



European Union Reference Laboratory for Parasites

Unit of Foodborne and Neglected Parasitic Diseases

Department of Infectious Diseases

ISTITUTO SUPERIORE DI SANITÀ



RUOKAVIRASTO

Livsmedelsverket • Finnish Food Authority

19th Workshop of the National Reference Laboratories for Parasites

6-7 November 2024

POCCHIARI room

(Lecture theatre; Viale Regina Elena 299)

Istituto Superiore di Sanità

Foodborne zoonotic parasites of the North

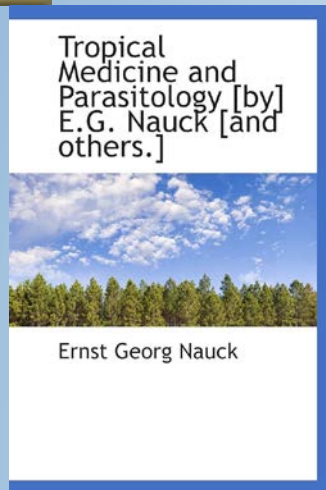
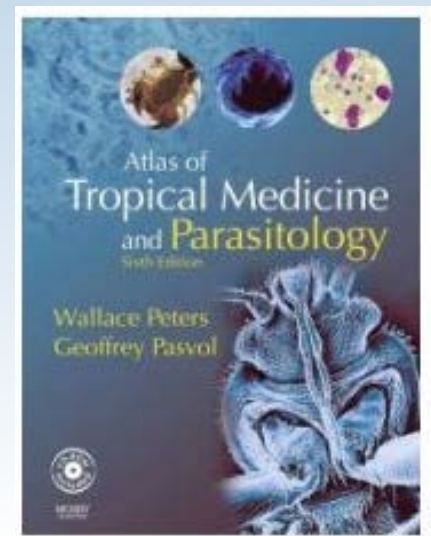
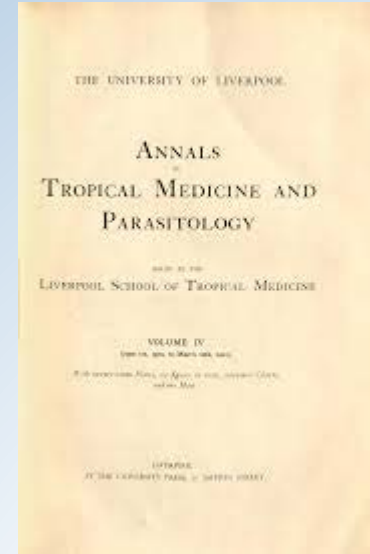
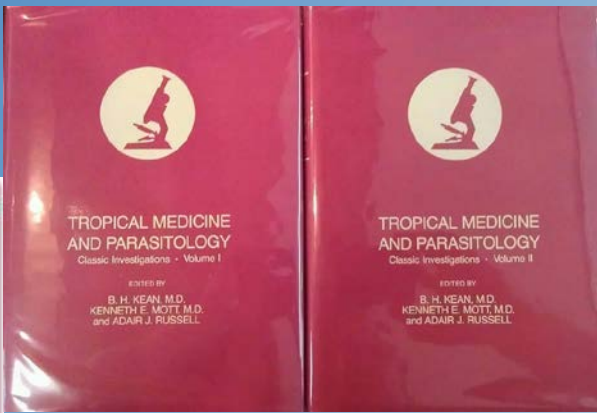
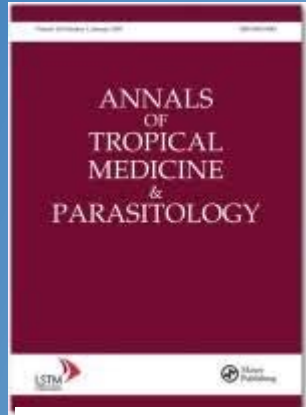
Antti Oksanen, Citizen of Finland

FINPAR



HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

ELÄINLÄÄKETIETEELLINEN TIEDEKUNTA
VETERINÄRMEDICINSKA FAKULTETEN
FACULTY OF VETERINARY MEDICINE





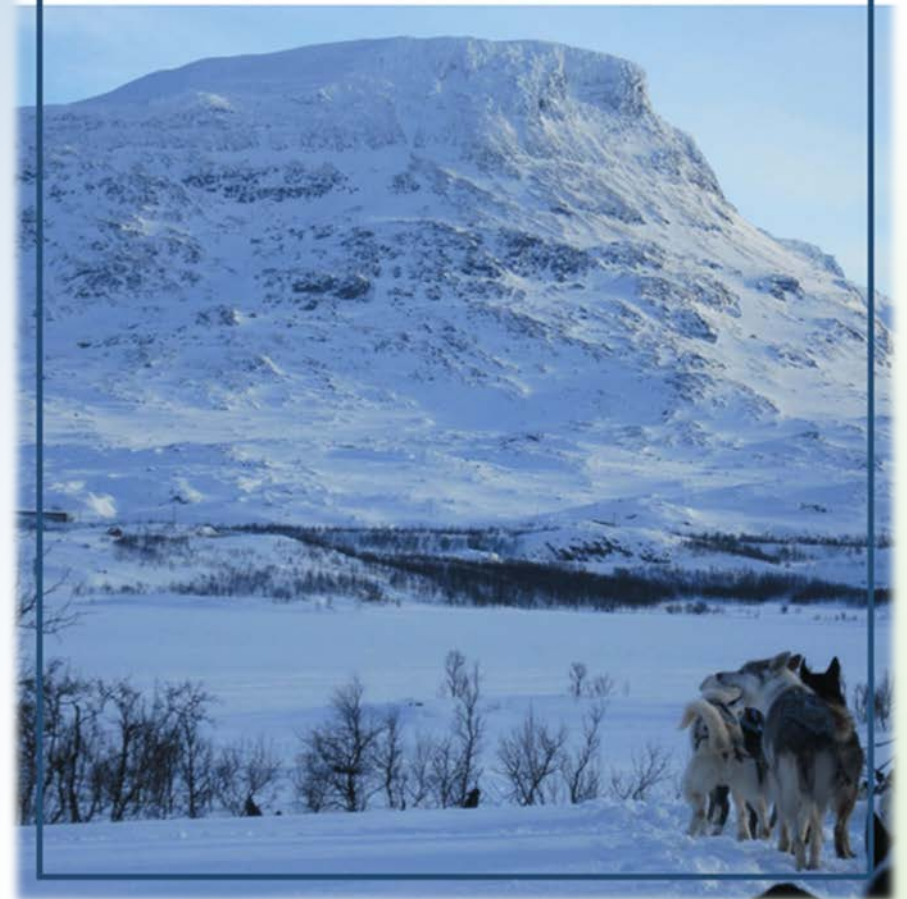
Eight countries by the Arctic Circle. (US Arctic Research Commission)

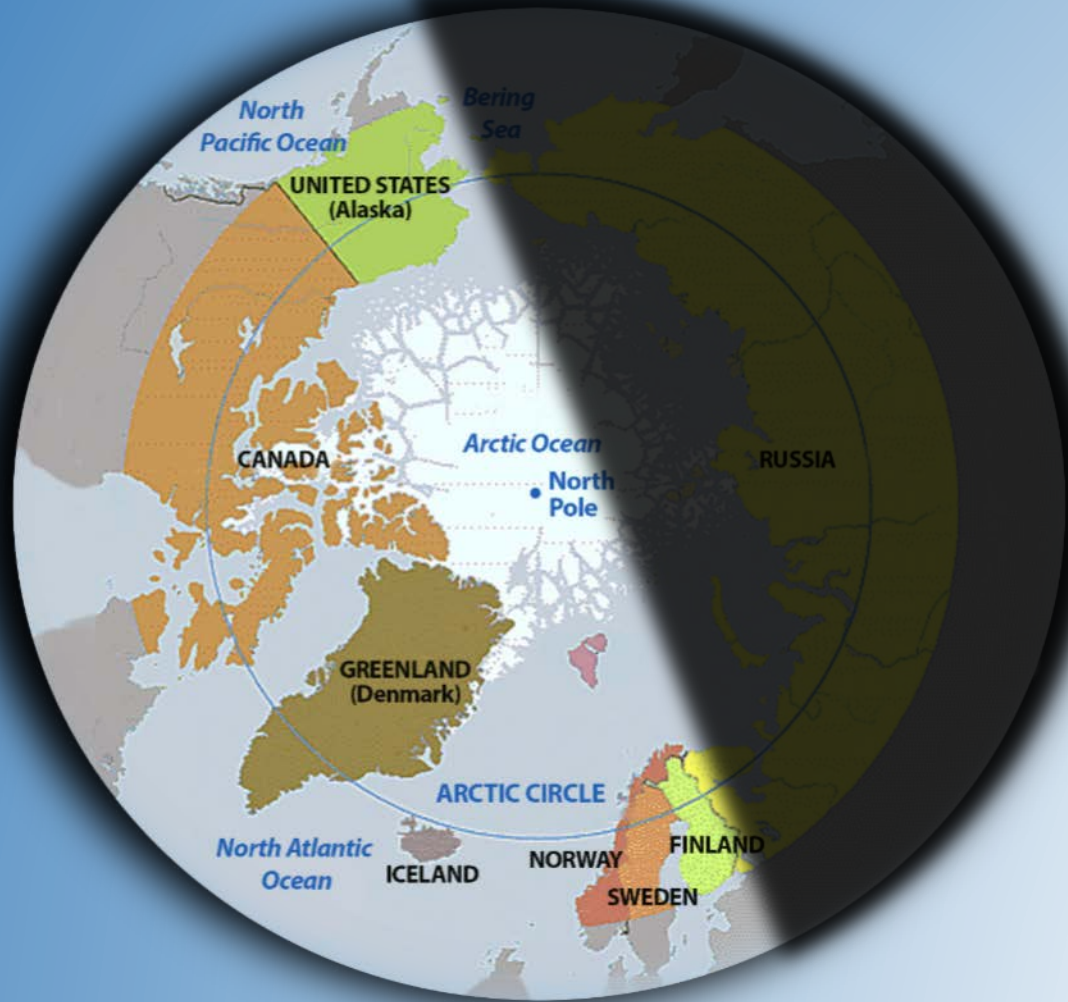


**FINNISH FOOD
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Finnish Food Authority
Research Reports
5/2019

One Arctic - One Health





Half Arctic – Full Health (???)

