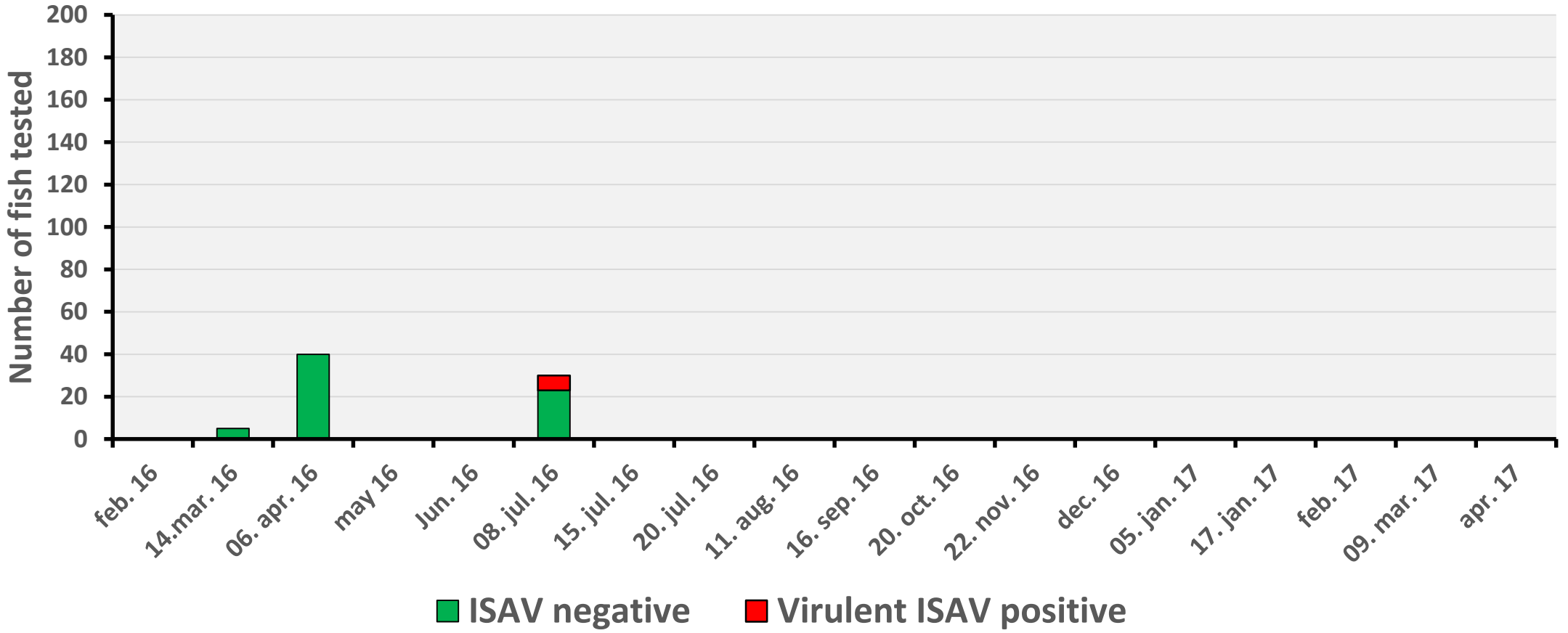




Eftirfylgjandi hevur tað verið 1 ILA útbrot

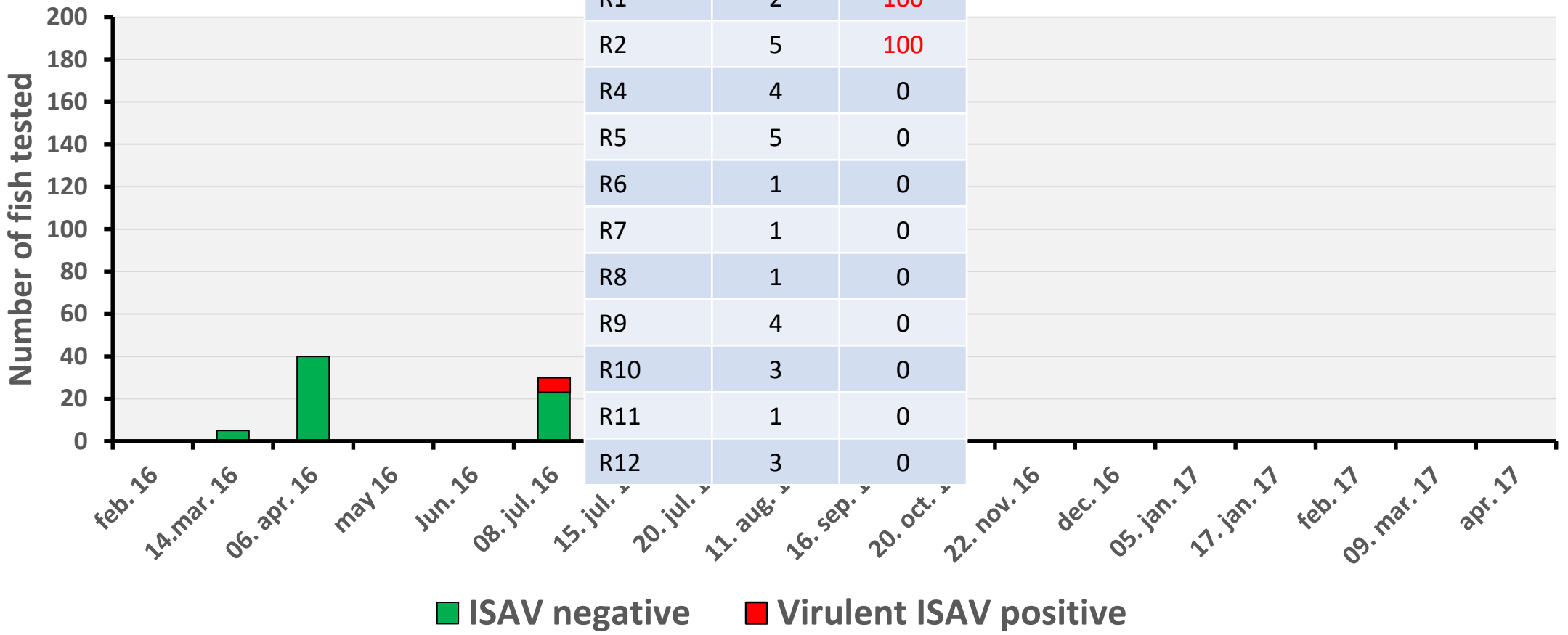


ILA útbrotið í 2016 vísir hvussu sníkjandi ILA kann vera og hvønn týdning strongd hevur

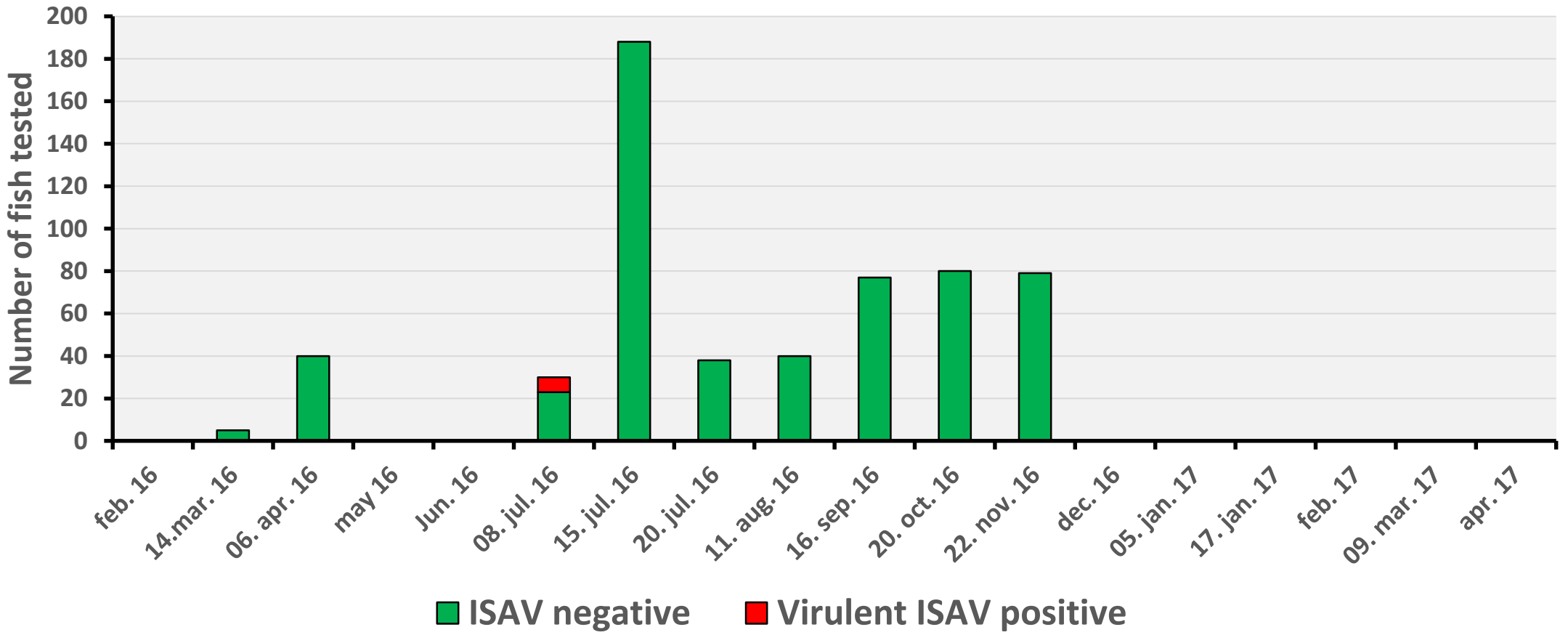


ILA útbroti í 2016 vísir hvussu sníkjandi ILA kann vera og hvønn týdning strongd hevur

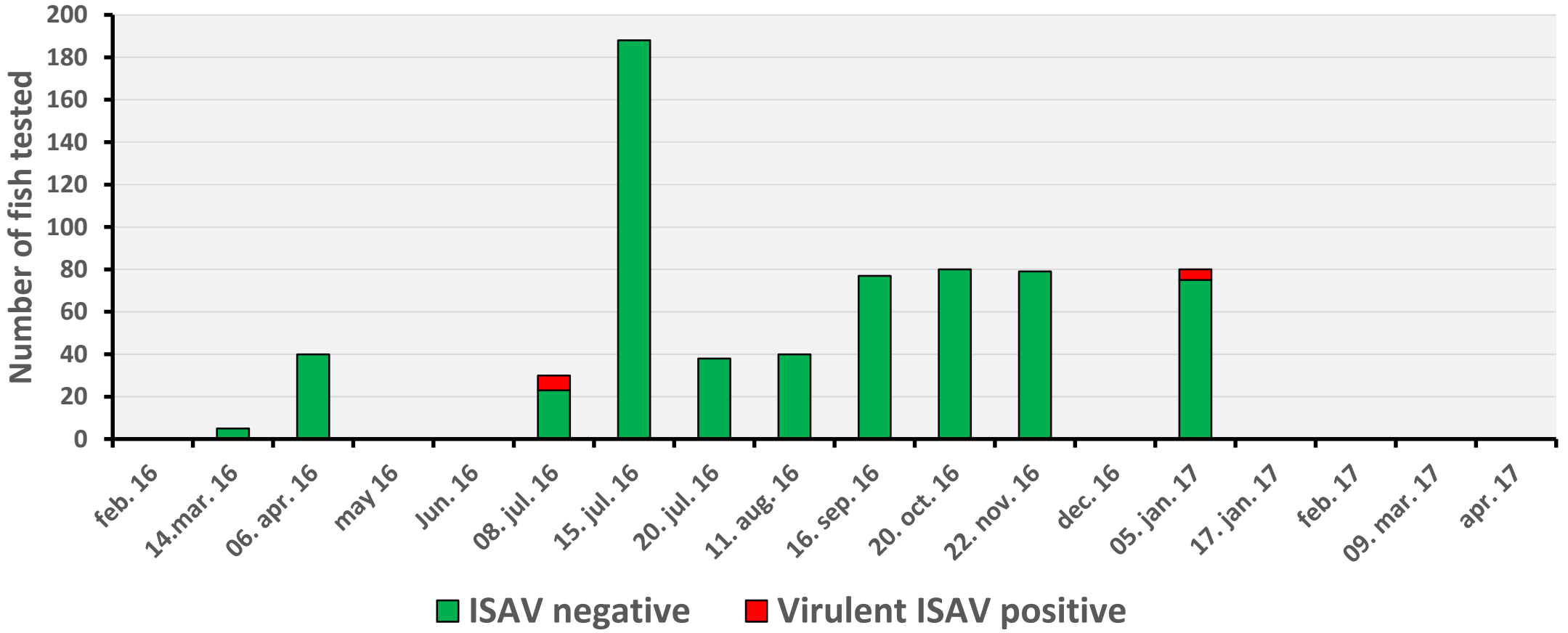
Cage no.	Number of fish	% HPRdel
R1	2	100
R2	5	100
R4	4	0
R5	5	0
R6	1	0
R7	1	0
R8	1	0
R9	4	0
R10	3	0
R11	1	0
R12	3	0