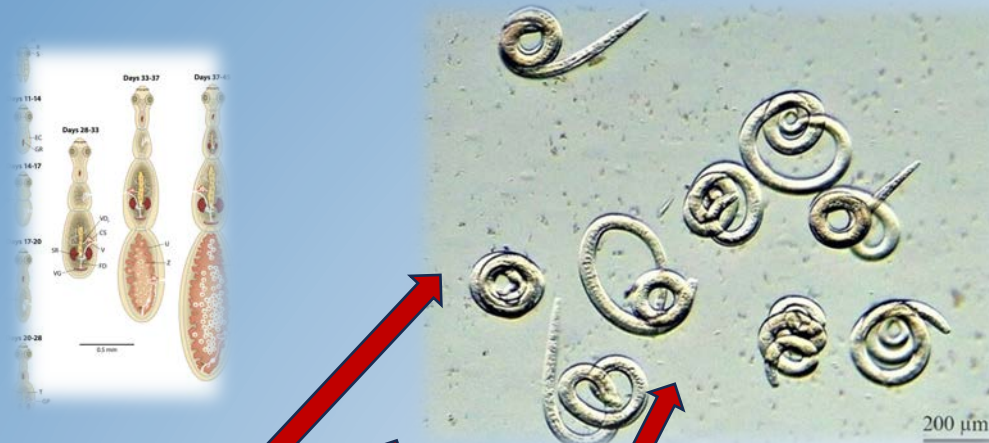
Host

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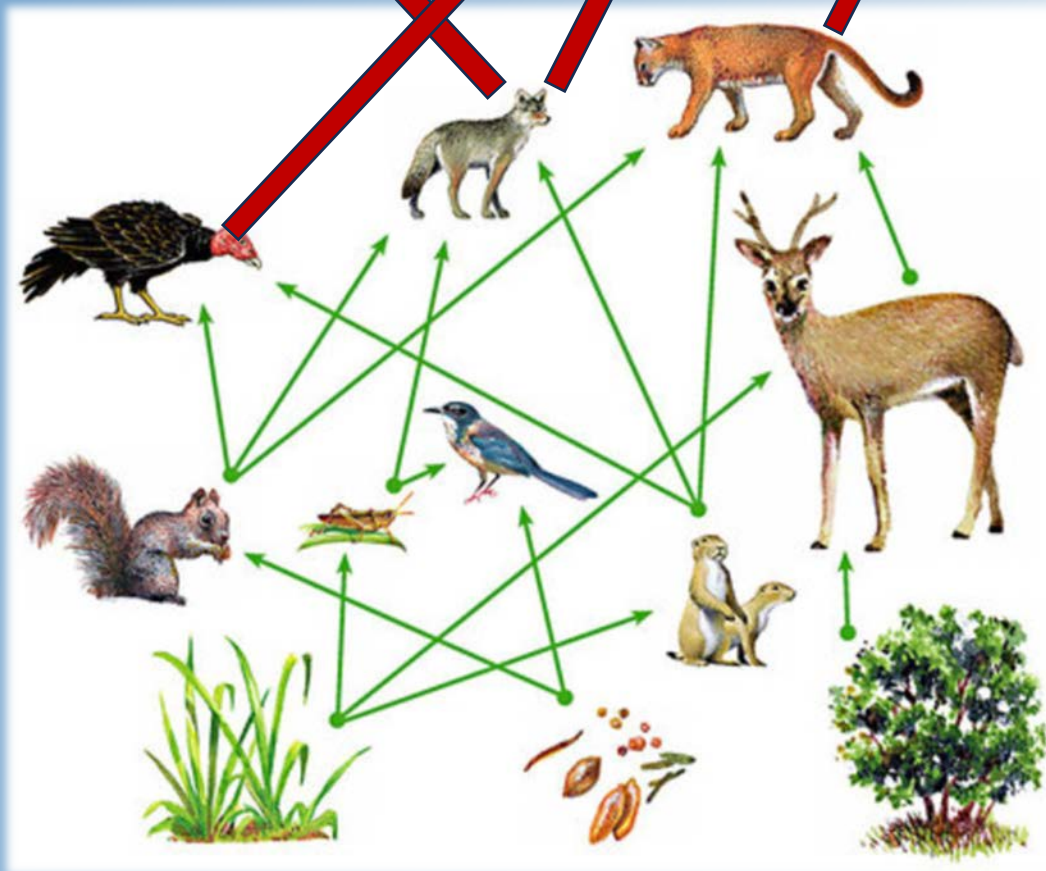
Parasite



Chapter Two - Biology and Systematics of
Echinococcus R.C.A. Thompson



Sgroi, G., D'Alessio, N., Marucci, G., Pacifico, L.,
Buono, F., Deak, G., ... & Veneziano, V. (2023).
Trichinella britovi in wild boar meat from Italy, 2015–
2021: A citizen science approach to surveillance. *One
Health*, 16, 100480.

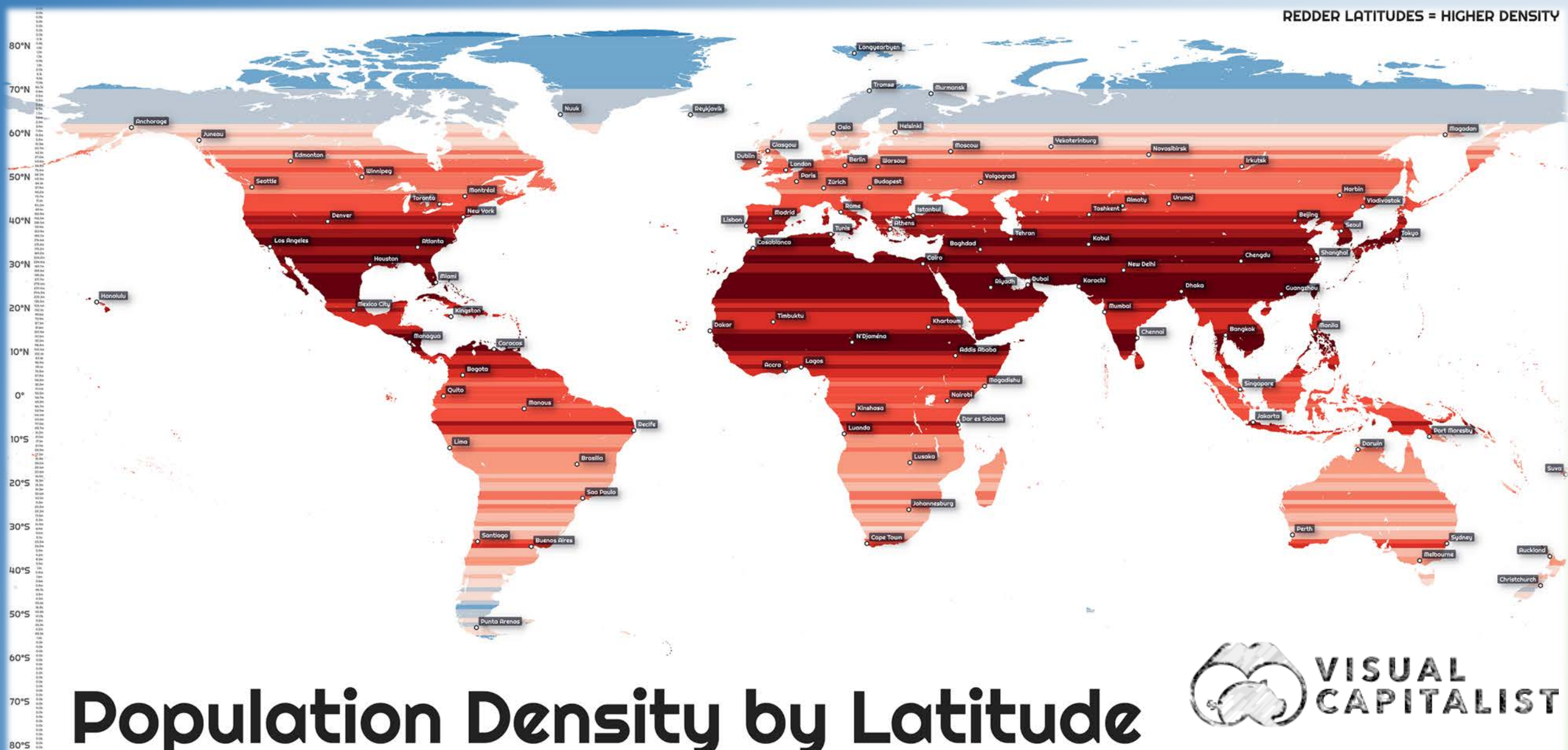


<https://chaseacademy.in/food-chain-food-web/>





REDDER LATITUDES = HIGHER DENSITY



Population Density by Latitude

DATA SOURCE: WORLDPOP.ORG, 2020



CONCEPTS & SYNTHESIS

EMPHASIZING NEW IDEAS TO STIMULATE RESEARCH IN ECOLOGY

Ecological Monographs, 79(3), 2009, pp. 343–377
© 2009 by the Ecological Society of America

The global distribution of net primary production: resolving the paradox

MICHAEL A. HUSTON^{1,3} AND STEVE WOLVERTON²

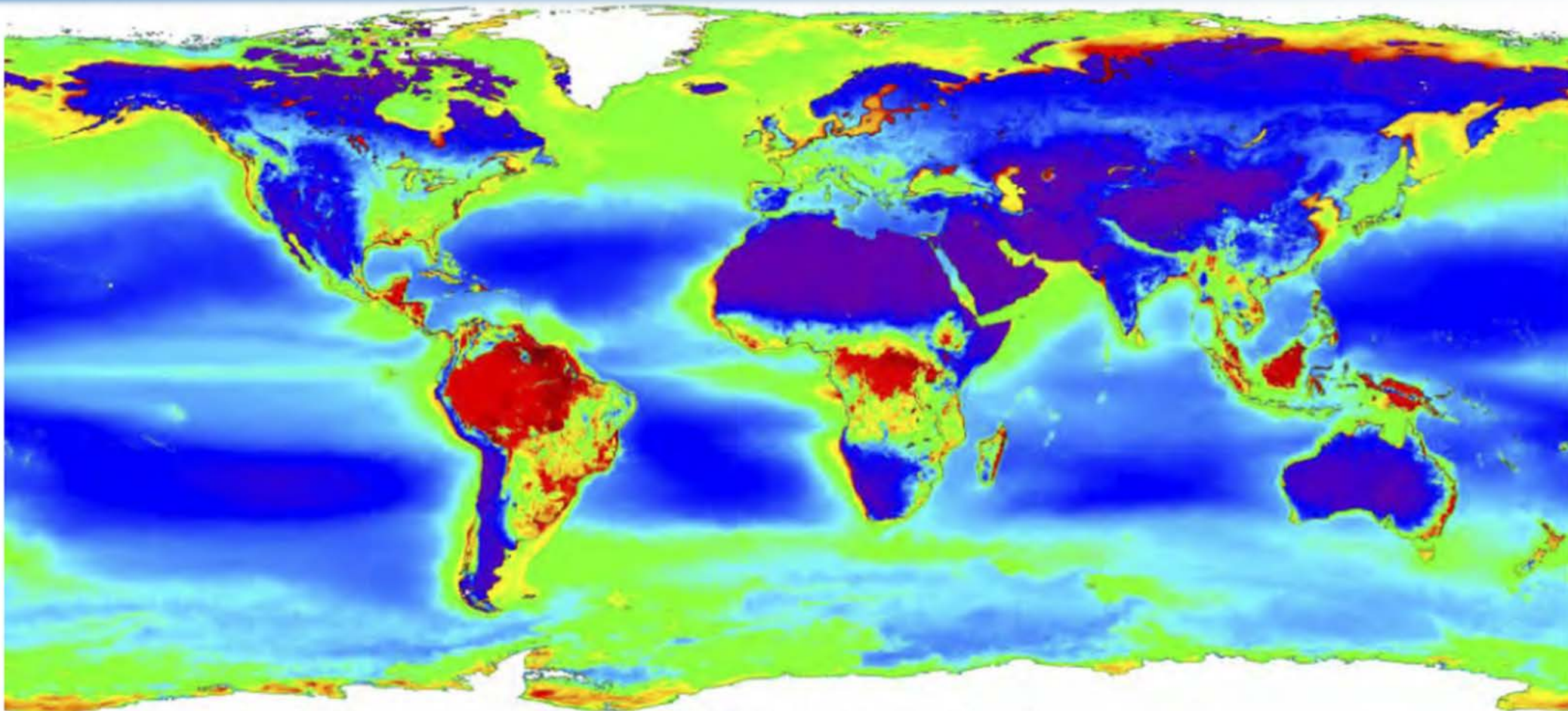
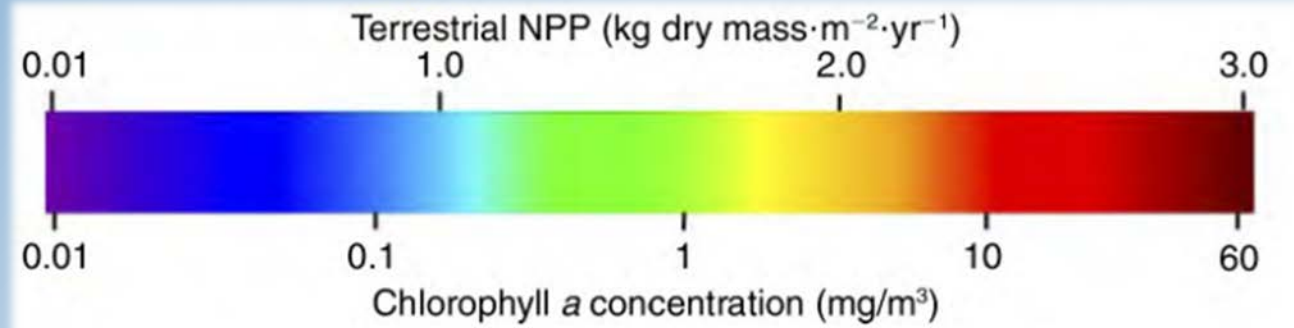






Foto: Svein Hugo Reitan Torset



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+38.5 °C



-40 °C



Homeothermic animals are
equally warm, but free-living
stages of parasites are exposed to
different ambient temperatures



+38 °C



+50 °C

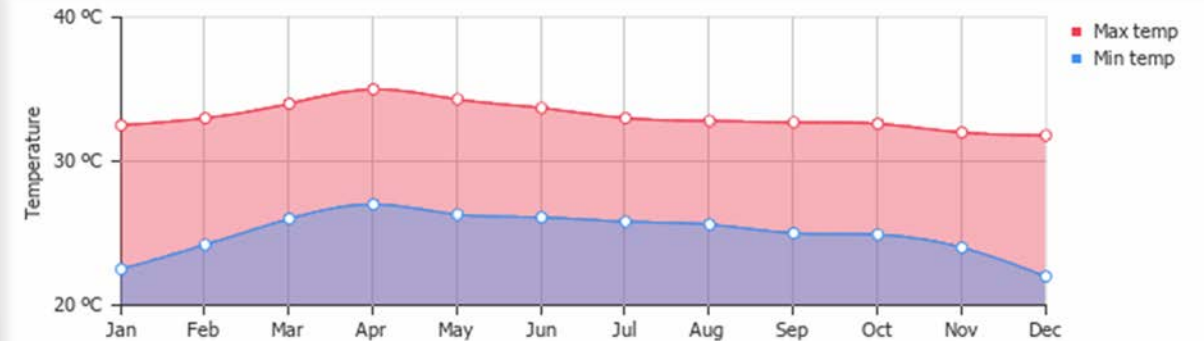


Heartworm (*Dirofilaria immitis*) developmental threshold in mosquito 14 °C (57 °F)

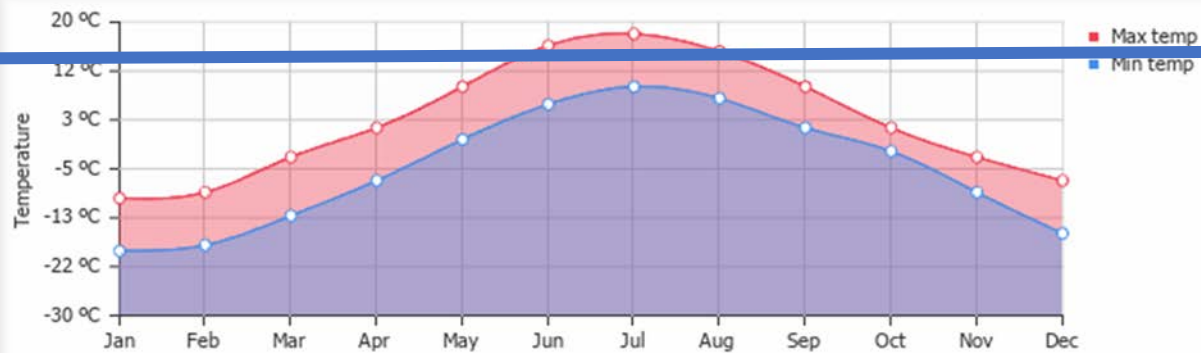


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Bangkok



Average min and max temperatures in Bangkok, Thailand Copyright © 2020 www.weather-and-climate.com



Average min and max temperatures in Kuusamo, Finland Copyright © 2019 www.weather-and-climate.com

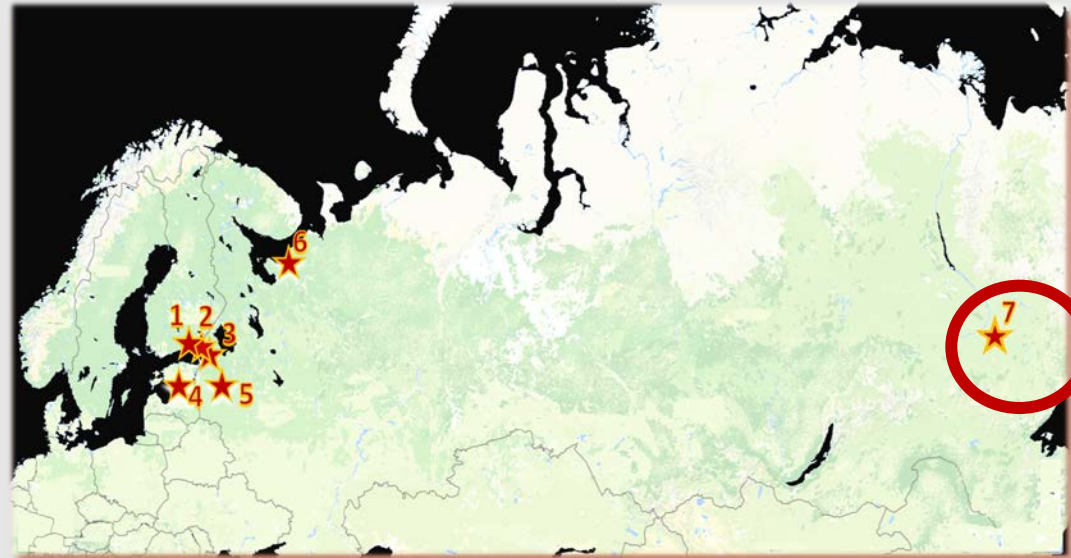
Vector-borne nematodes are commonly regarded as causes of tropical diseases, because they really do cause tropical disease

Kuusamo

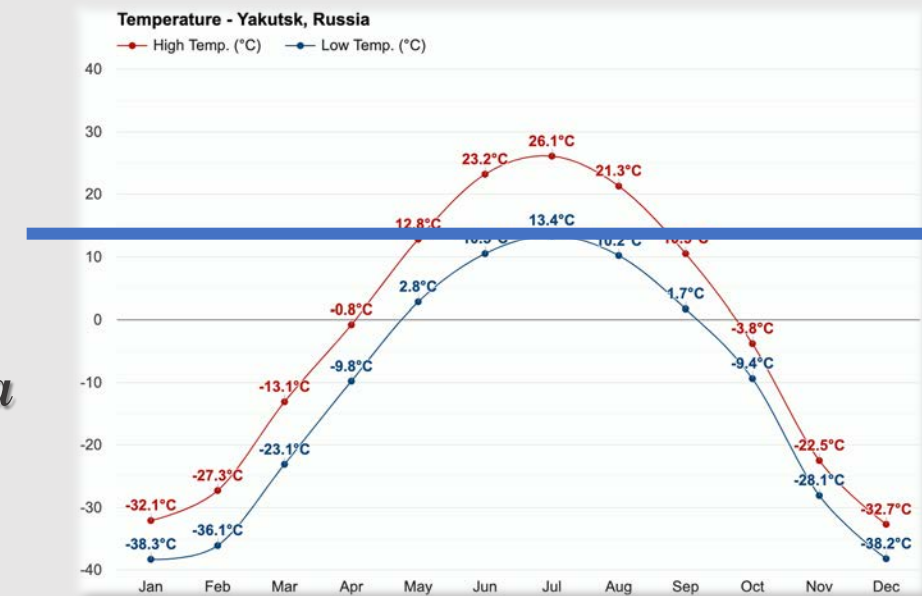


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Yakutsk, "World's Coldest City":
Both *Dirofilaria repens* and *Dirofilaria immitis* endemic in dogs.



Pleistocene Europe ~20.000 years ago

<https://commons.wikimedia.org/w/index.php?curid=469608>



USGS



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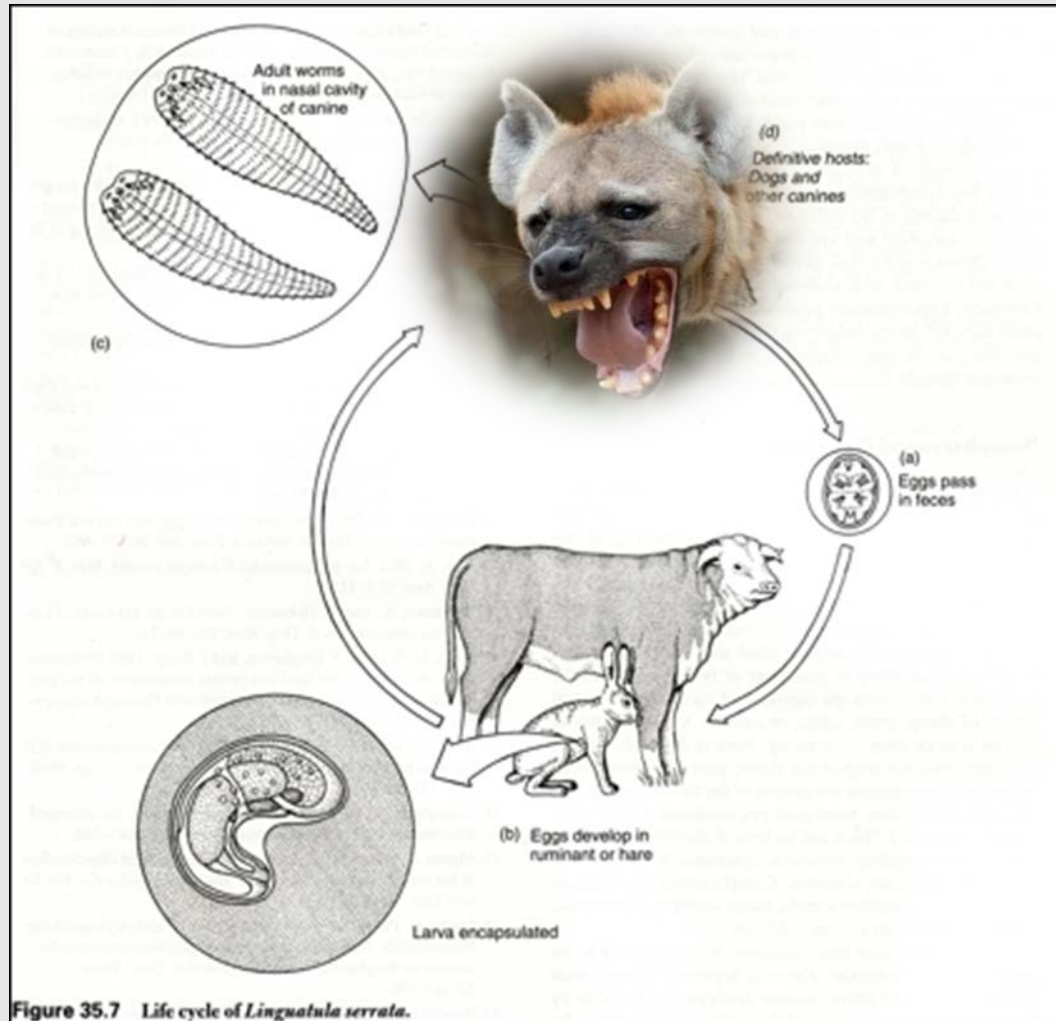