Eingin ávísing av ILAV teir næstu 5 mánarnar

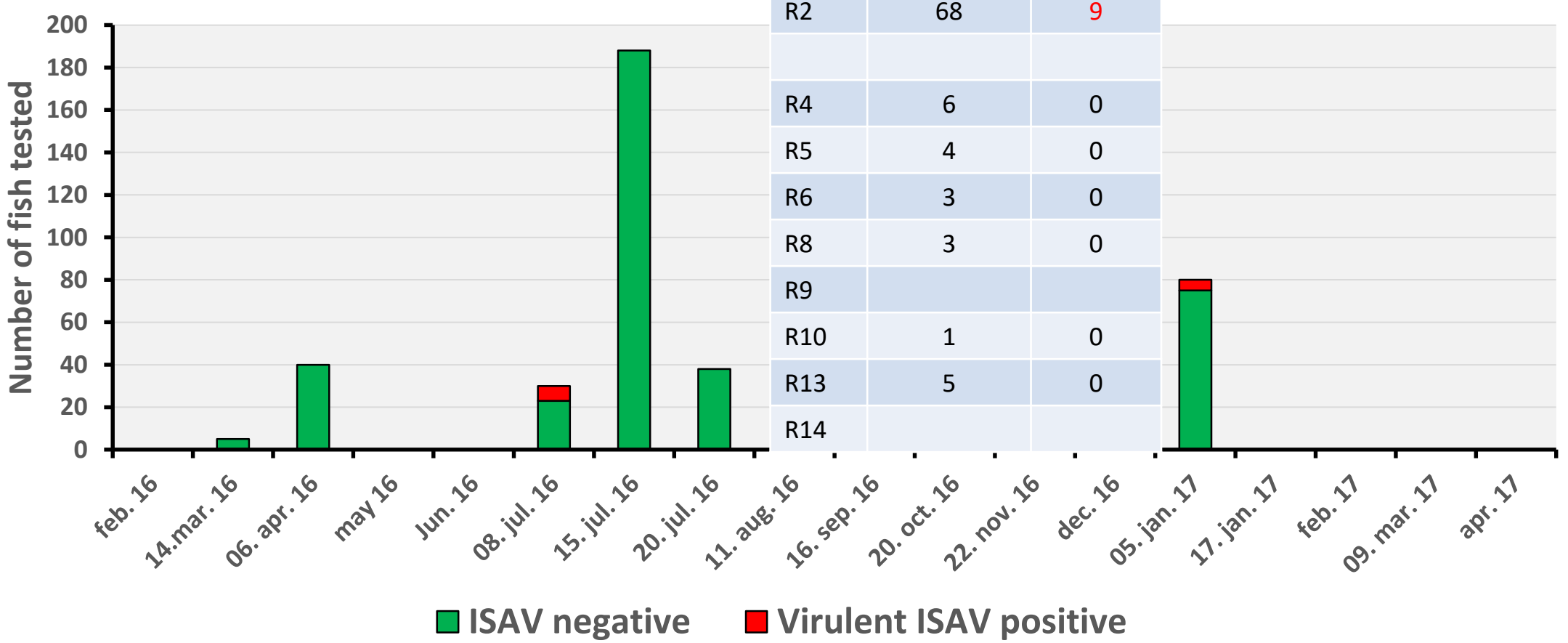


Nýggj ávísing av HPRdel í januar 2017

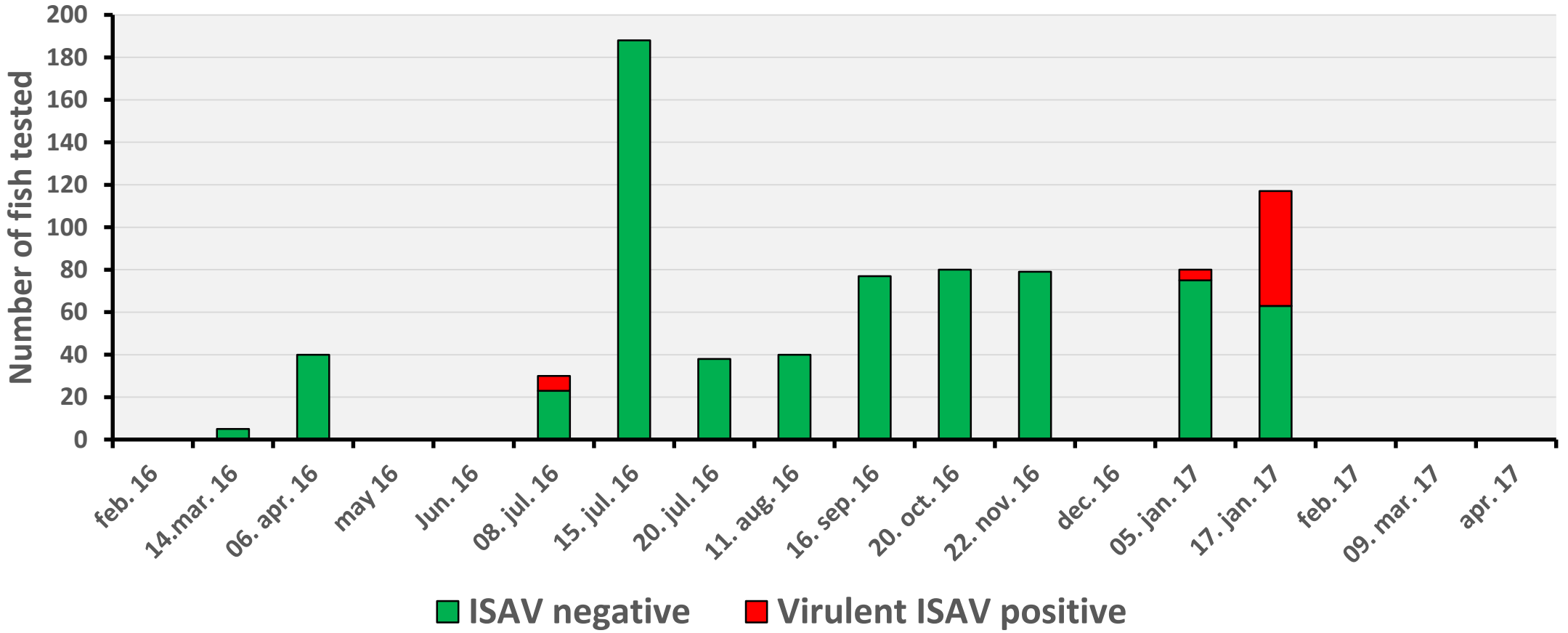


Allir HPRdel vóru úr ringi 2

Cage	Number of samples	% HPRdel
R2	68	9
R4	6	0
R5	4	0
R6	3	0
R8	3	0
R9		
R10	1	0
R13	5	0
R14		

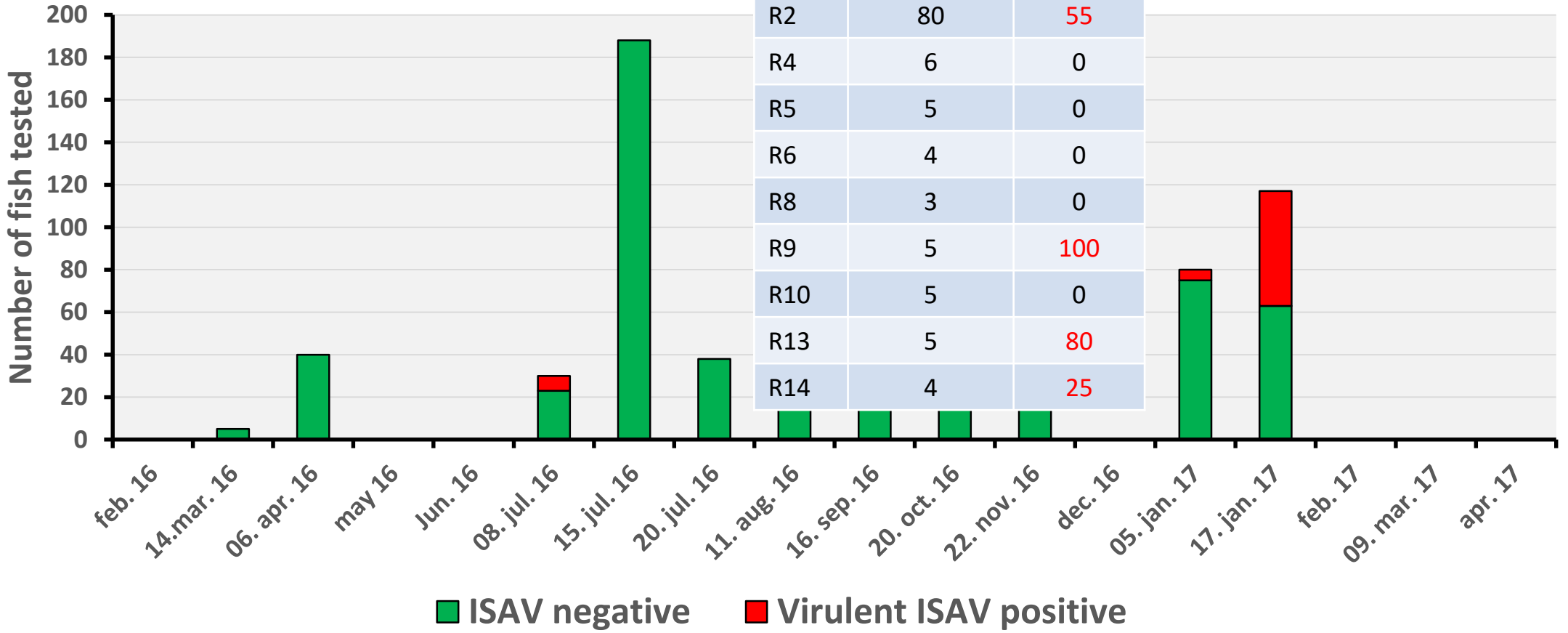


Prevalensurin av HPRdel øktur til næstan 50% eftir 12 dagar

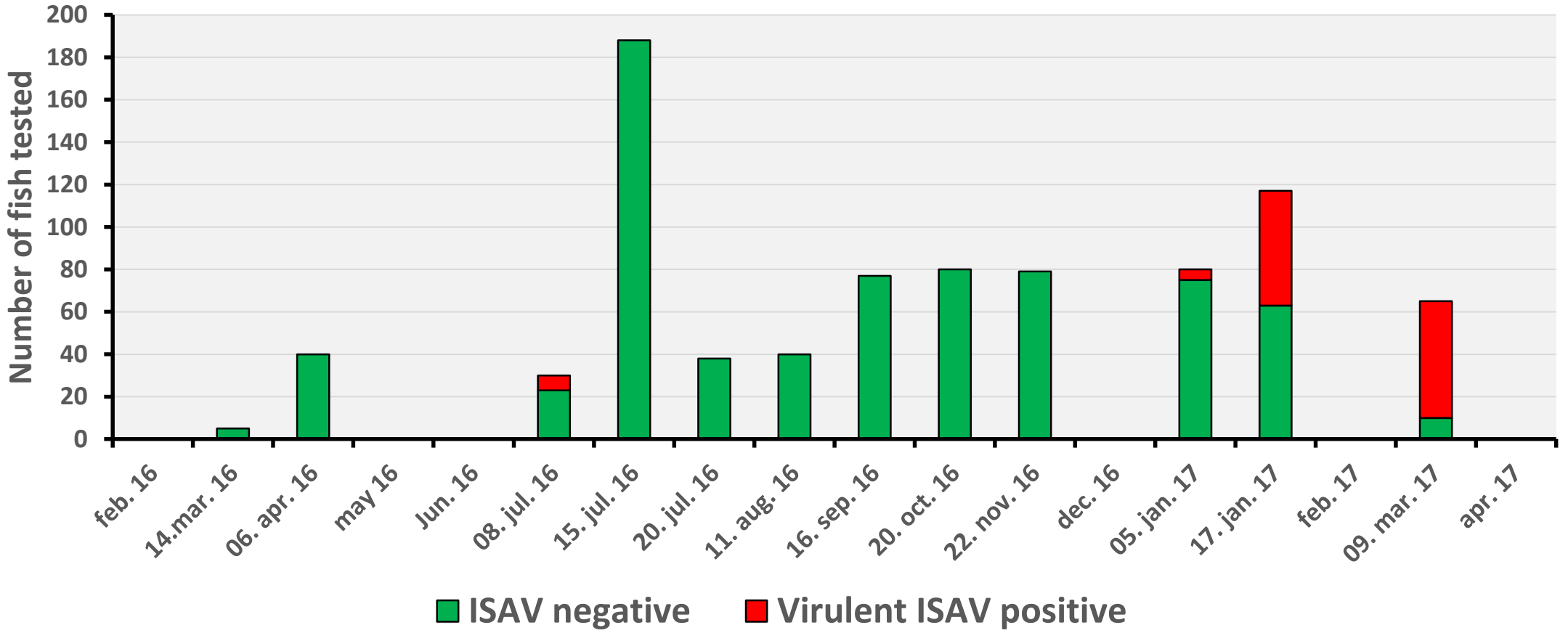


HPRdel spjatt seg til fleiri ringar

Cage	Number of samples	% HPRdel
R2	80	55
R4	6	0
R5	5	0
R6	4	0
R8	3	0
R9	5	100
R10	5	0
R13	5	80
R14	4	25