JULIUS T. CSOTONYI



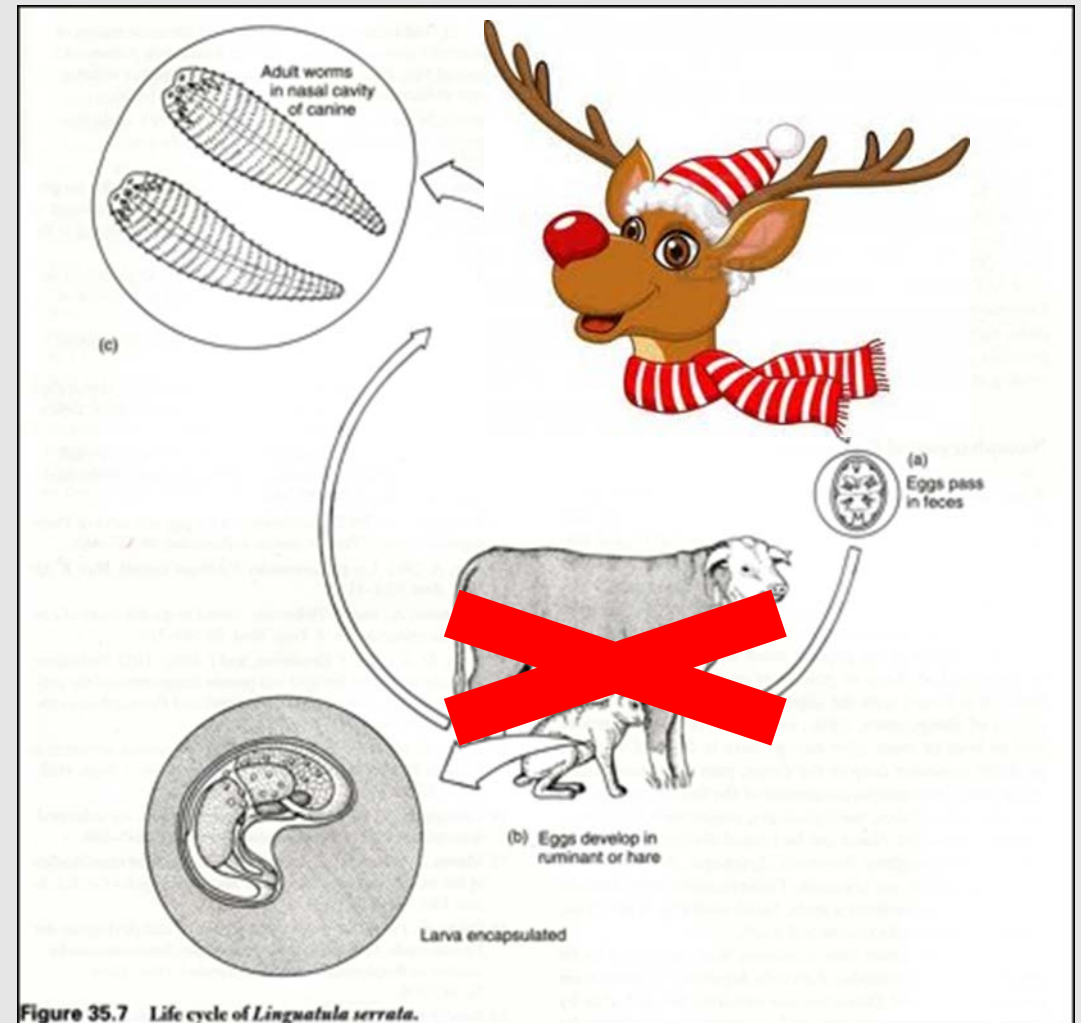
Mauricio Antón





Linguatula multiannulata

Linguatula arctica





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Adult *Linguatula arctica*, female



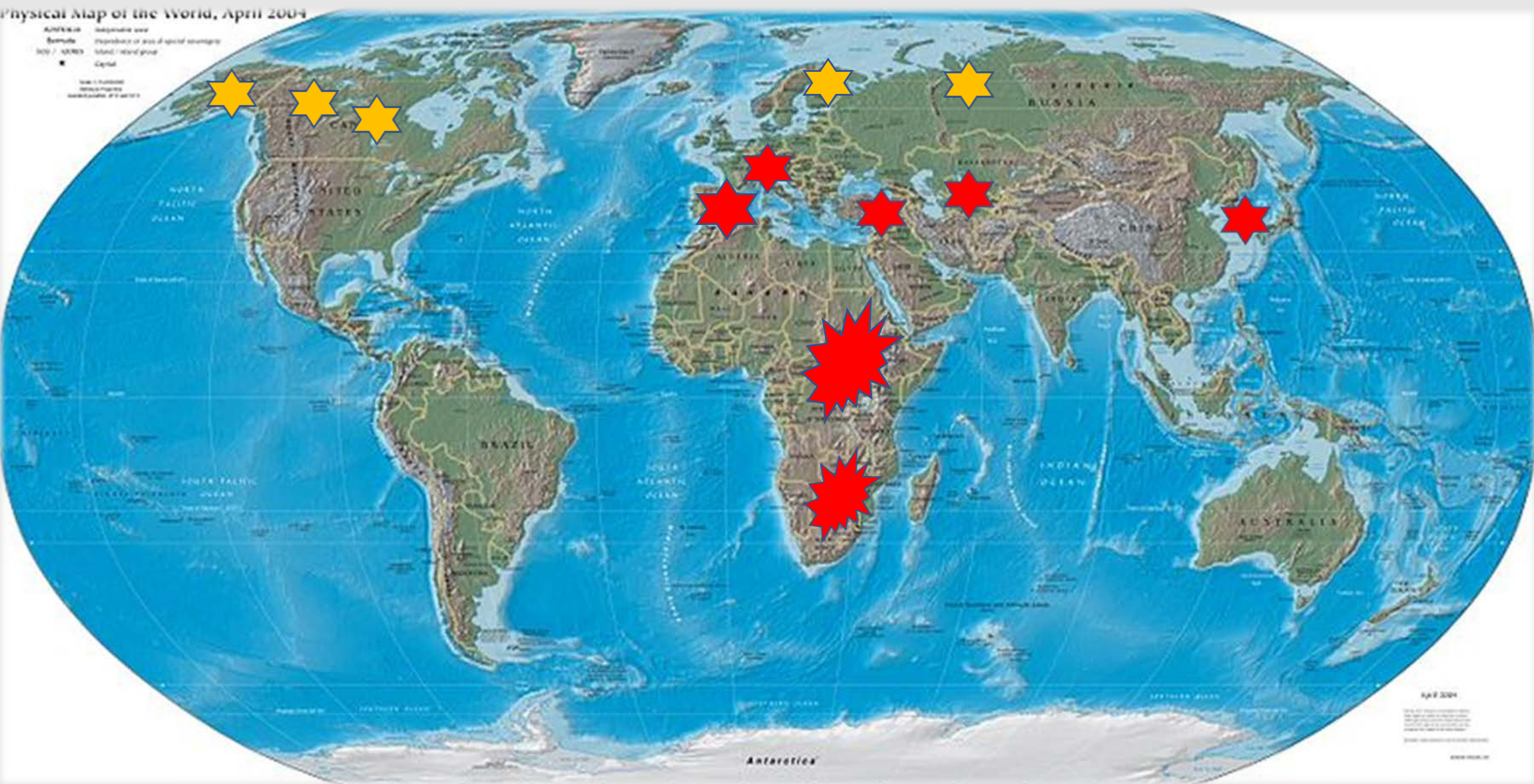
Arne C. Nilssen

Besnoitia besnoiti *Besnoitia tarandi*



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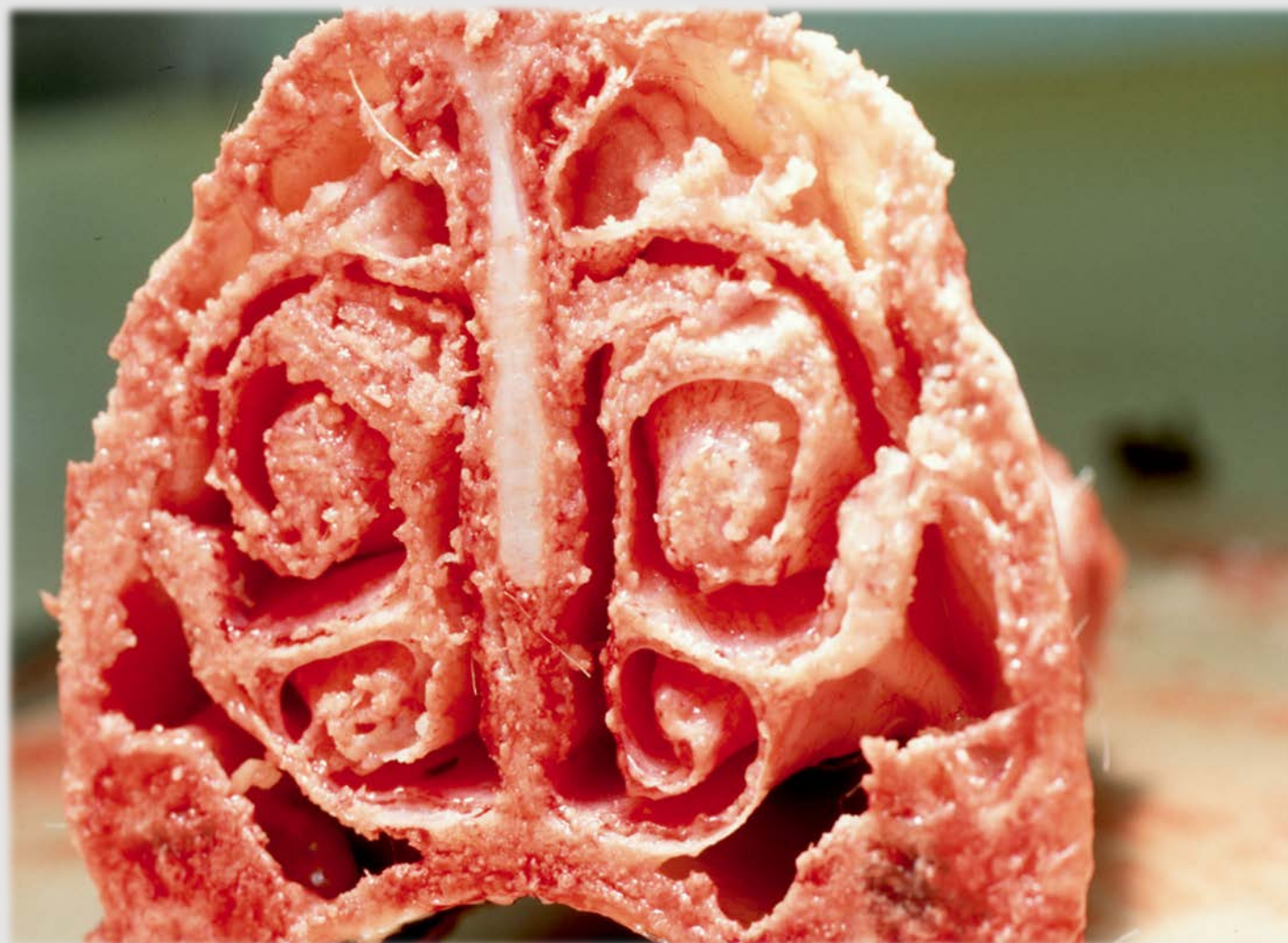
Physical Map of the World, April 2004





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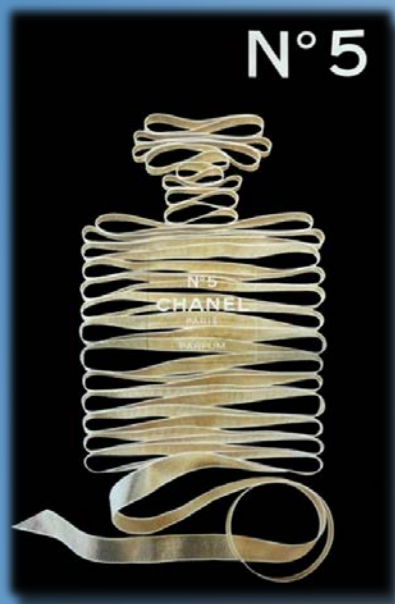




Risk ranking of foodborne parasites: State of the art

Brecht Devleesschauwer^{a,*}, Martijn Bouwknegt^b, Pierre Dorny^{c,d}, Sarah Gabriël^e,
Arie H. Havelaar^f, Sophie Quoilin^a, Lucy J. Robertson^g, Niko Speybroeck^h,
Paul R. Torgersonⁱ, Joke W.B. van der Giessen^j, Chiara Trevisan^c

CHANEL N° 5 (Andy Warhol (?))



DIBOTHRIOCEPHALUS N° 1 (Unknown Finn)

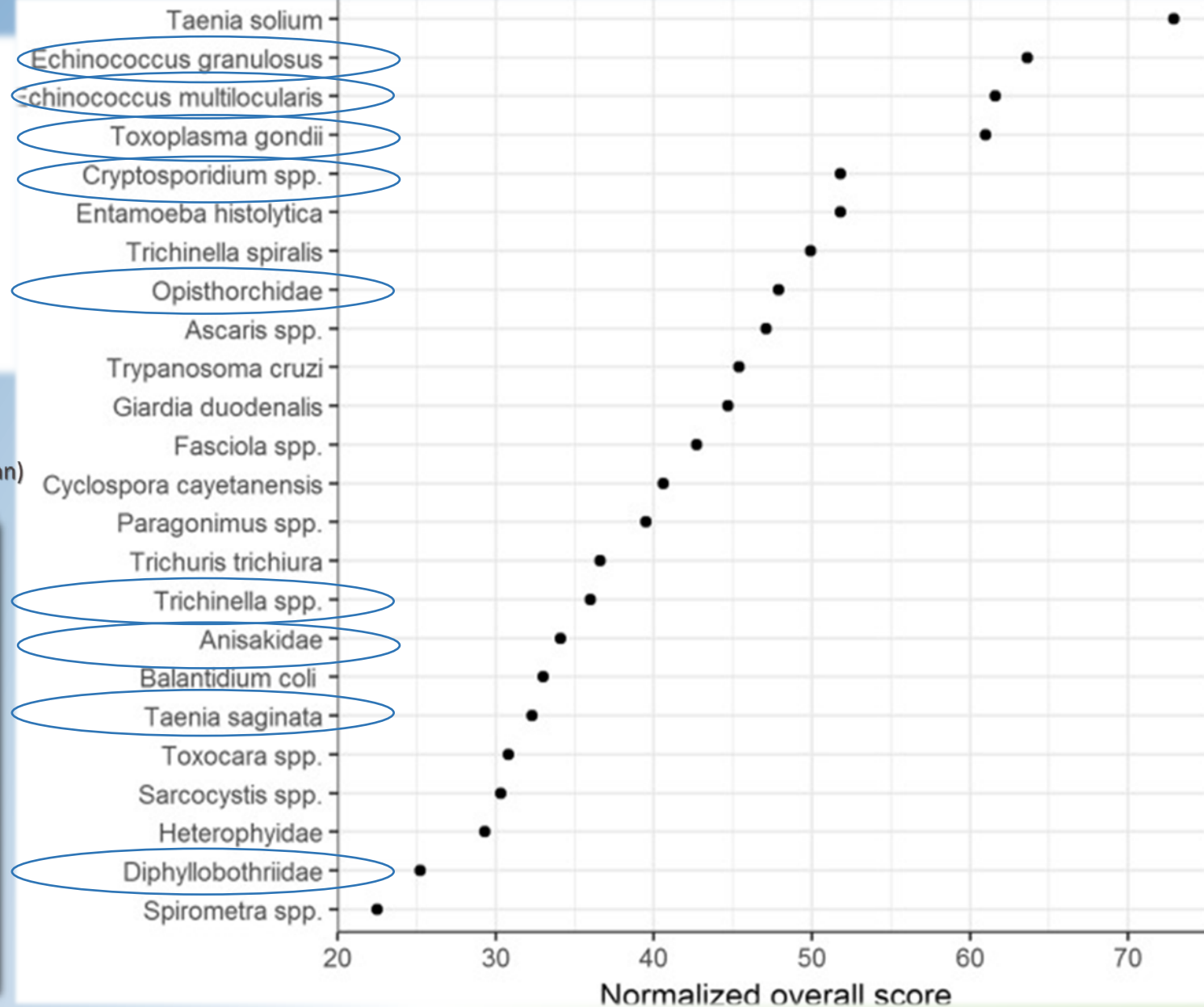


Fig. 3. Global ranking of foodborne parasites using multi-criteria decision analysis (FAO/WHO (Food and Agriculture Organization of the United Nations and World Health Organization), 2014).

The normalized overall scores are weighted sums of normalized criteria scores and weights elicited from expert meeting participants.



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Contents lists available at ScienceDirect

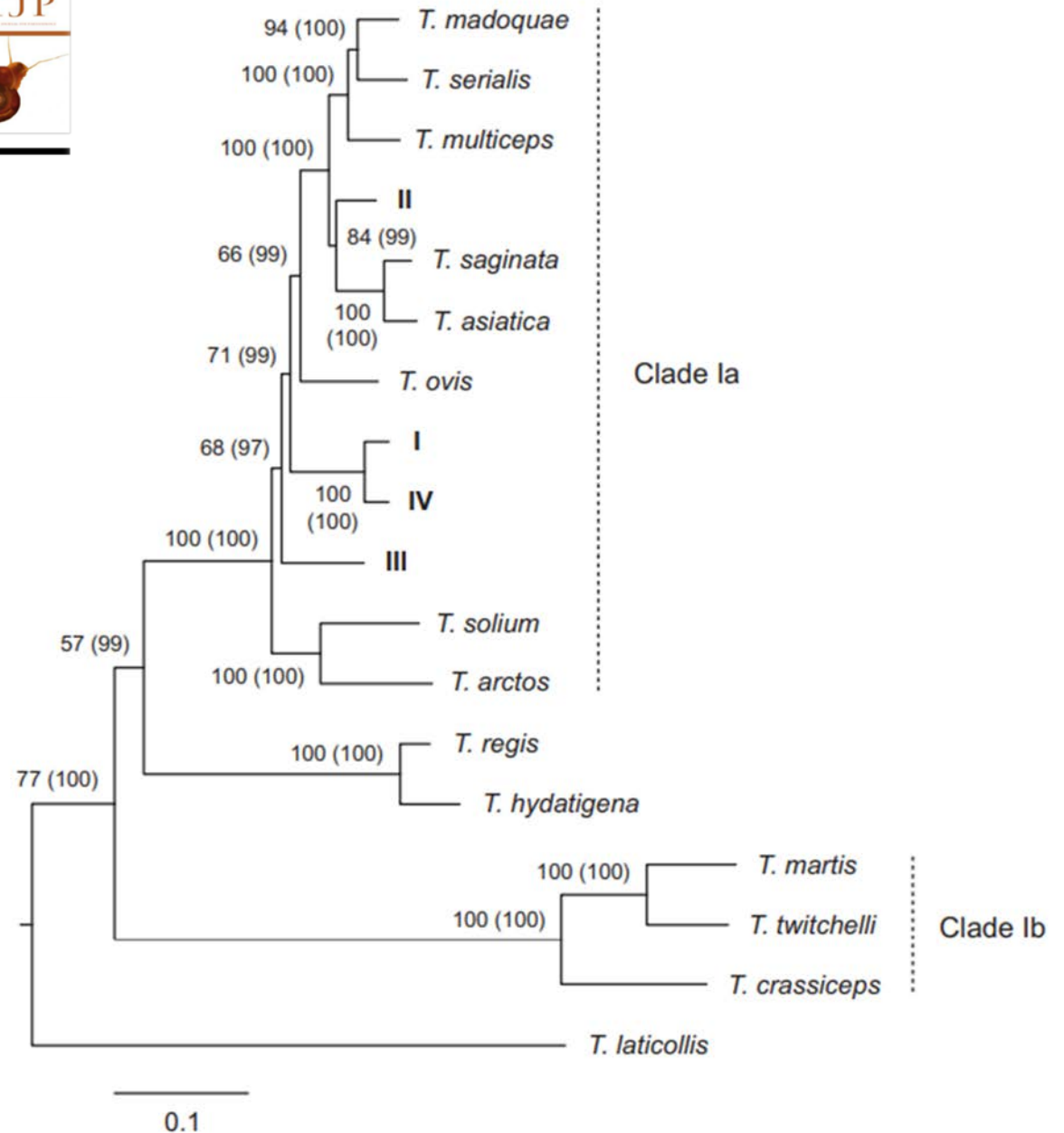
International Journal for Parasitology

journal homepage: www.elsevier.com/locate/ijpara

Phylogenetic characterisation of *Taenia* tapeworms in spotted hyenas and reconsideration of the “Out of Africa” hypothesis of *Taenia* in humans ☆