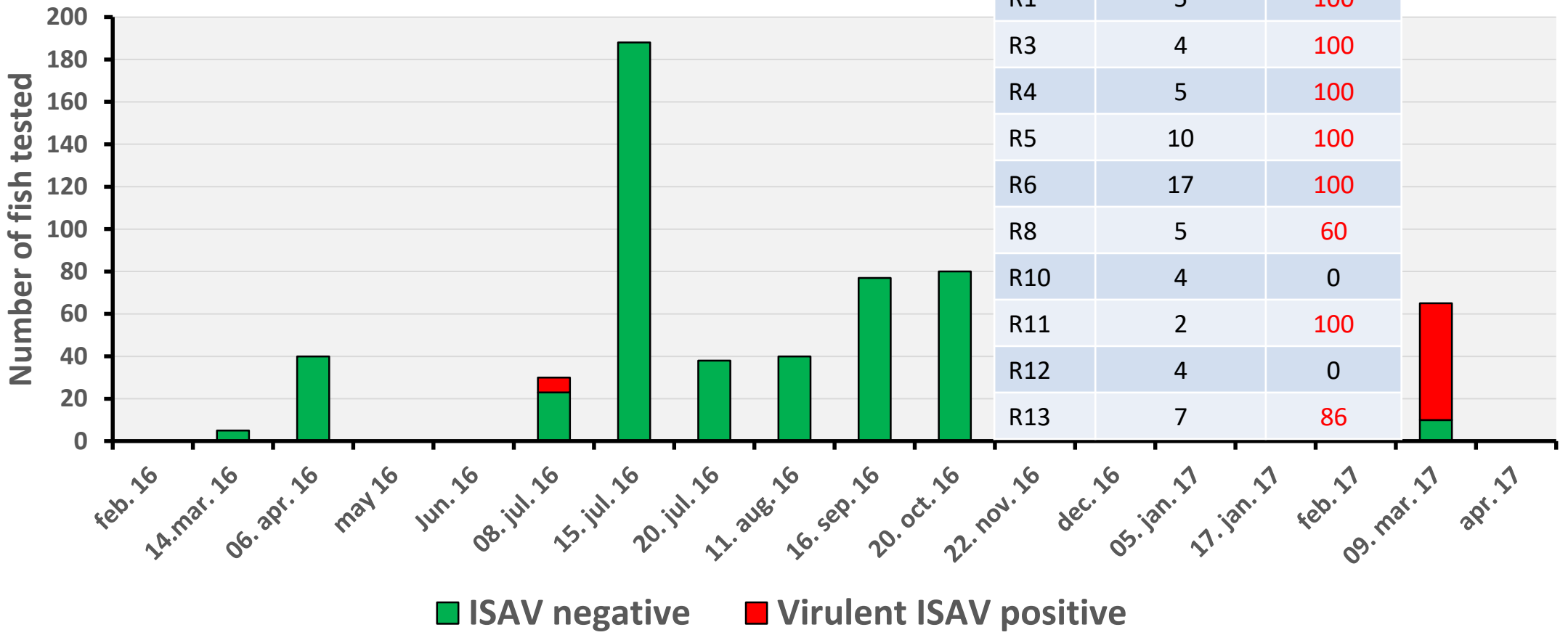


Í mars vóru næstan allir laksar HPRdel positivir

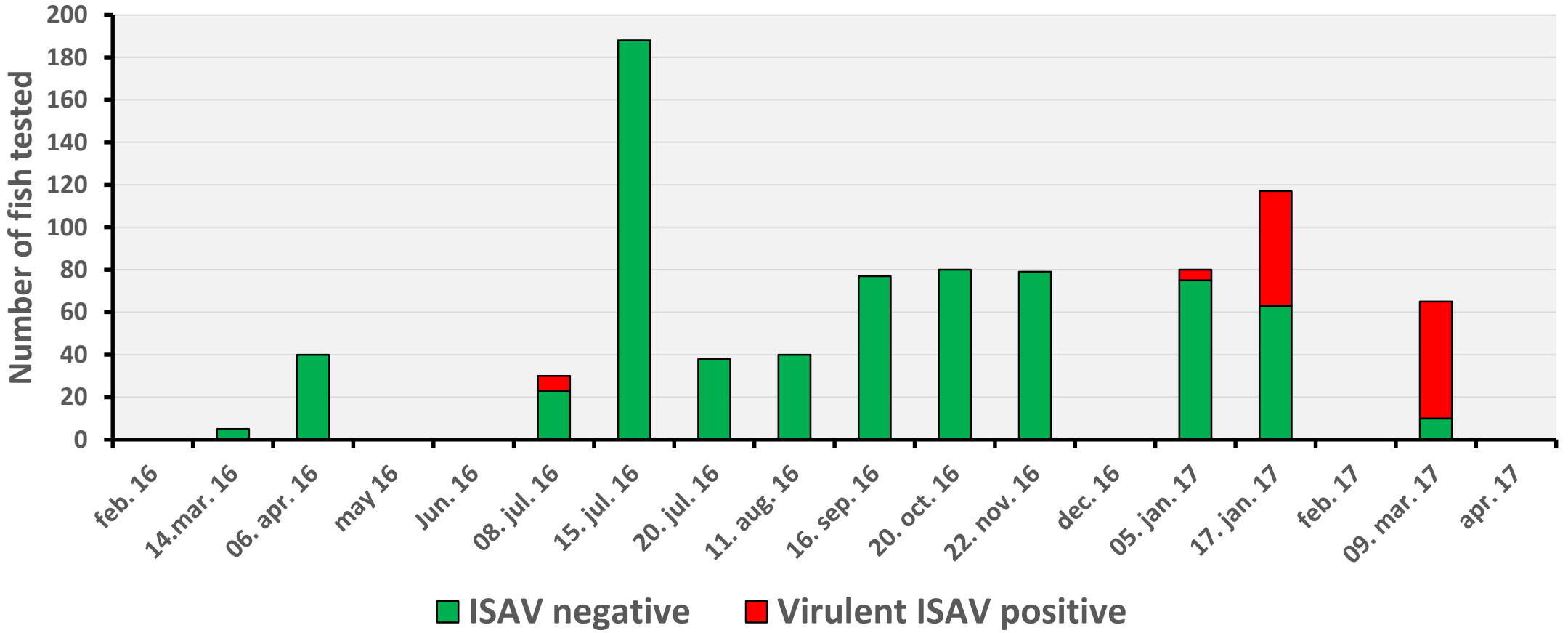


Prevalensurin høgur í flestu ringum

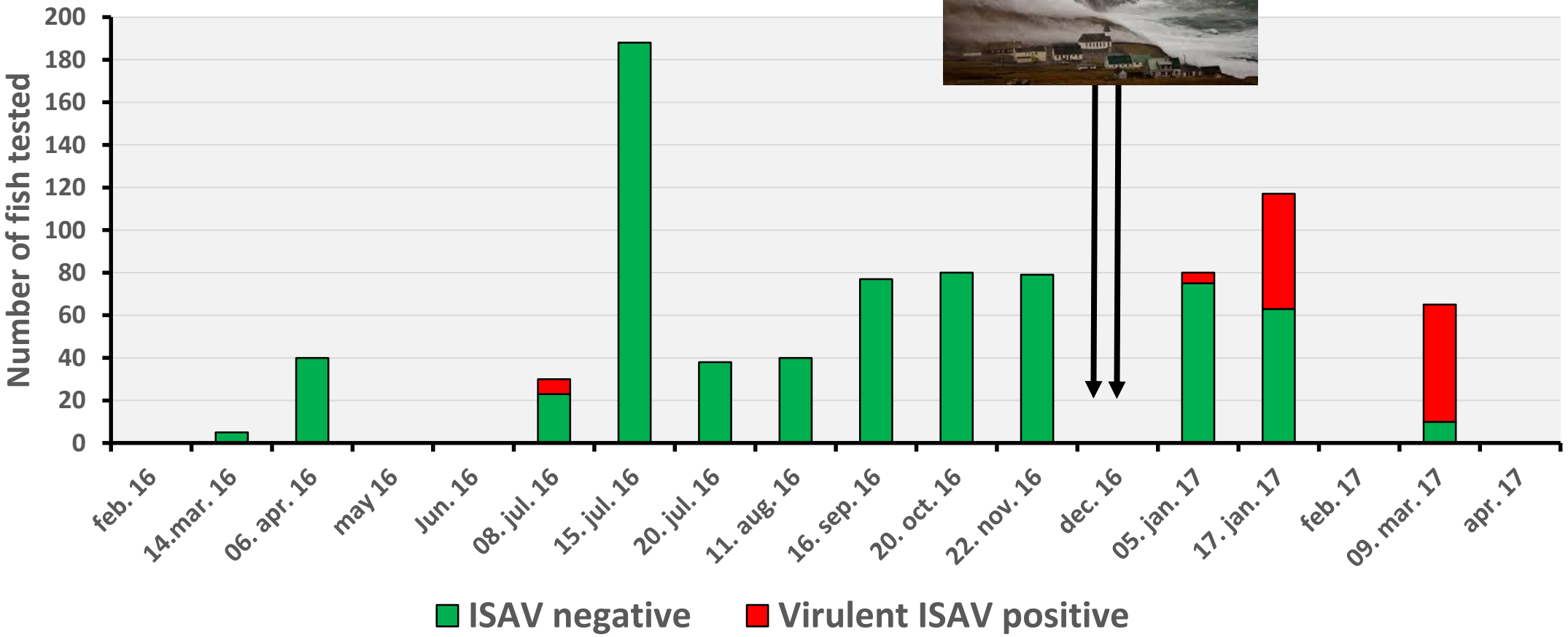
Cage	Number of samples	ISAV+
R1	5	100
R3	4	100
R4	5	100
R5	10	100
R6	17	100
R8	5	60
R10	4	0
R11	2	100
R12	4	0
R13	7	86



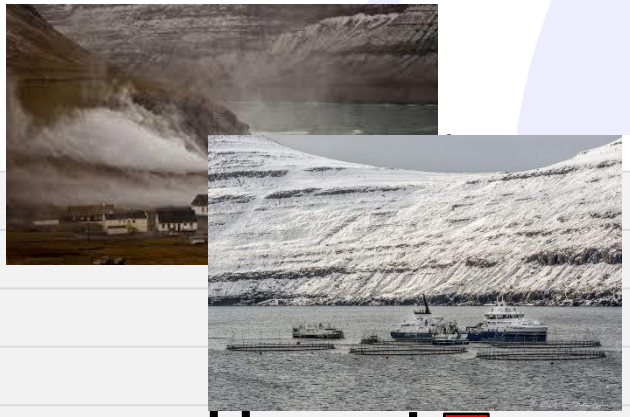
ILA smittuspjaðing kann vera sera sníkjandi

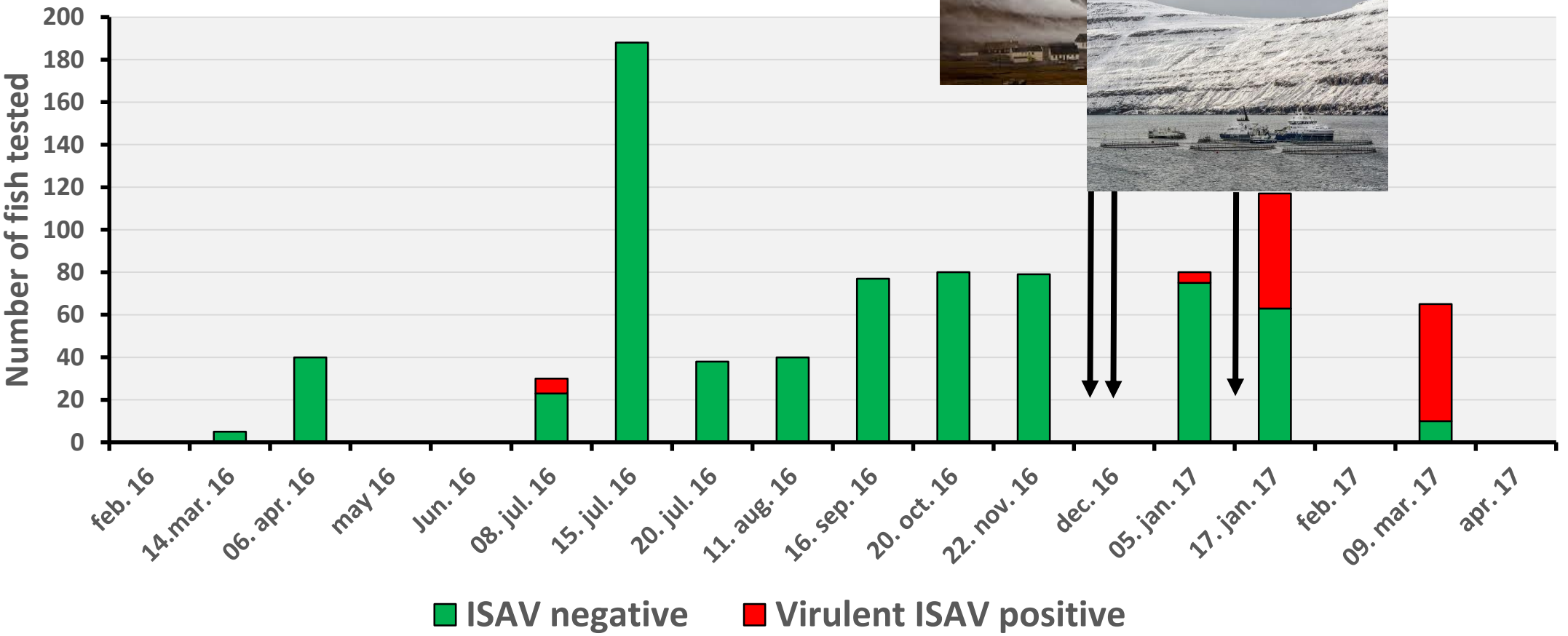


Tvær jólaódnir

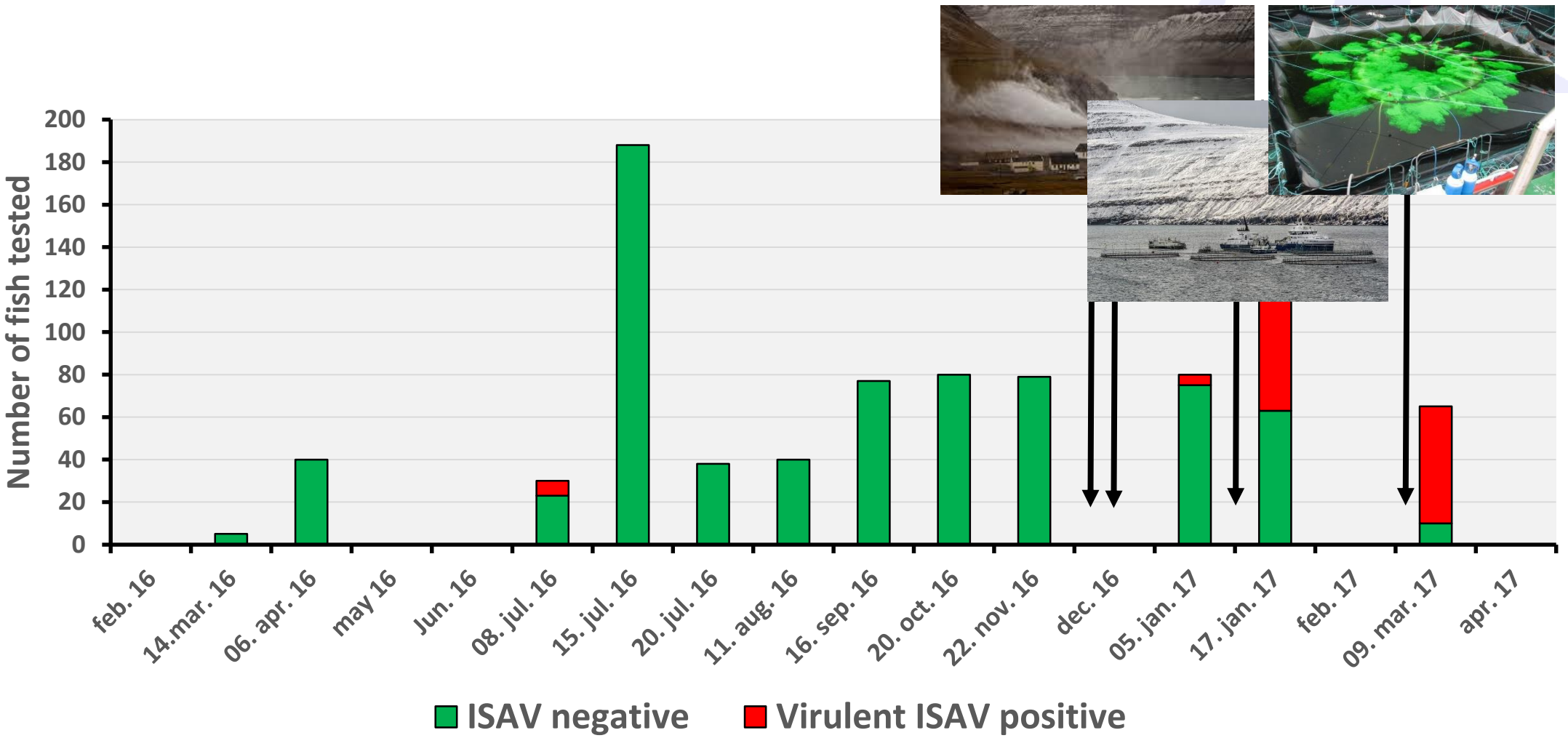


Viðgerð við feskvatni móti lús





Markant øking av HPRdel eftir at laksurin var viðgjørdur móti lús



Hvat vísir hetta ILA útbrotið okkum ?