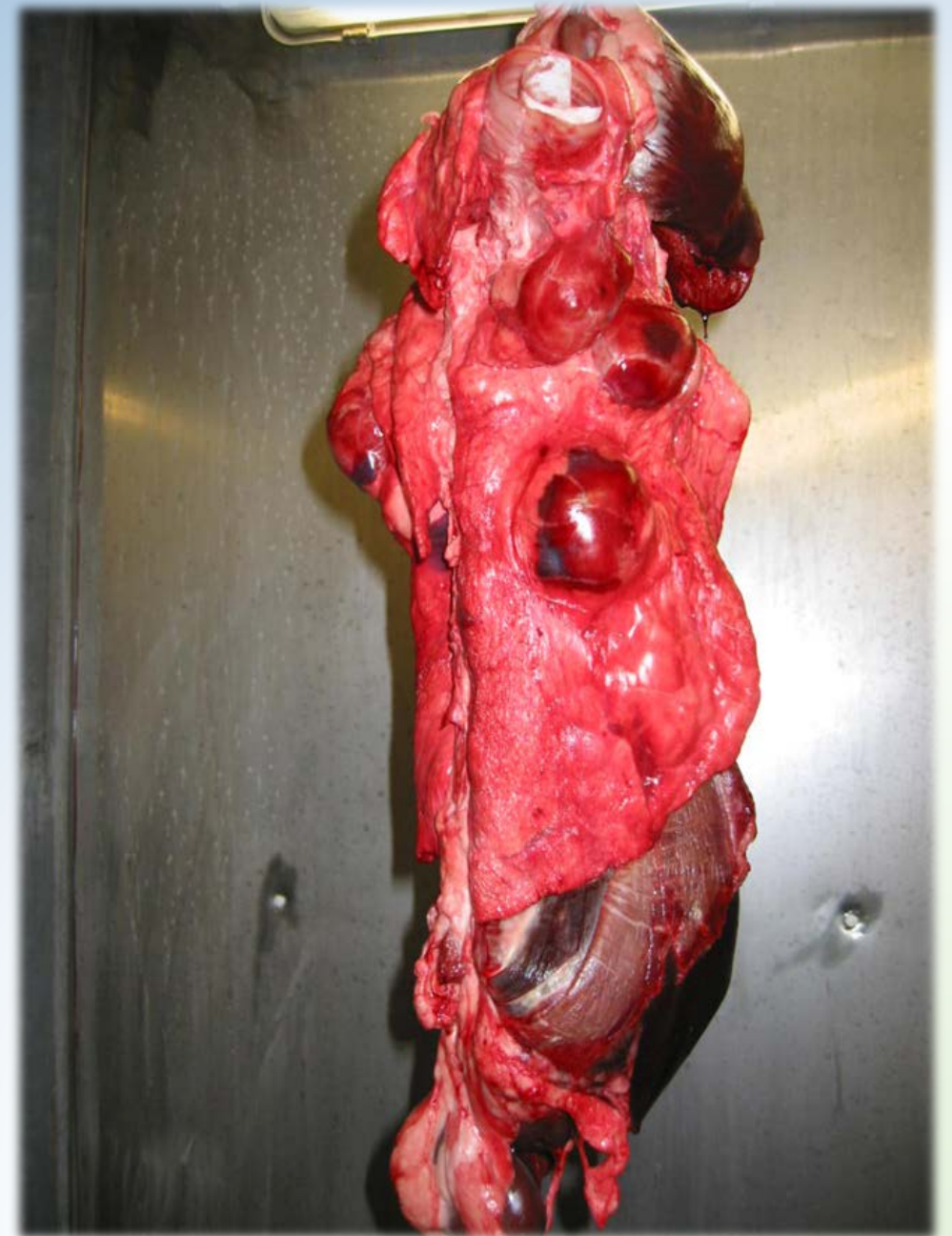
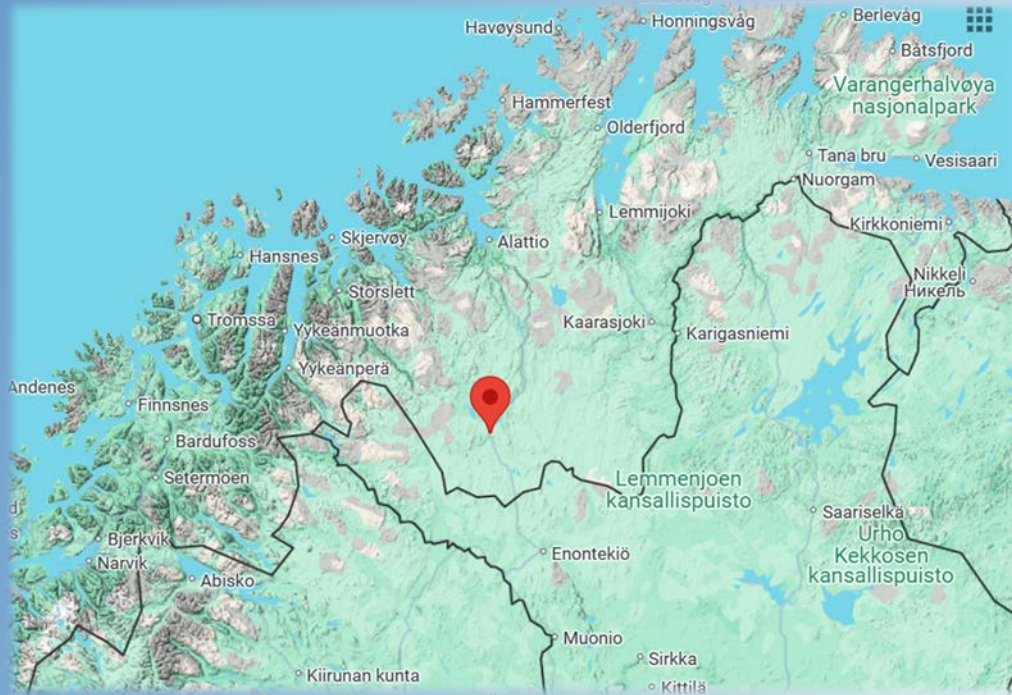
Yitagele Terefe ^{a,1}, Zerihun Hailemariam ^{a,1}, Sissay Menkir ^{b,1}, Minoru Nakao ^{c,*}, Antti Lavikainen ^d,
 Voitto Haukisalmi ^e, Takashi Iwaki ^f, Munehiro Okamoto ^g, Akira Ito ^c

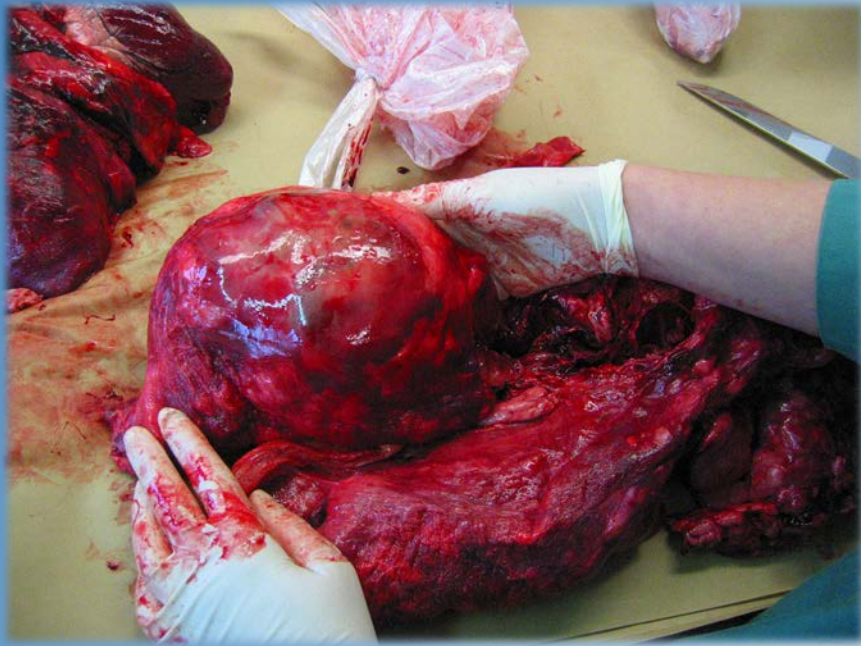
Y. Terefe et al. / International Journal for Parasitology xxx (2014) xxx–xxx

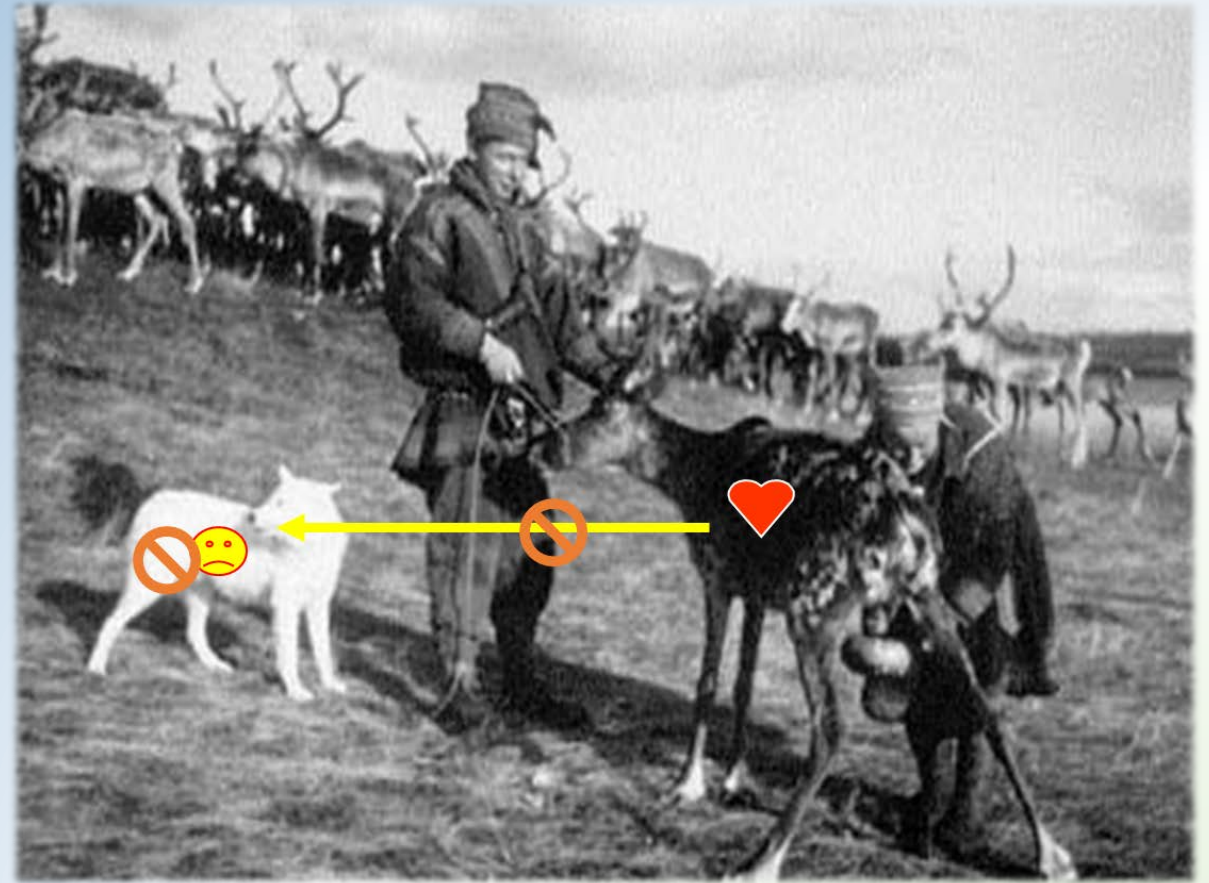
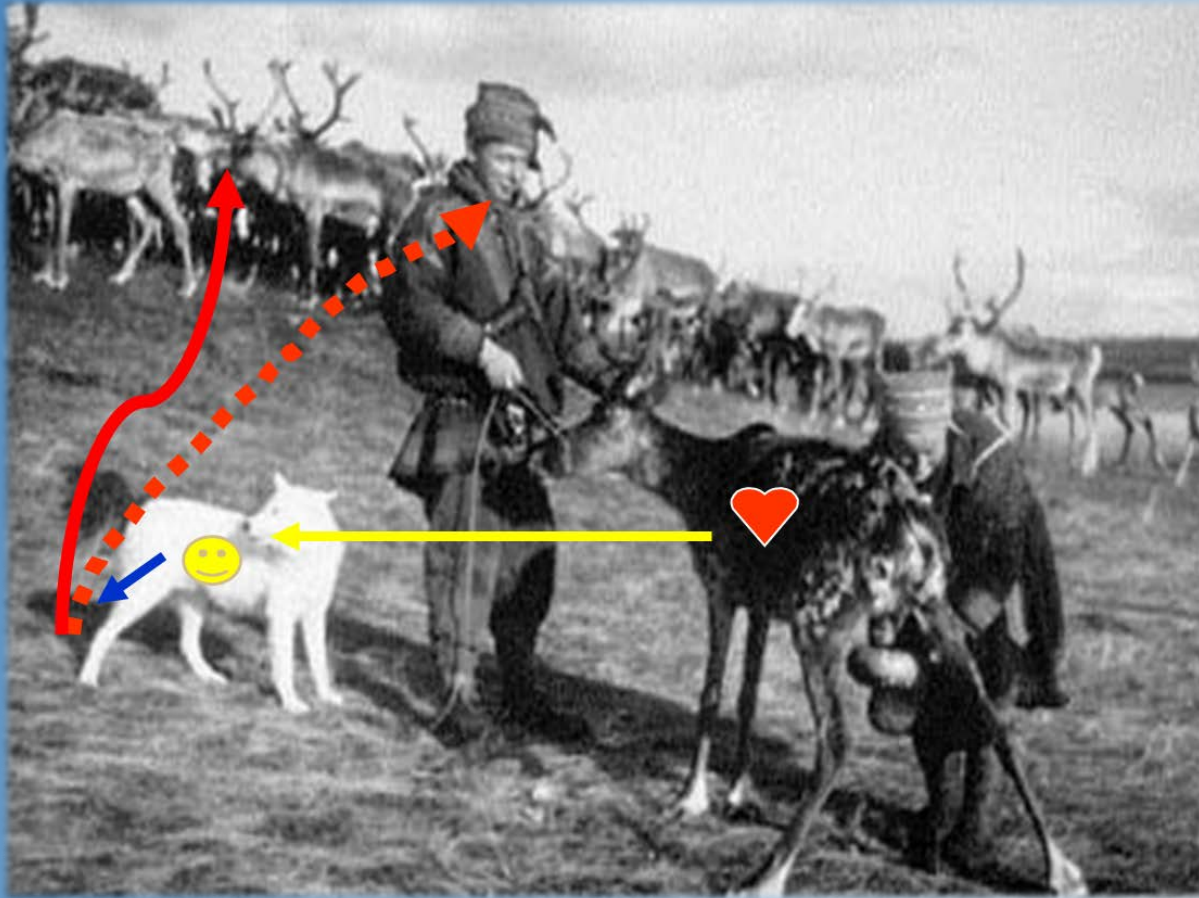