1. ILA sjúkan kann vera sera sníkjandi og fjala seg í longri tíð áðrenn eitt útbrot verður sjónligt við felli.

2. Strongd sum veður, handfaring og viðgerðir kann fáa eitt ILA útbrot at eksplodera.

Hvat vita vit um HPRO ?

Mynd: Peter S. Østergaard

Øll framleiðsluumfør á sjónum vera smittaði í stytri ella longri tíð við HPR0

Journal of General Virology (2011), **92**, 909–918 DOI 10.1099/vir.0.027094-0

A low-pathogenic variant of infectious salmon anemia virus (ISAV-HPR0) is highly prevalent and causes a non-clinical transient infection in farmed Atlantic salmon (*Salmo salar* L.) in the Faroe Islands

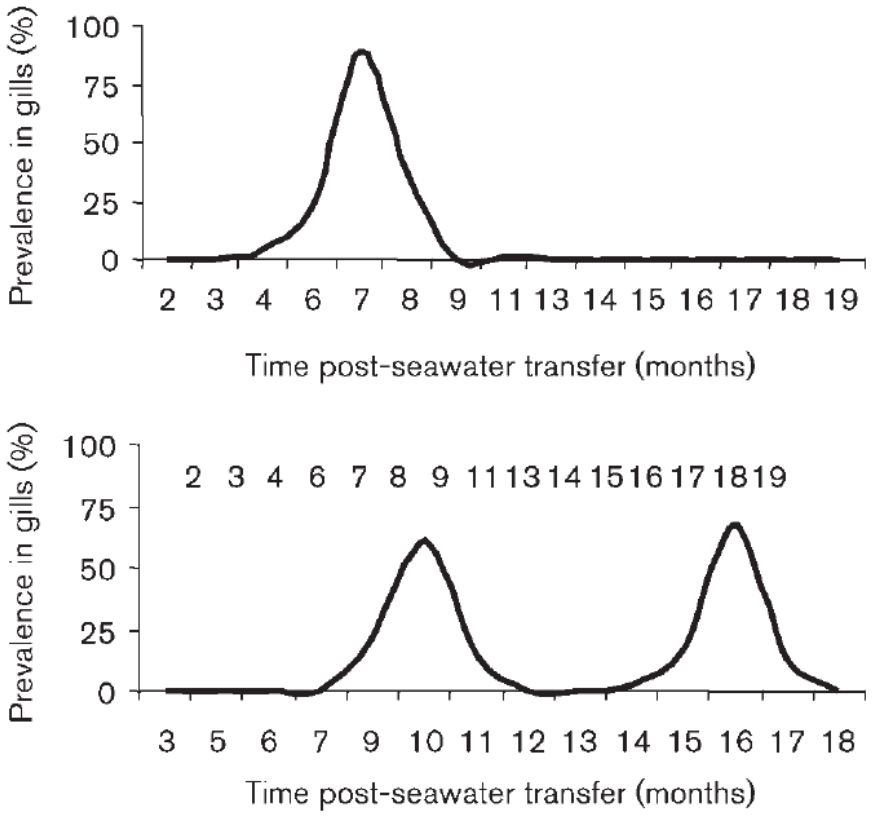
Debes H. Christiansen,[1] Peter S. Østergaard,[1] Michael Snow,[2] Ole Bendik Dale[3] and Knut Falk[3]

[1]Food and Veterinary Agency, National Reference Laboratory for Fish Diseases, Tórshavn, Faroe Islands

[2]Marine Scotland Science, Marine Laboratory, Aberdeen, Scotland, UK

[3]National Veterinary Institute, Section for Fish Health, Oslo, Norway

Correspondence
Debes H. Christiansen
Debesc@hfs.fo



Nær eftir útsetu verður laksurin smittaður ?

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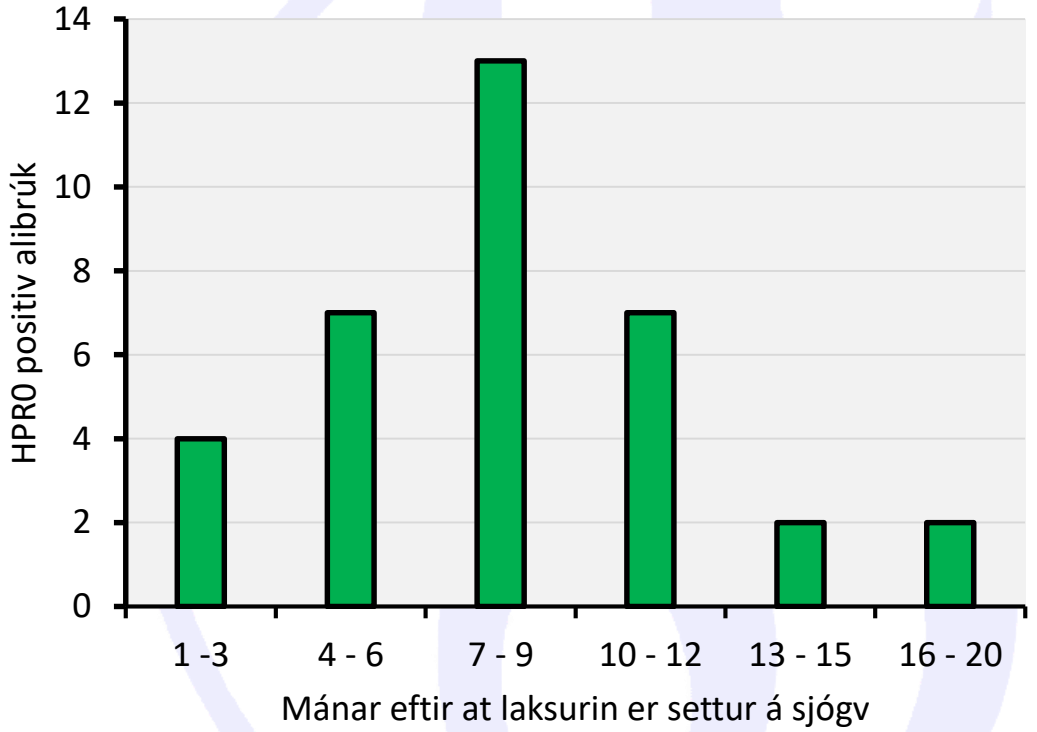

Nær er størsti vandi at blíva smittaður við HPR0 ?

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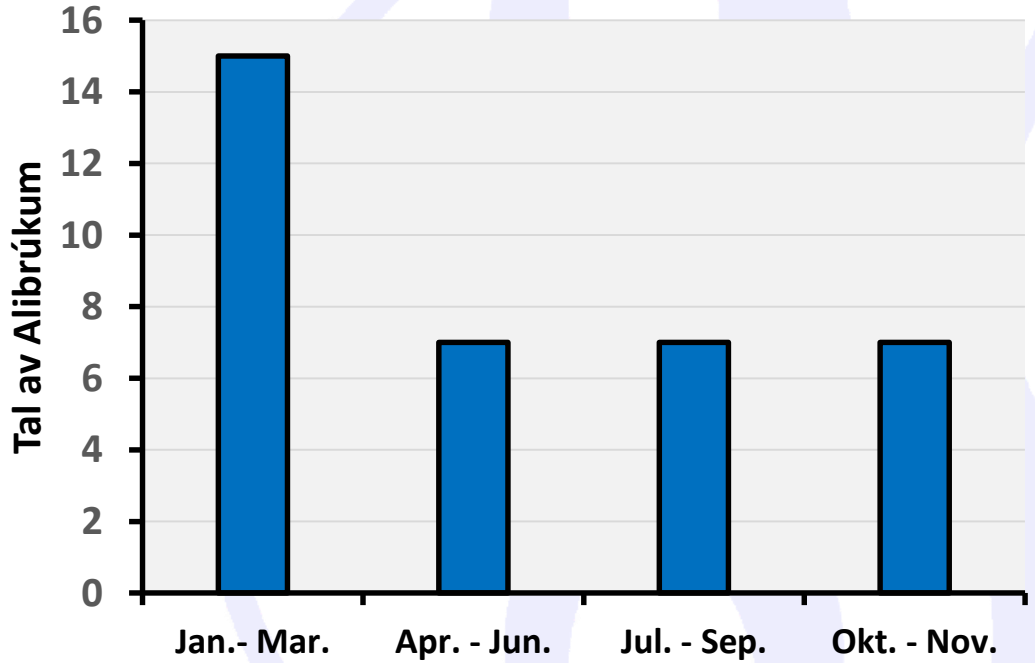


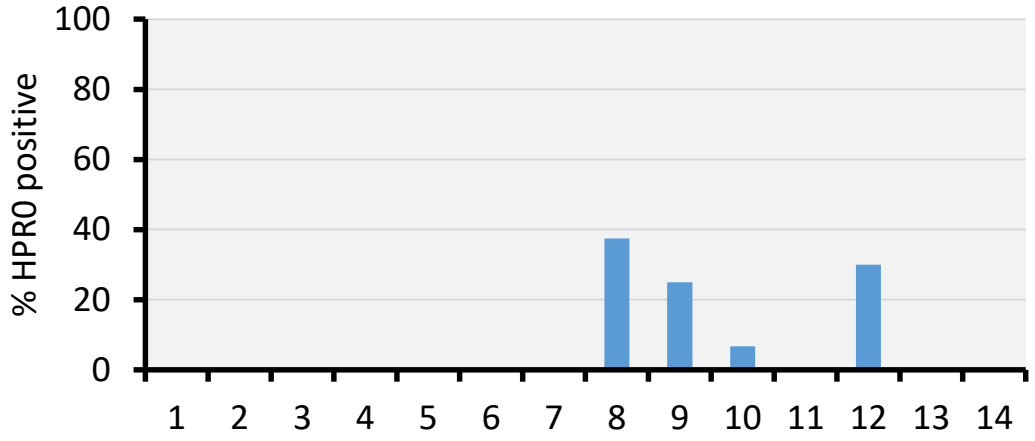
Lívfiskur er ofta smittaður við HPR0 undir strúking

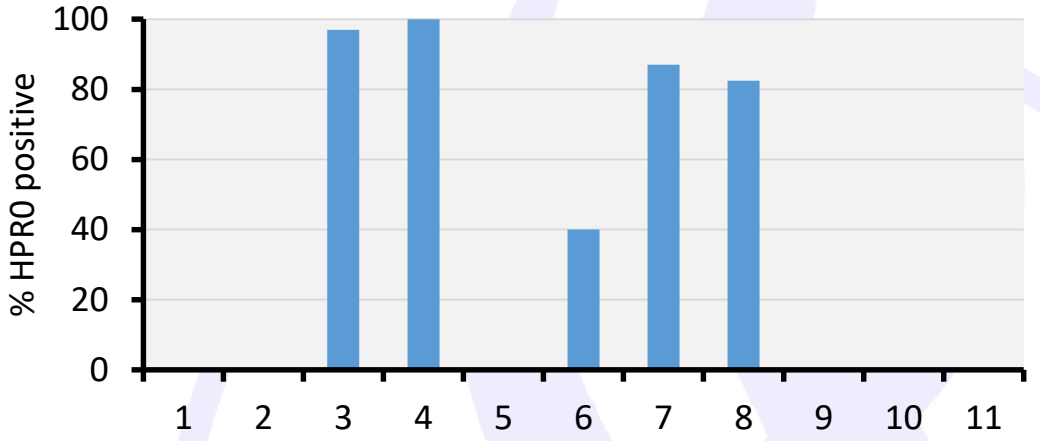
	Lívfiskur N	HPR0 %
2008	443	47
2009	50	0
2010	427	93
2011	210	35
2012	263	0.3
2013	65	0
2014	121	63
Í alt	1751	39

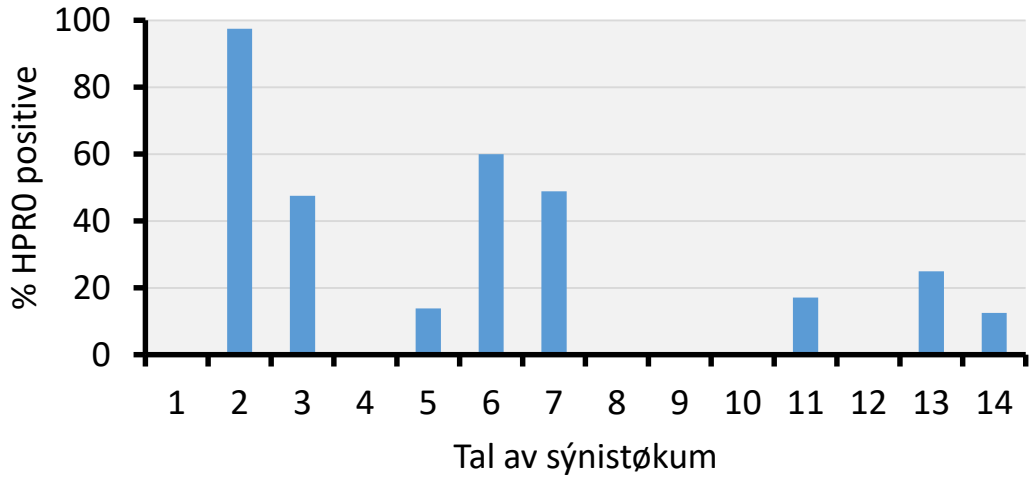
Smolt eru regluliga smittaði við HPR0

	I		II		III		IV	
	Smolt n	HPR0 %	Smolt n	HPR0 %	Smolt n	HPR0 %	Smolt n	HPR0 %
2009	332	0	357	0	341	0	348	17
2010	309	25	284	0	359	0	260	11
2011	339	9	382	0	359	0	359	15
2012	80	0	49	0	40	0	80	48
2013	40	0	80	0	120	0	40	8
2014	74	3	69	0	111	35	80	35
2015	44	0	39	0	40	65	40	38
2016	85	16	80	0	90	26	90	9
2017	50	8	124	23	78	40	55	15