Cystic Echinococcosis

- *Echinococcus canadensis* G10
- Regarded as emerging in Kautokeino, Finnmark, Norway, during the 1950s; ~1% prevalence in humans, 10% in reindeer, eradicated later







Tromsø museum





© Ron Niebrugge



Cyst size (32+1 cases, compiled by A. Lavikainen)

size	cases		
grape	1 (14 cysts)	tomato	1
chestnut	1	billiard ball	2
walnut	1	6 cm	1
3 cm	1	apple	1
4 cm	1	8 cm	1 (2 cysts)
4-5 cm	1	goose egg	1
5 cm	1	fist	2
plum	2	orange	4
egg	5	1 litre	1
tangerine	2	child's head	1
		13 litres	1

Also 3 small, 5 large, 2 big and 1 enormous; **in 2015 avocado size**

Cuisine

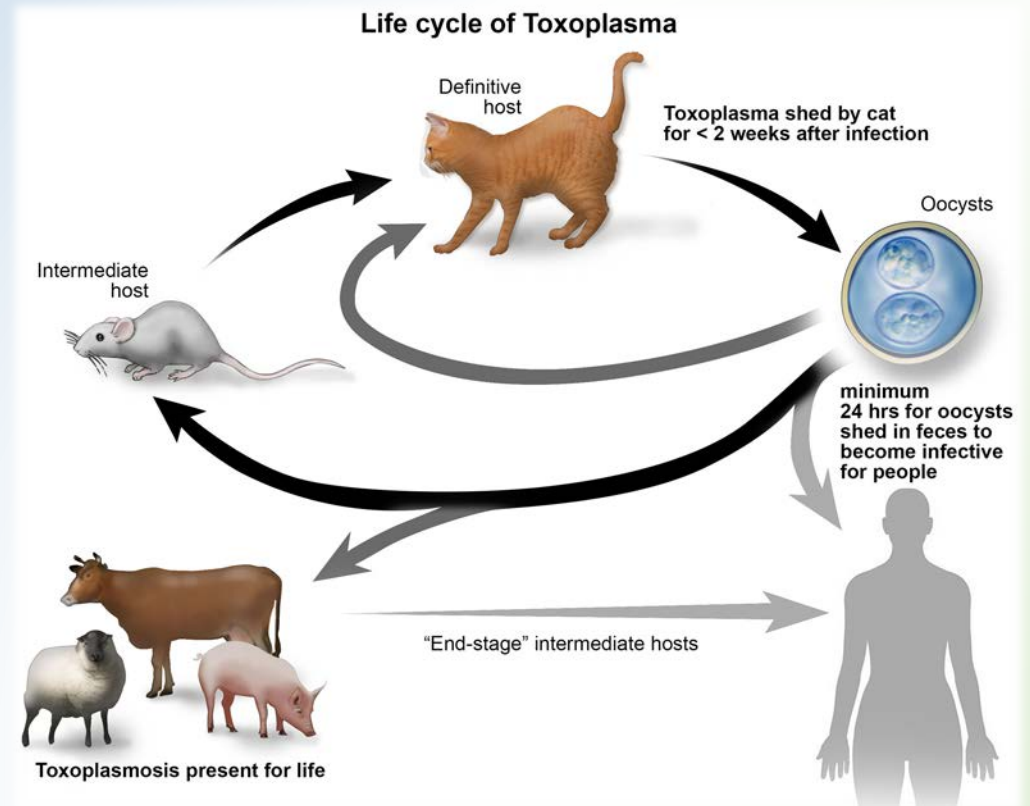
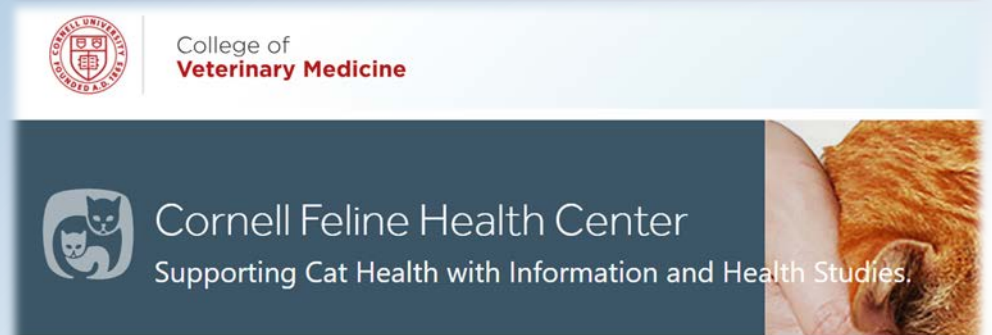
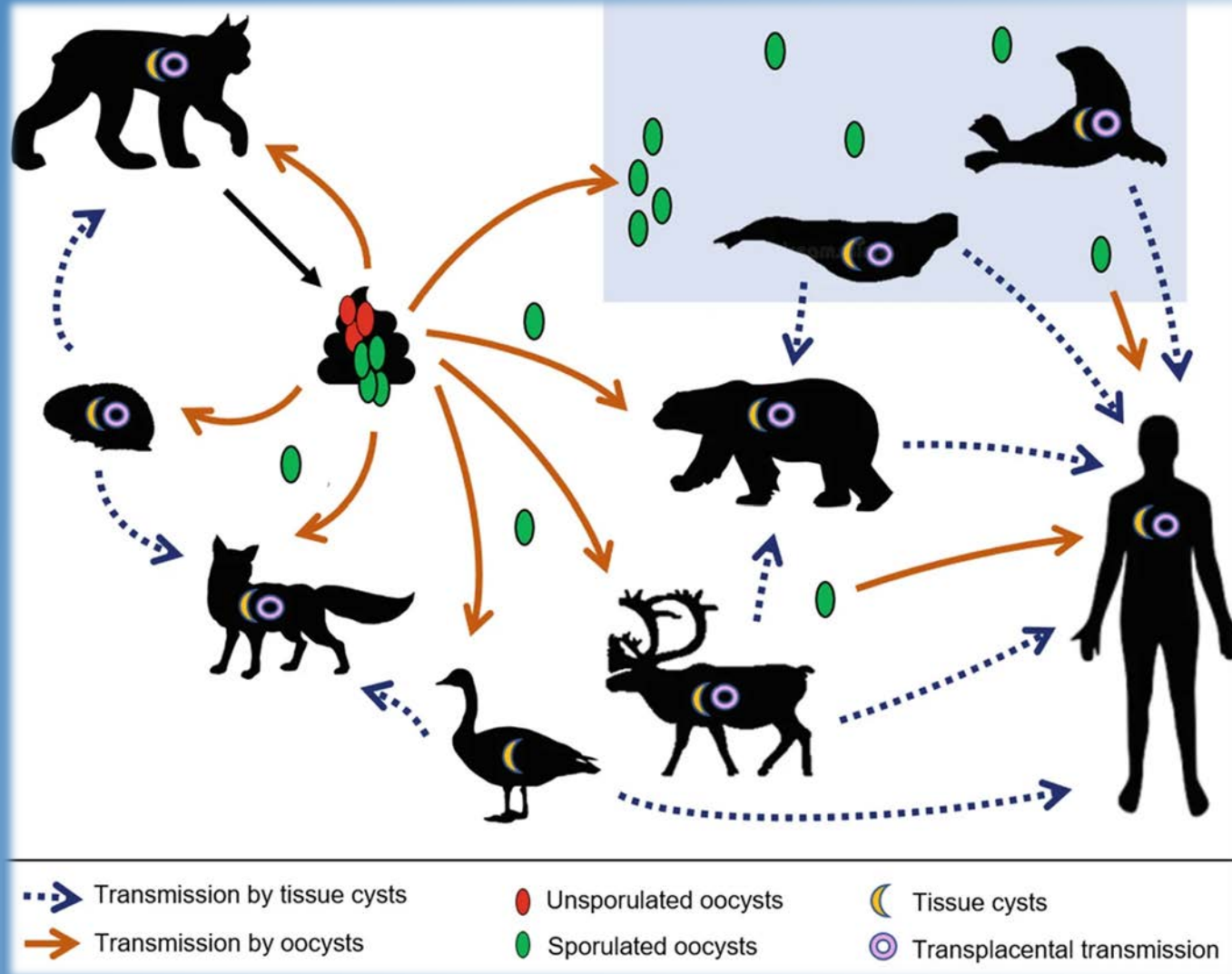
Indigenous peoples traditionally eat lots of nutritious raw or fermented meats, including fish



Arctic One Health Toxoplasmosis in Northern Regions Figure 2

Émilie Bouchard, Pikka Jokelainen, Rajnish Sharma, Heather Fenton, and Emily J. Jenkins

Potential routes of transmission of *Toxoplasma gondii* in the North, with focus on free-ranging hosts and the shared environment.





Parasitology

Seroprevalence of parasitic zoonoses and their relationship with social factors among the Canadian Inuit in Arctic regions ☆

Stephanie Goyette ^a, Zhirong Cao ^a, Michael Libman ^b, Momar Ndao ^{a,c}, Brian J. Ward ^{a,c,*}**Table 5**

Weighted prevalence by parasite.