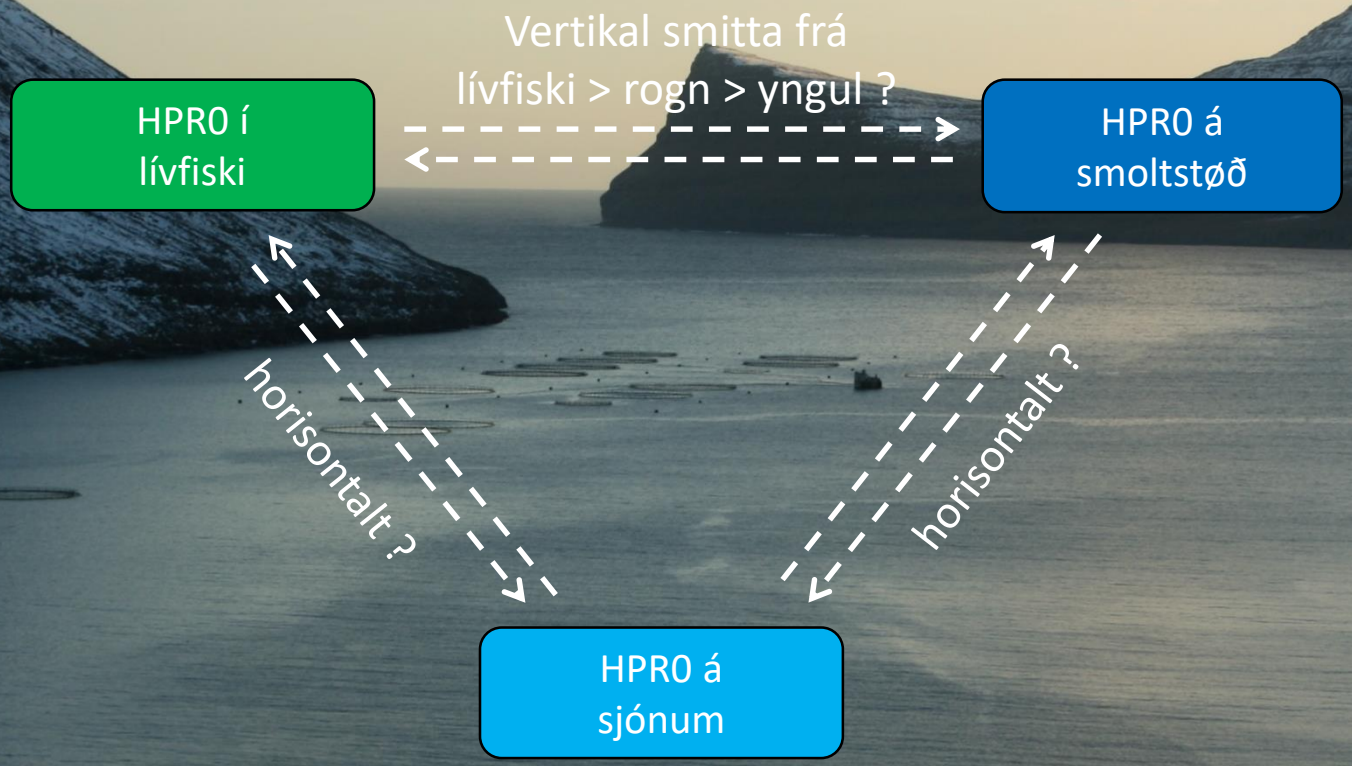
HPRO smittu dynamikkur á smoltstøðum yvir 18 måneder





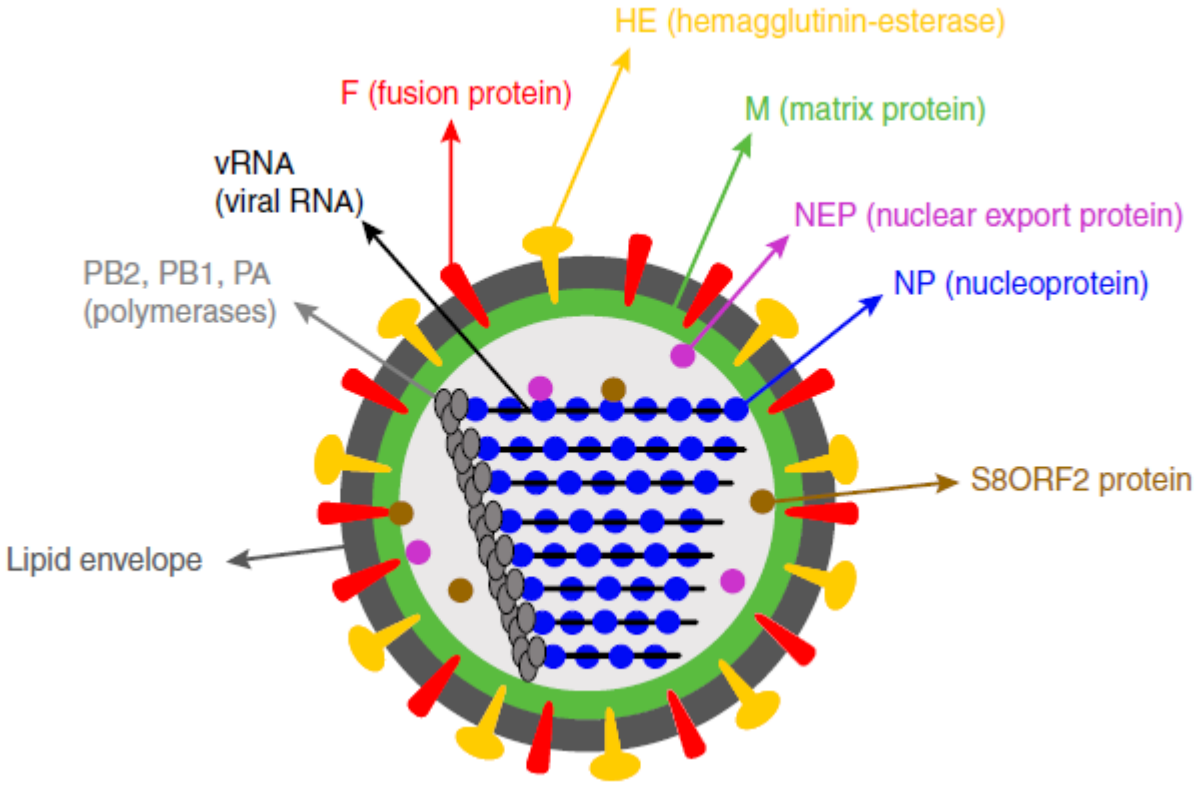


Hvussu smittar HPR0 millum framleiðslueindir á sjógvi og landi ?



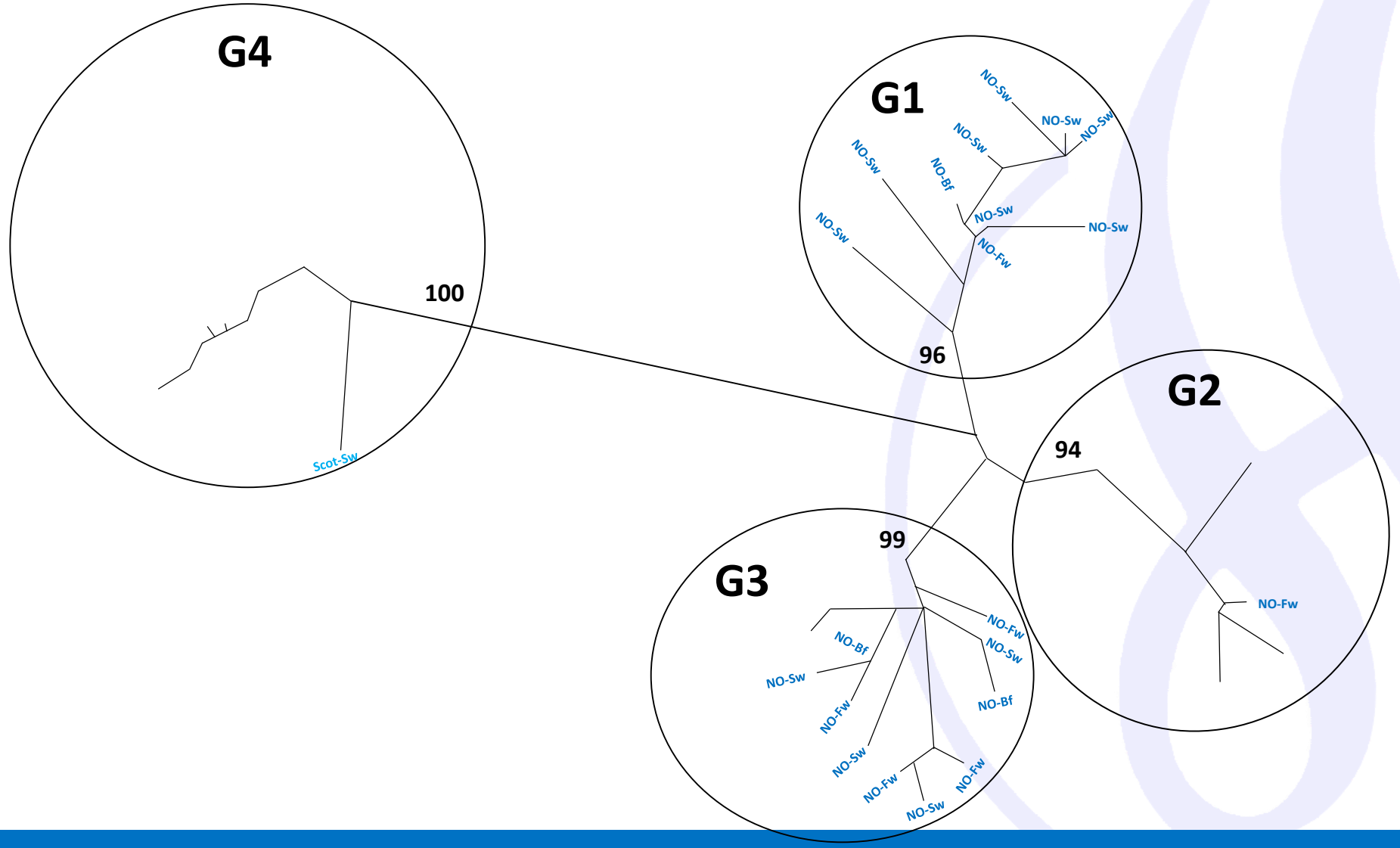
Mynd: Peter S. Østergaard

Hvussu smittar HPRO millum framleiðslueindir á sjógvi og landi ?

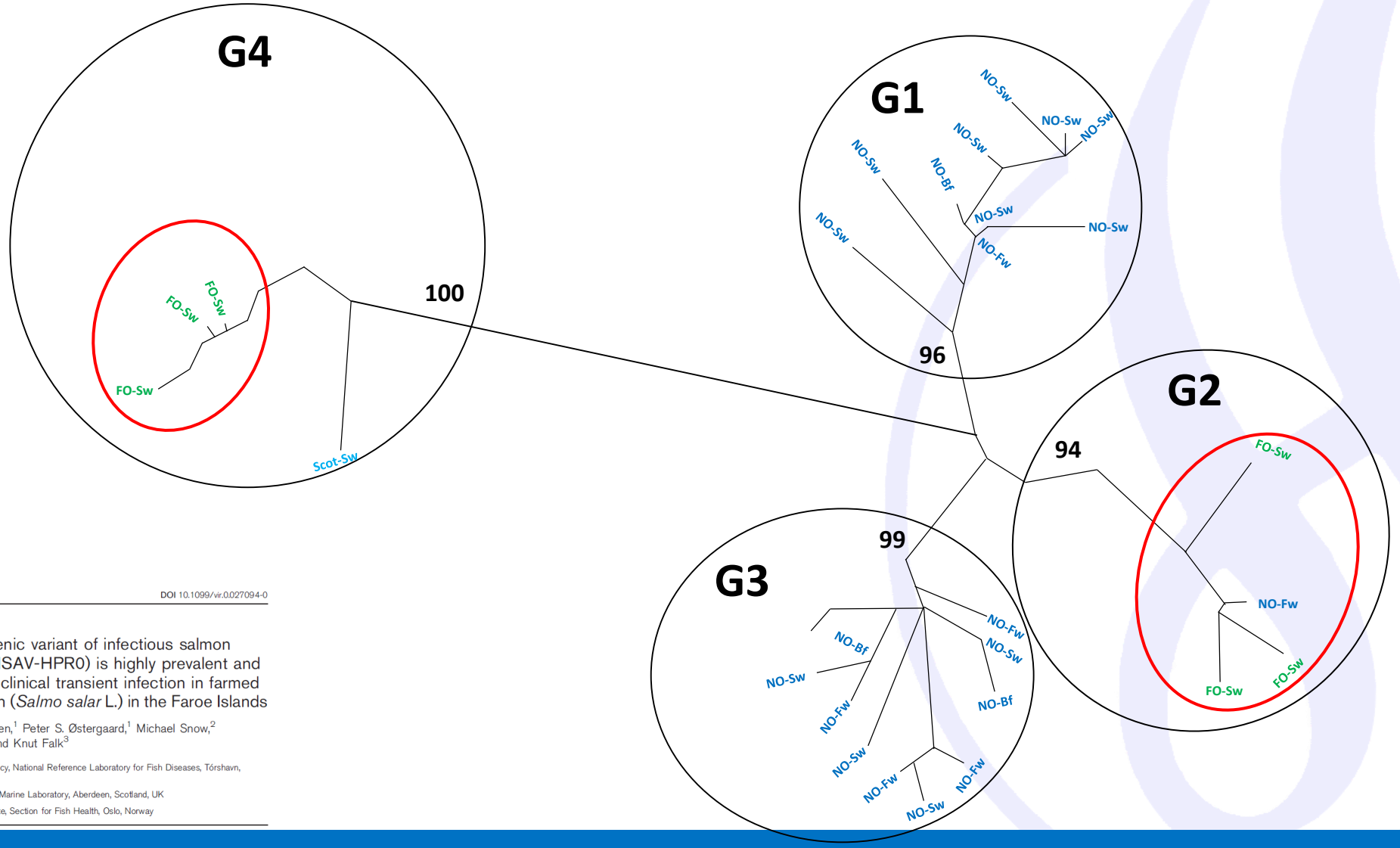


- Við at kannað arvamassan hjá ymiskum ILA-virus kann ein siga nakað um hvussu tætt teir eru í familju.

Í Europa eru tað 4 ymiskar HPRO familjur: G1, G2, G3 og G4



Allir Føroysku HPR0 variantarnir á sjónum hoyra til G2 ella G4



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A low-pathogenic variant of infectious salmon anemia virus (ISAV-HPR0) is highly prevalent and causes a non-clinical transient infection in farmed Atlantic salmon (*Salmo salar* L.) in the Faroe Islands

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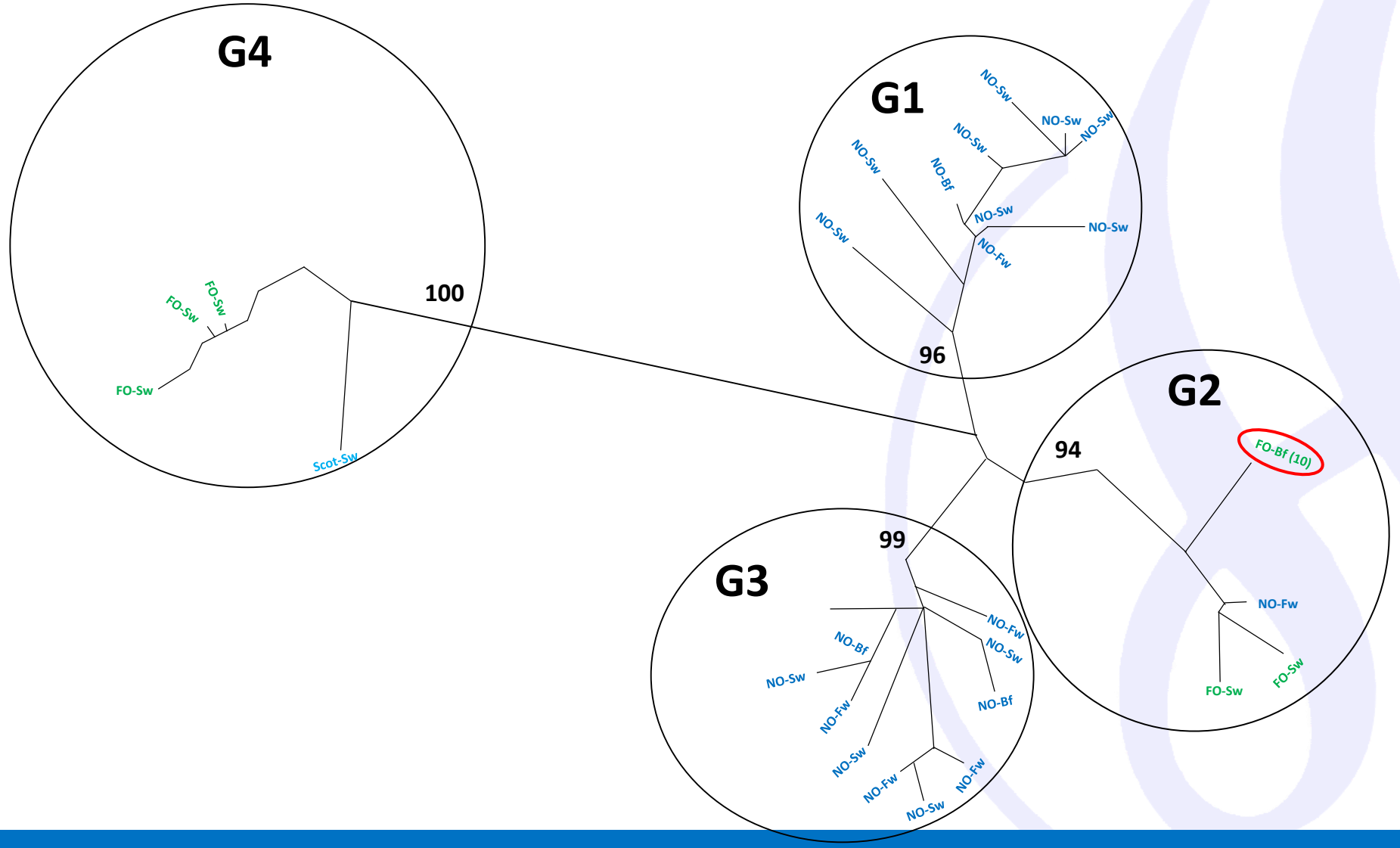
Hvørja HPR0 familju(r) hoyrir lívfiskurin stroking í 2010 til ?

Ár	Lívfiskar kannaðir fyri ILAV (N)	HPR0 positivir lívfiskar (%)	HPR0 positiv rognvæske (%)
2007	256	5	n/a
2008	474	40	n/a
2009	50	0	n/a
2010	427	93	12
2011	201	35	n/a
2012	263	0.3	n/a

Hvørja HPRO familju(r) hoyrir lívfiskurin stroking í 2010 til ?
G2

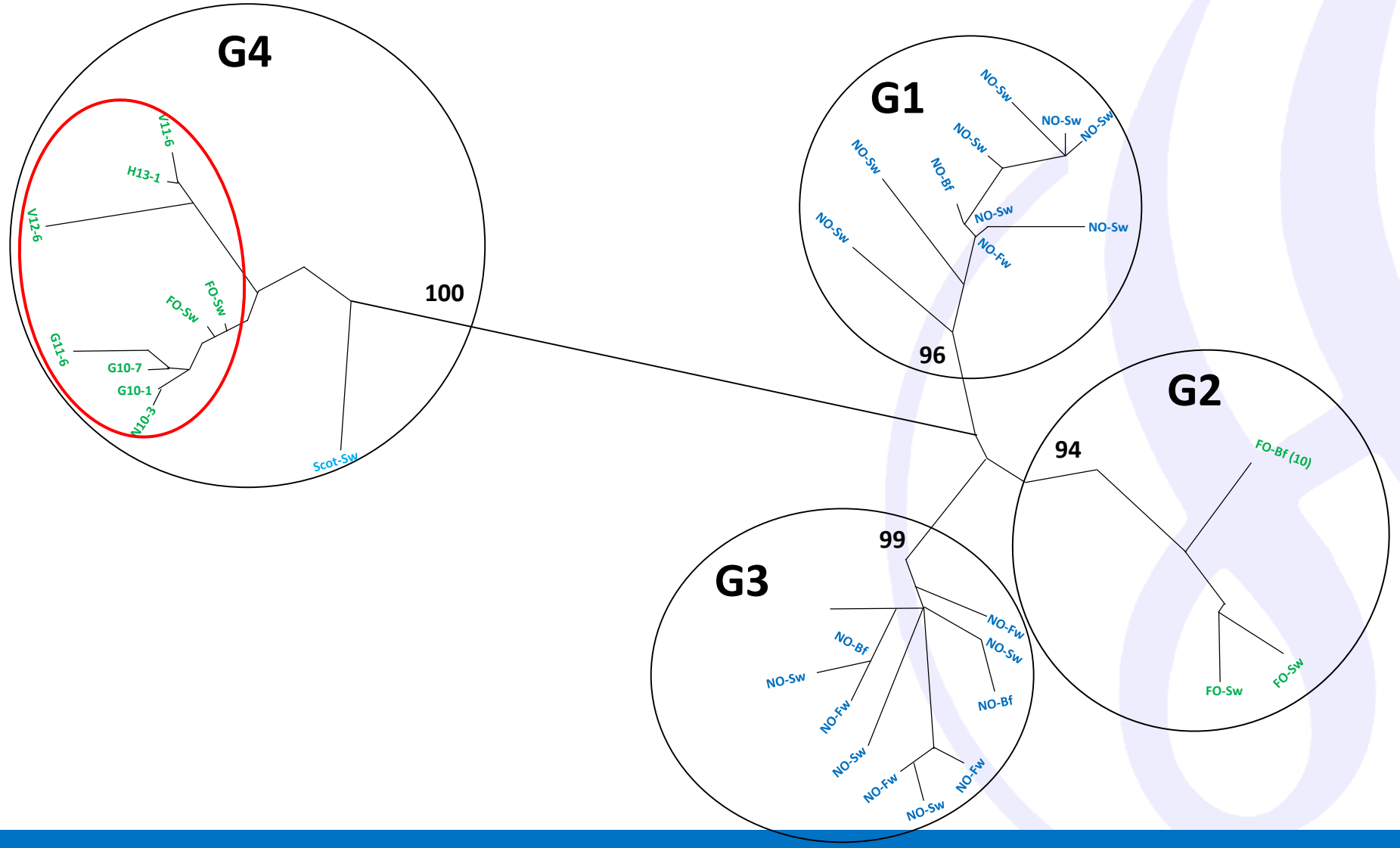


Flestu smoltstøðirnar hava móttikið rogn frá tí HPR0-positiva lívfiskinum

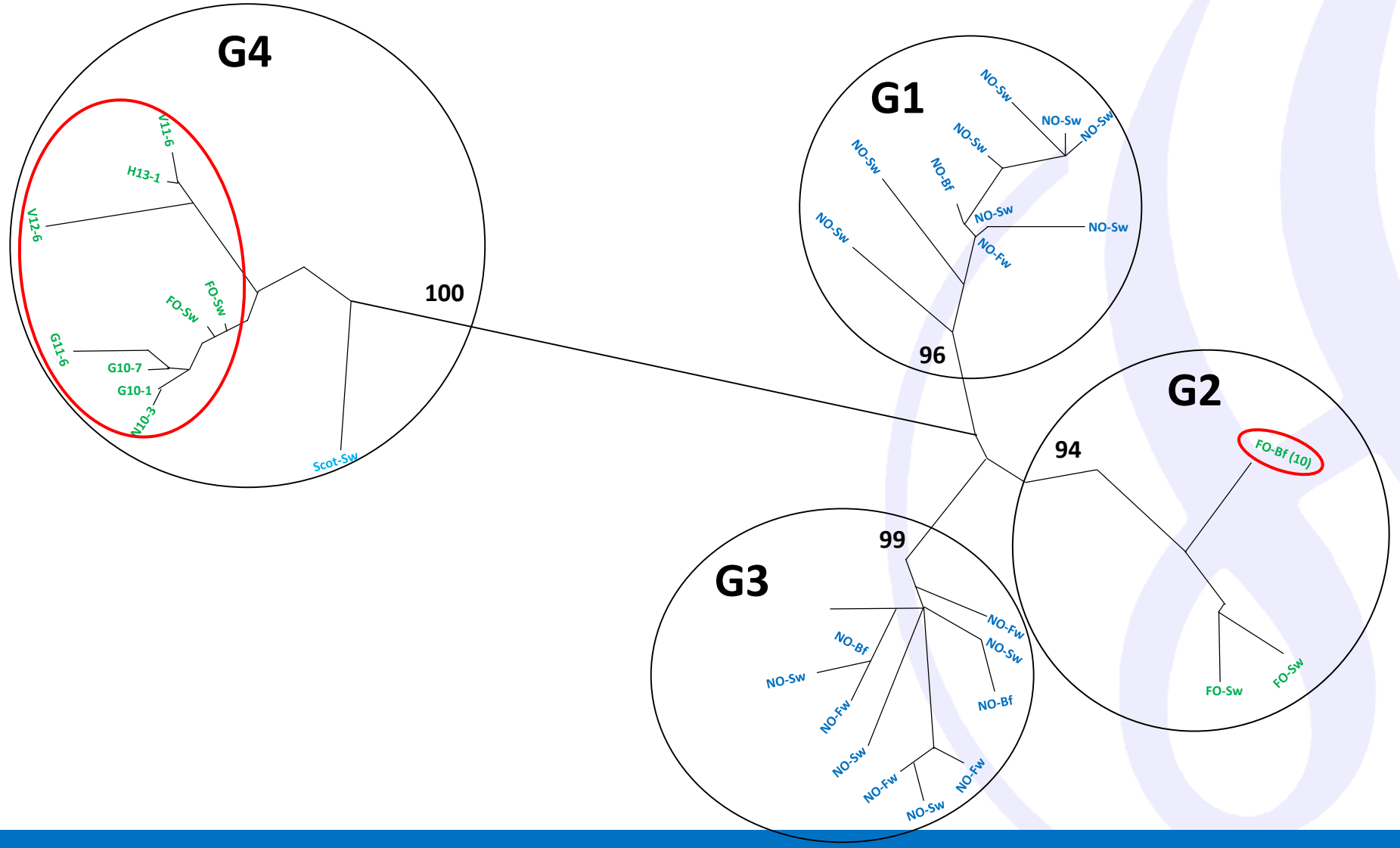
År	Antal fisk screenet for ISAV	HPR0 positive stamfisk (%)	HPR0 positiv rognvæske (%)
2007	256	5	n/a
2008	474	40	n/a
2009	50	0	n/a
2010	427	93	12
2011	2010	35	n/a
2012	263	0.3	n/a

Smoltstøð	rogn (mill)	HPR0 positive smolt 2011 (%)	HPR0 positive smolt 2012 (%)	HPR0 positive smolt 2013 (%)
N+H	3.1	0	38	6
G	1.2	19	4	18
V	0.7	15	48	8
F	0.6	0	0	0

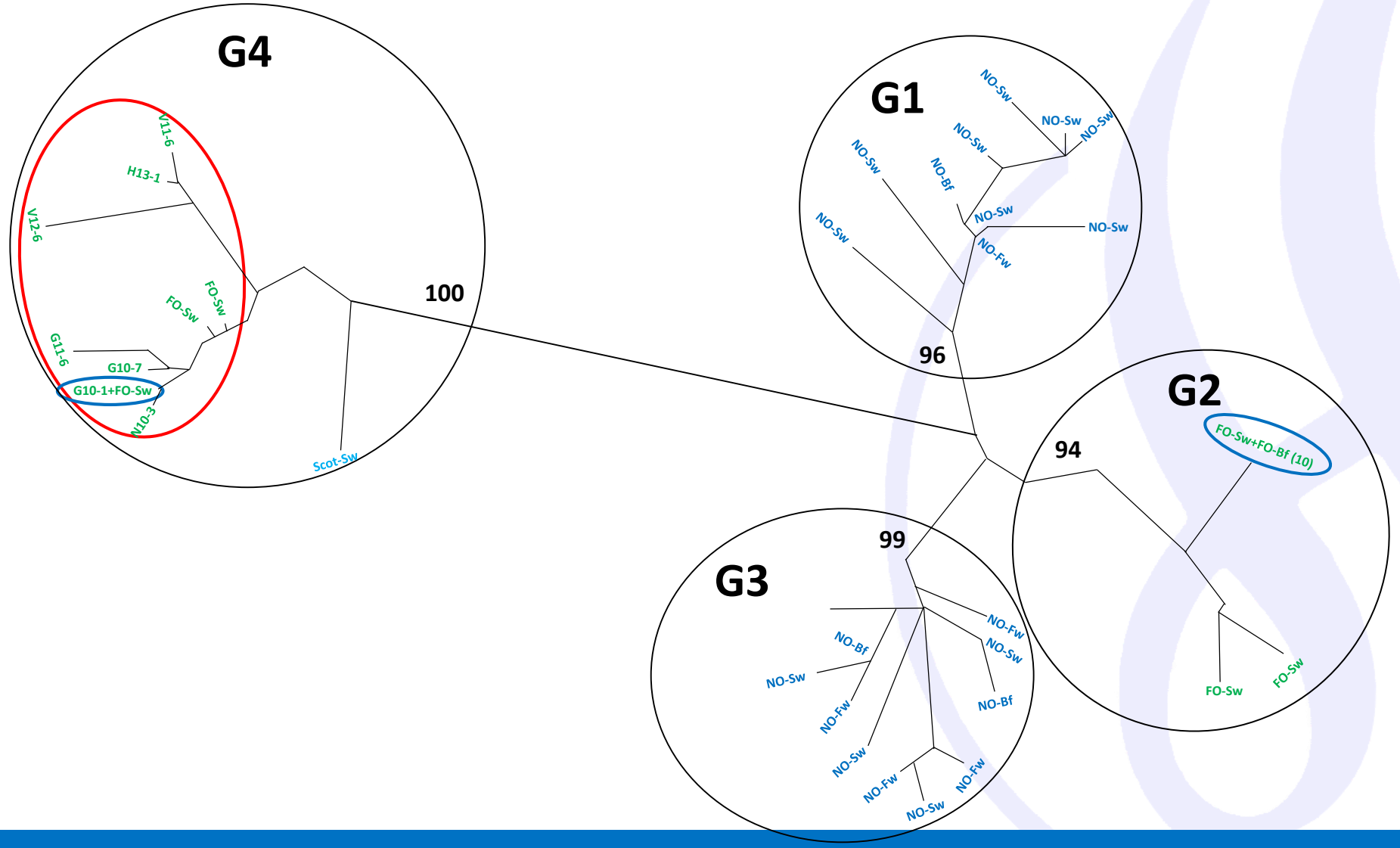
Allir HPRO á smoltstøðum kannaðar í 2011 – 2013 hoyra til G4



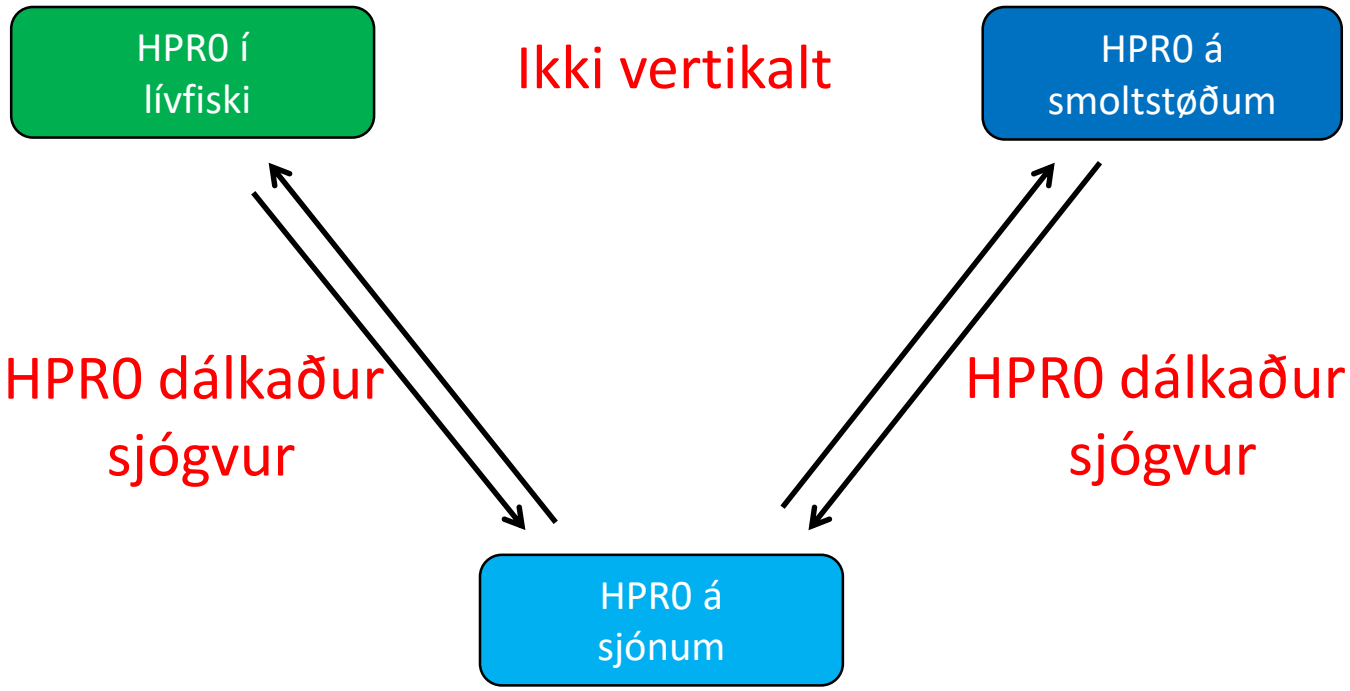
HPRO í lívfiski er ikki í familju við HPRO á smoltstøðunum



HPRO á sjónum er í tættari familju við HPRO í lívfiski og smolt



Hvussu smittar HPR0 millum framleiðslueindir á sjógvi og landi ?



1. HPR0 í lívfiski er ikki í familju við HPR0 í smolt.
2. HPR0 í laksi á sjónum er tætt í familju við HPR0 í smolt
3. HPR0 í laksi á sjónum er tætt í familju við HPR0 í lívfiski

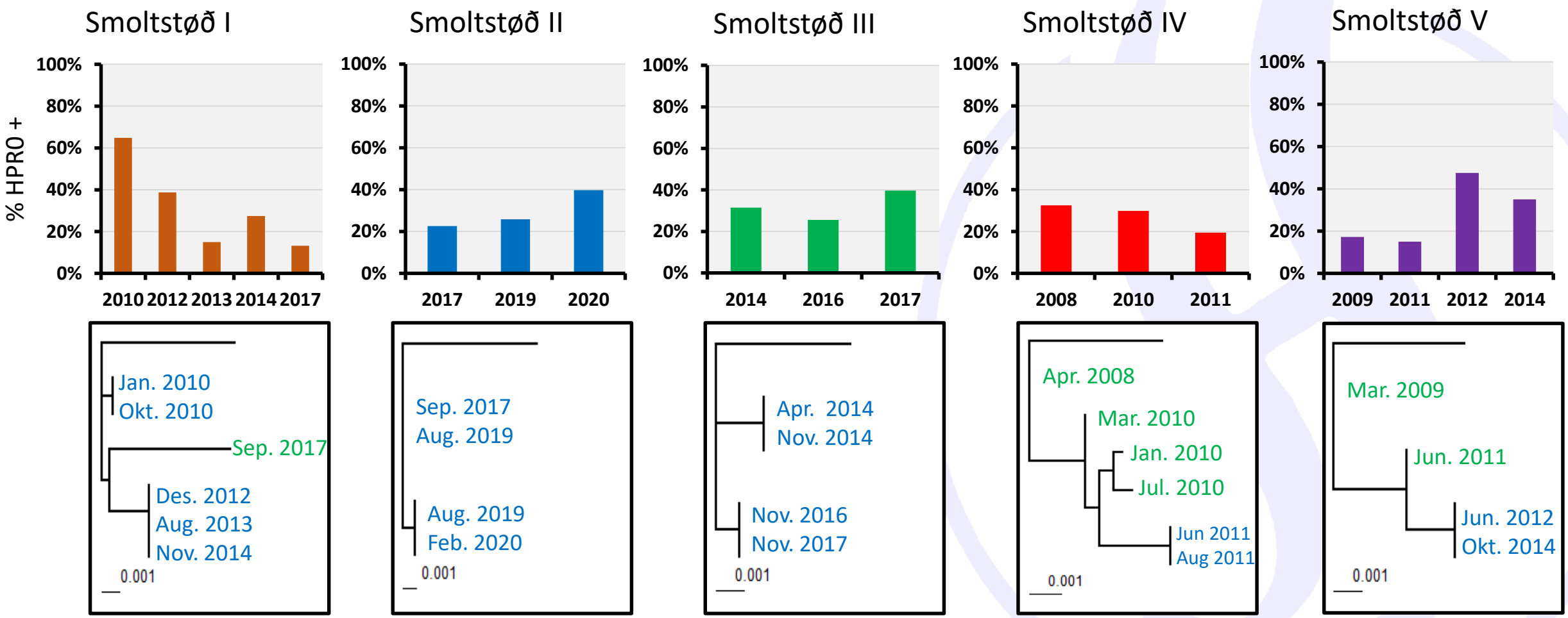
Er smittuverjan á lívfiska- og smoltstøðum nóg góð ?

Er smittuverjan á lívfiska- og smoltstøðum nóg góð ?

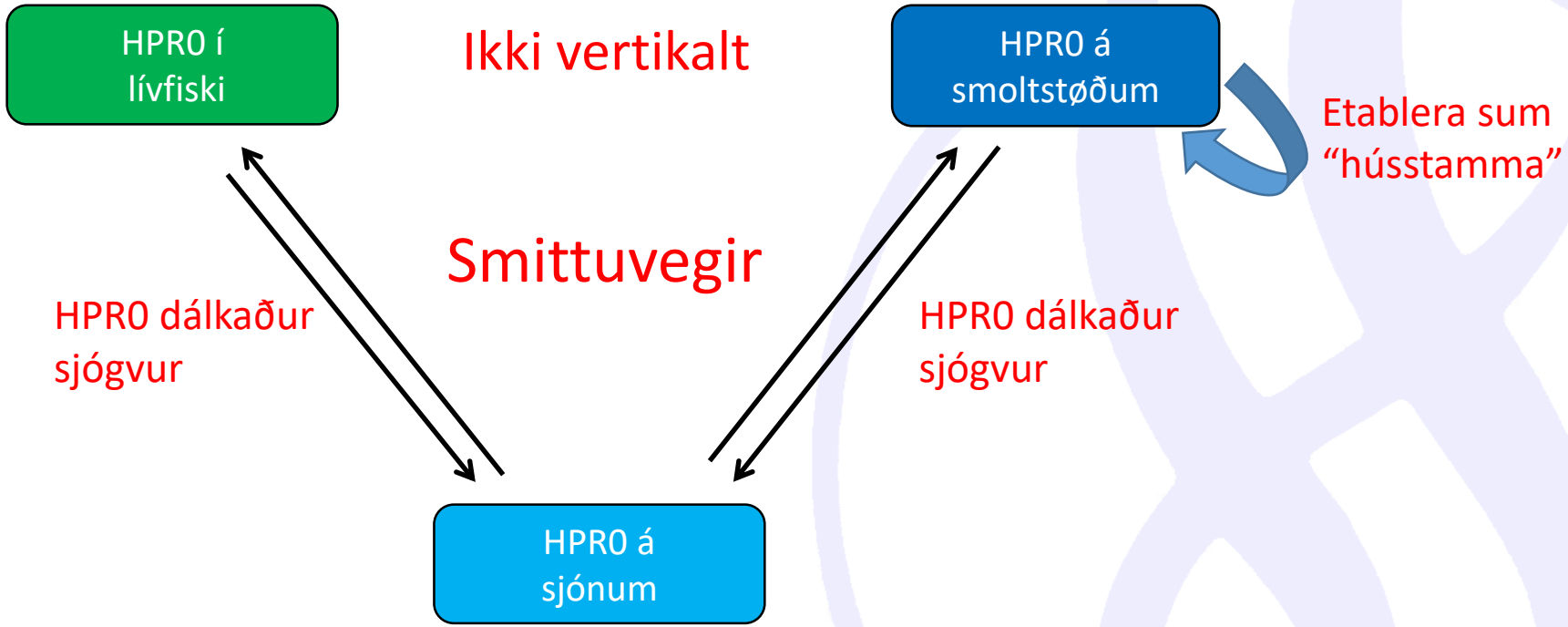
- *Er HPR0 etablera sum ein hústamma á smoltstøðunum ?*

- *Ella kemur HPR0 á smoltstøðirnar við jøvnum millumbilum við HPR0 dálkaðum sjógvi?*

Er HPRO etablera sum ein hússtamma á smoltstøðunum ?



Hvussu er HPR0 komið á lívfiska- og smoltstøðirnar?



Hvussu leingi kann HPRO liva í umhvørvinum ?

Persistence of Avian Influenza Viruses in Lake Sediment, Duck Feces, and Duck Meat▽†

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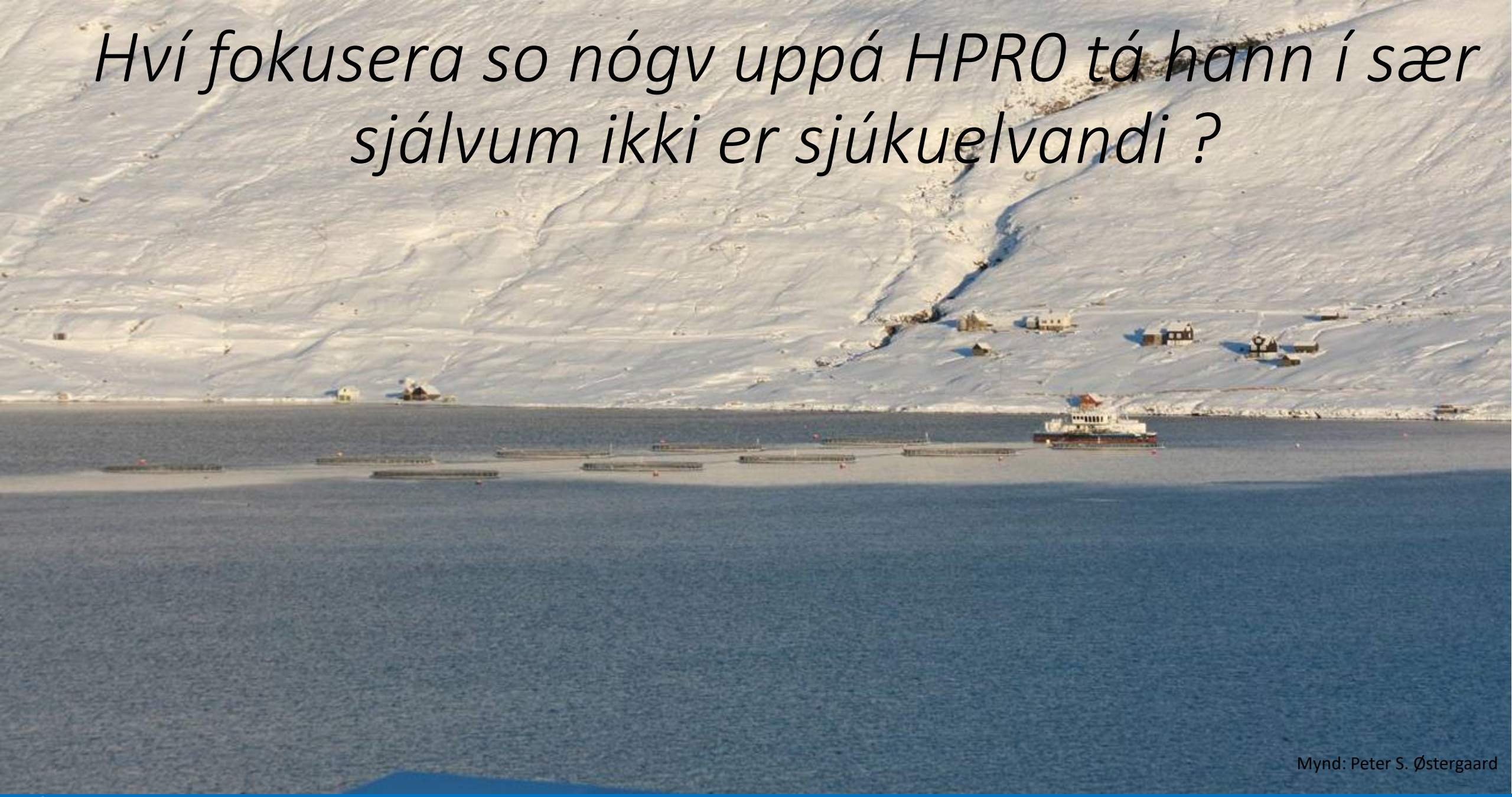
Received 24 February 2011/Accepted 18 May 2011

The persistence of 3 low-pathogenicity avian influenza viruses (LPAIV) (H4N6, H5N1, and H6N8) and one human influenza virus (H1N1) as well as Newcastle disease virus (NDV) and enteric cytopathogenic bovine orphan (ECBO) virus was investigated in lake sediment, duck feces, and duck meat at 30, 20, 10, and 0°C using a germ carrier technique. Virus-loaded germ carriers were incubated in each substrate, and residual infectivity of the eluted virus was quantified on cell culture after regular intervals for a maximum of 24 weeks. Data were analyzed by a linear regression model to calculate T_{90} values (time required for 90% loss of virus infectivity) and estimated persistence of the viruses. In general, the persistence of all of the viruses was highest in lake sediment, followed by feces, and was the lowest in duck meat at all temperatures. For the avian influenza virus subtypes, T_{90} values in sediment ranged from 5 to 11, 13 to 18, 43 to 54, and 66 to 394 days at 30, 20, 10, and 0°C, respectively, which were 2 to 5 times higher than the T_{90} values of the viruses in the feces and meat. Although the individual viruses vary in tenacity, the survival time of influenza viruses was shorter than that of NDV and ECBO virus in all substrates. The results of this study suggest that lake sediment may act as a long-term source of influenza viruses in the aquatic habitat, while the viruses may remain infectious for extended periods of time in duck feces and meat at low temperatures, allowing persistence of the viruses in the environment over winter.

Kann hesin vera eitt reservoir fyri smittur ?

Mynd: Peter S. Østergaard

Hví fokusera so nógv uppá HPR0 tá hann í sær sjálvum ikki er sjúkuelvandi ?



Mynd: Peter S. Østergaard

Hvat fær HPRO til at mutera til HPRΔ ?

Strongd

↓

Niðursett immunverja

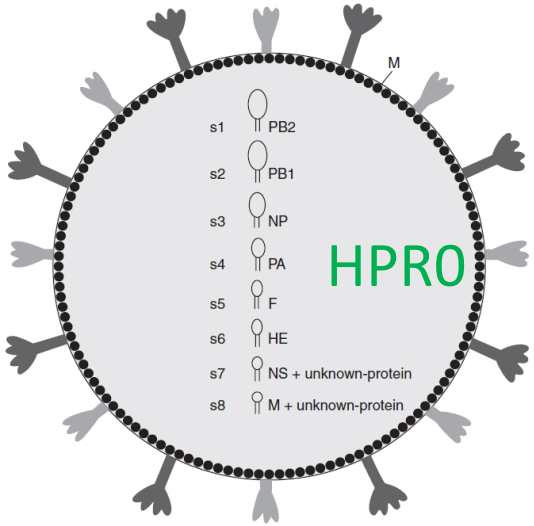
↓

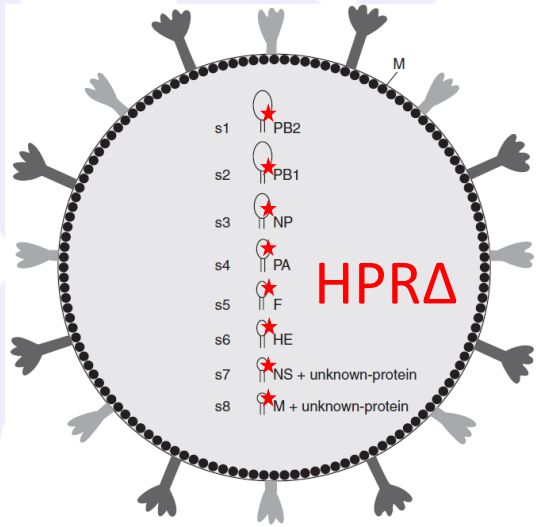
økt proliferation av virus

↓

tilvildarligar mutationir

↓





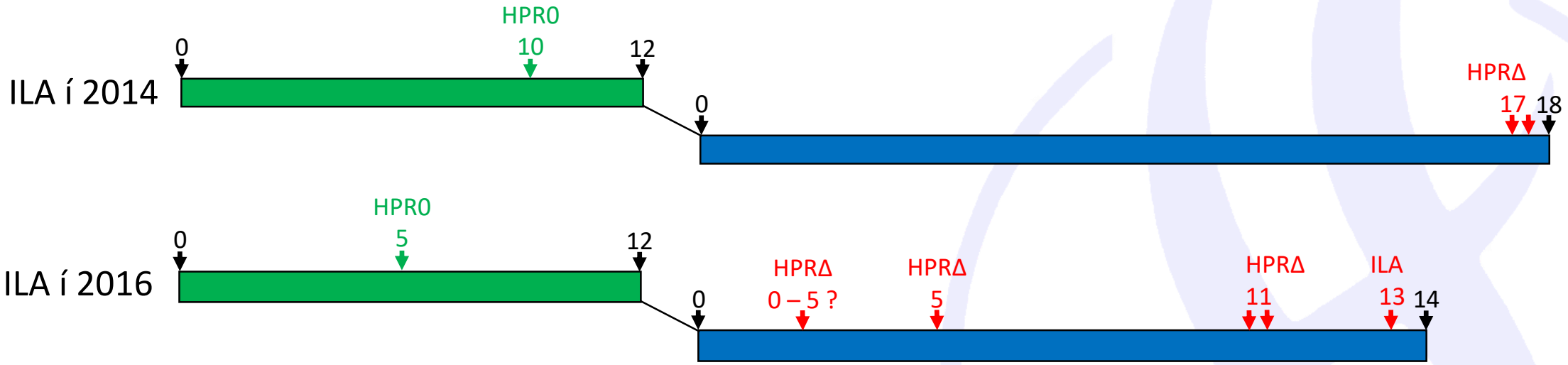
↑

Nær og hvussu leingi laksurin er smittaður

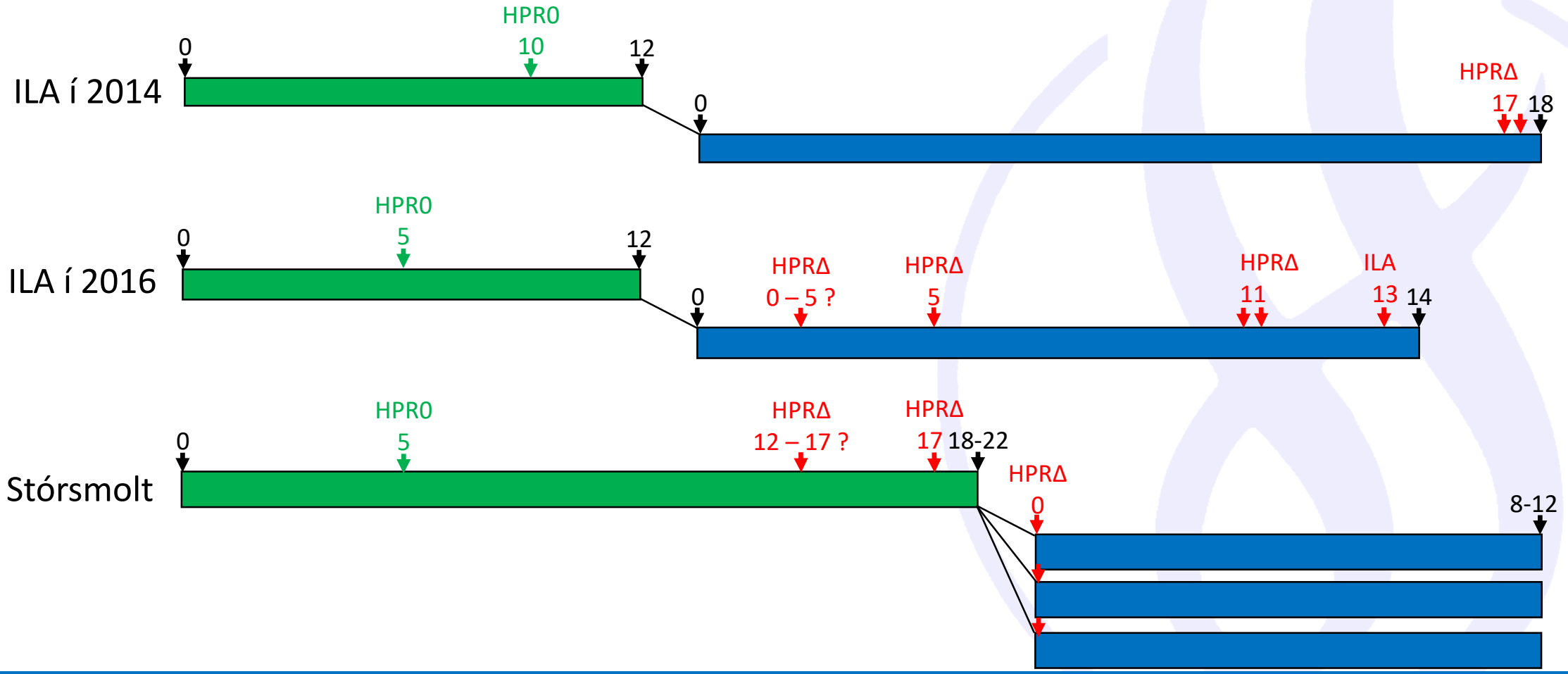
↑

Tíð

Hvussu long tíð gongur til HPRO muterar til HPRΔ?



Er stórsmolt ein vandi fyri at spjaða ILA ?



Er RAS & stórsmolt ein størri vandi fyri spjaðing av ILA ?

- RAS: JA
  - HPR0 er á øllum smoltstøðum í Føroyum
  - Tað eru etableraðar HPR0 “hússtammur” á øllum smoltstøðum.
  - Nýggjar HPR0 familjur koma við jøvnum millumbilum inn á smoltstøðina

- Stórsmolt: JA
  - Jú longur ein laksur gongur á smoltstøð jú størri vandin at HPR0 > HPRΔ áðrenn laksurin er settur á sjógv

Hvussu stórur er vandin at spjaða ILA frá einari smoltstøð?

- Vandin er lítil
  - Men við RAS & stórsmolt vera mørk alla tíðina flutt við nógvum óvissum eisini um vandan við sjúkum
- Avleiðingin er stór
  - Kemur ILA í eina smoltstøð so kenna vit avleiðingina

Tí er sera umráðandi alla tíð at hava fokus á

- fiskaheilsu og fiskavælferð
- smittufyribyrging

á smoltstøðunum

Kunnu aðrir vandar standast av HPR0 ?

- Í 2013 setti WHO HPR0 á listan yvir álvarsamar smittandi sjúkur saman við tí sjúkuelvandi ILAdel-virus

- Hetta kann fáa fíggjarligar avleiðingar tí lond sum ikki ynskja HPR0 positivan laks kunnu innføra handilsbann

- *Ella kann ein positivur HPR0 laksur vera brúktur/misbrúktur av londum sum eru í ferð við at uppbyggja landbaserað aling av laksi ?*

Tak fyri

Spurningar

Mynd: Peter S. Østergaard