	<i>T. gondii</i>		<i>T. canis</i>		<i>Trichinella</i> sp.		<i>E. granulosus</i>	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Marine mammal per day								
<16 g	14.4***	11.6–17.2	0.7**	0.1–1.3	10.2***	7.7–12.7	5.0	3.1–6.8
≥16 g	36.5	32.4–40.5	2.6	1.1–4.1	24.7	20.9–28.4	7.6	5.8–9.4
Marine mammal once a week or more								
No	18.0***	14.7–21.2	0.5***	0.1–1.0	13.6**	10.7–16.6	5.2	3.5–6.9
Yes	35.6	31.3–40.0	3.1	1.4–4.8	22.9	19.0–26.8	7.8	5.8–9.8
Game food per day								
<70 g	26.3	22.7–30.0	1.3	0.6–2.0	18.5	15.1–21.9	5.3	3.6–7.0
≥70 g	25.8	22.0–29.6	2.1	0.6–3.5	17.3	14.0–20.7	7.3	5.4–9.2
Game food once a week or more								
No	28.3	24.1–32.5	1.6	0.6–2.6	20.1	16.1–24.0	5.6	3.4–7.8
Yes	24.9	21.7–28.2	1.8	0.6–2.9	16.8	13.9–19.6	6.7	5.1–8.3
Traditional food per day								
<220 g	21.9**	18.2–25.5	1.6	0.3–3.0	16.8	13.4–20.3	5.1	3.4–6.7
≥220 g	30.0	26.1–33.9	1.8	0.7–2.8	18.9	15.5–22.3	7.6	5.6–9.5
Traditional food daily								
No	24.1	20.5–27.6	1.5	0.3–2.6	17.2	13.9–20.6	5.8	4.0–7.6
Yes	28.5	24.4–32.5	2.0	0.8–3.2	18.6	15.1–22.2	7.1	5.1–9.0
Seafood in last 12 months								
No	20.0***	17.2–22.8	1.3	0.3–2.4	11.8***	9.4–14.1	4.3***	3.0–5.6
Yes	35.3	30.5–40.1	2.3	0.9–3.7	27.1	22.5–31.7	9.5	6.9–12.1

** $P < 0.001$.*** $P < 0.0001$.

Serosurvey for *Toxoplasma gondii* in arctic foxes and possible sources of infection in the high Arctic of Svalbard

Kristin Wear Prestrud^{a,*}, Kjetil Åsbakk^a, Eva Fuglei^b, Torill Mørk^c, Audun Stien^d, Erik Ropstad^e, Morten Tryland^a, Geir Wing Gabrielsen^b, Christian Lydersen^b, Kit M. Kovacs^b, Maarten J.J.E. Loonen^f, Kjetil Sagerup^g, Antti Oksanen^h



West Greenland harbour porpoises assayed for antibodies against *Toxoplasma gondii*: false positives with the direct agglutination method

Marie-Anne Blanchet^{1,4,*}, Jacques Godfroid^{1,5}, Eva Marie Breines¹, Mads-Peter Heide-Jørgensen², Nynne Hjort Nielsen², Ilka Hasselmeier³, Maria Iversen², Silje-Kristin Jensen^{1,6}, Kjetil Åsbakk^{1,5}



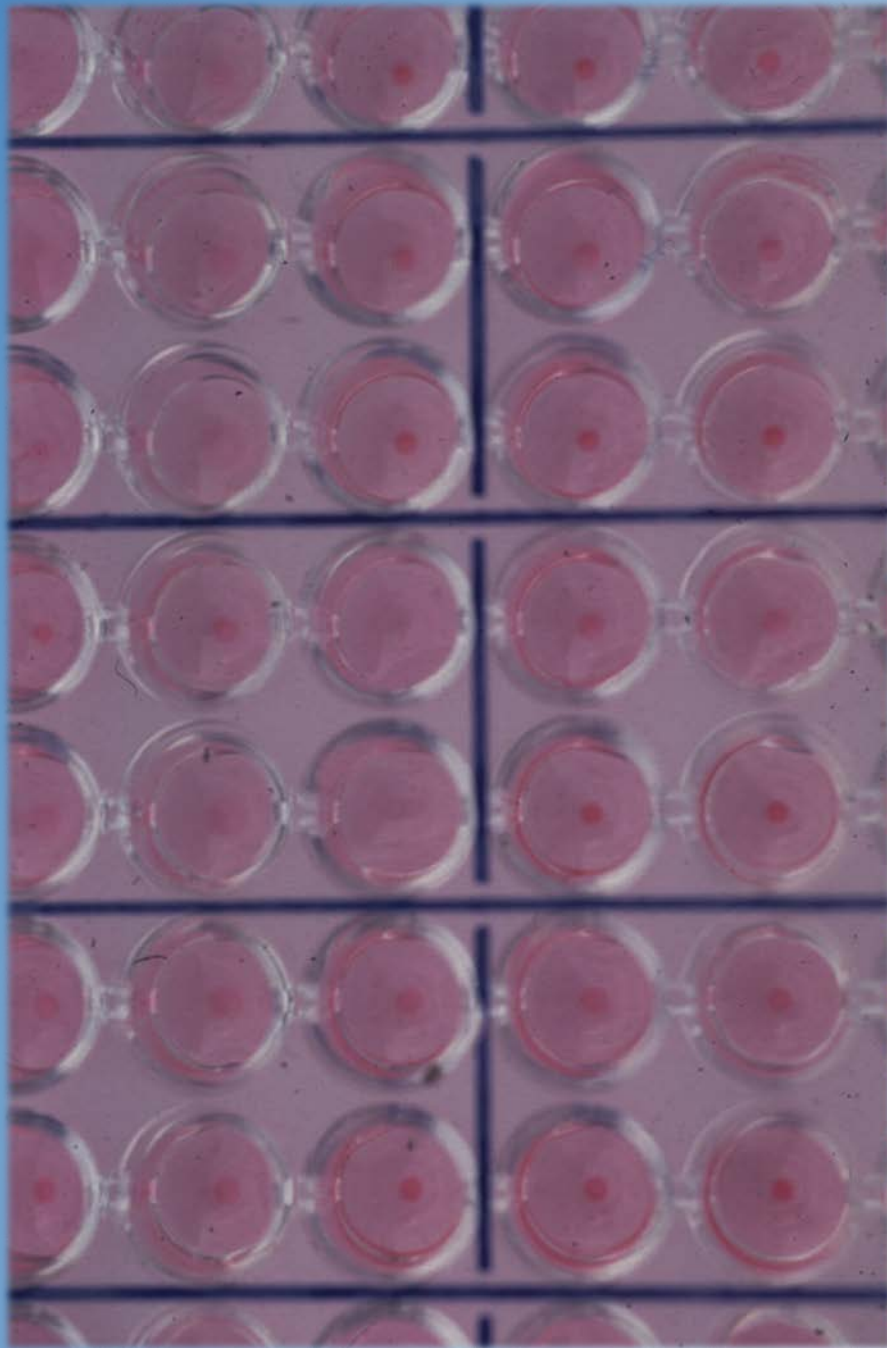


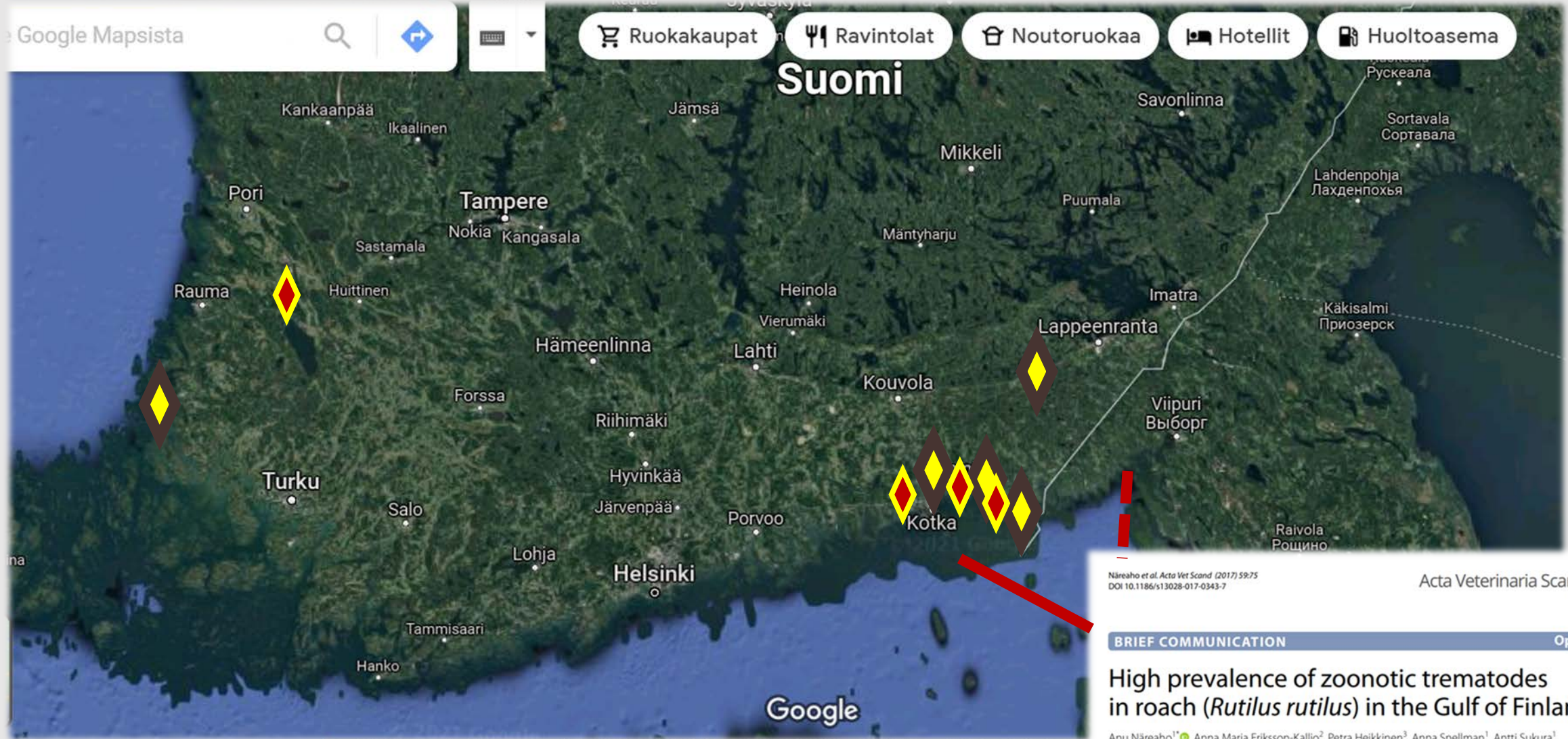
Table 1. *Phocoena phocoena*. Morphometric information of the 20 sampled harbour porpoises and results of the direct agglutination tests (Run 1 = initial screening of samples, Run 2 = retesting following clean-up) on blood and/or tissue fluid samples. Ratios show the highest dilutions at which the samples were interpreted as positive

ID	Sex	Age (yr)	Weight (kg)	Length (cm)	Run 1	Run 2
5041	F	4	72.7	156	Neg	Neg
5045	F	7	51.1	136	Neg	Neg
5046	F	3	49.3	138	Neg	Neg
5055	M	2	40.3	124	Neg	Neg
5056	F	<1	25.8	105	Neg	Neg
5057	M	<1	27.9	113	1:40	Neg
5059	F	6	63.8	152	1:160	Neg
5060	F	3	46.7	135	1:80	Neg
5061	M	6	58.6	147	1:80	Neg
5062	M	4	46.2	134	1:160	Neg
5063	F	10	66.0	151	Neg	Neg
5069	F	4	68.4	157	1:160	Neg
5072	F	>10	60.8	142	1:80	Neg
5076	M	>9	60.4	150	1:40	Neg
5078	M	2	38.8	130	1:160	Neg
5082	F	6	60.1	153	Neg	Neg
5083	F	1	34.1	120	Neg	Neg
5084	F	5	53.0	139	Neg	Neg
5086	F	6	58.1	146	Neg	Neg
5087	M	10	43.1	128	Neg	Neg



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Näreaho et al. *Acta Vet Scand* (2017) 59:75
DOI 10.1186/s13028-017-0343-7

Acta Veterinaria Scandinavica

BRIEF COMMUNICATION

Open Access

High prevalence of zoonotic trematodes in roach (*Rutilus rutilus*) in the Gulf of Finland

Anu Näreaho^{1*}, Anna Maria Eriksson-Kallio², Petra Heikkinen³, Anna Snellman¹, Antti Sukura¹ and Perttu Koski³





Opisthorchis felinus and *Metorchis bilis* are the main agents of liver fluke infection of humans in Russia

Viatcheslav A. Mordvinov ^{a,*}, Natalia I. Yurlova ^b, Ludmila M. Ogorodova ^c, Aleksey V. Katokhin ^a

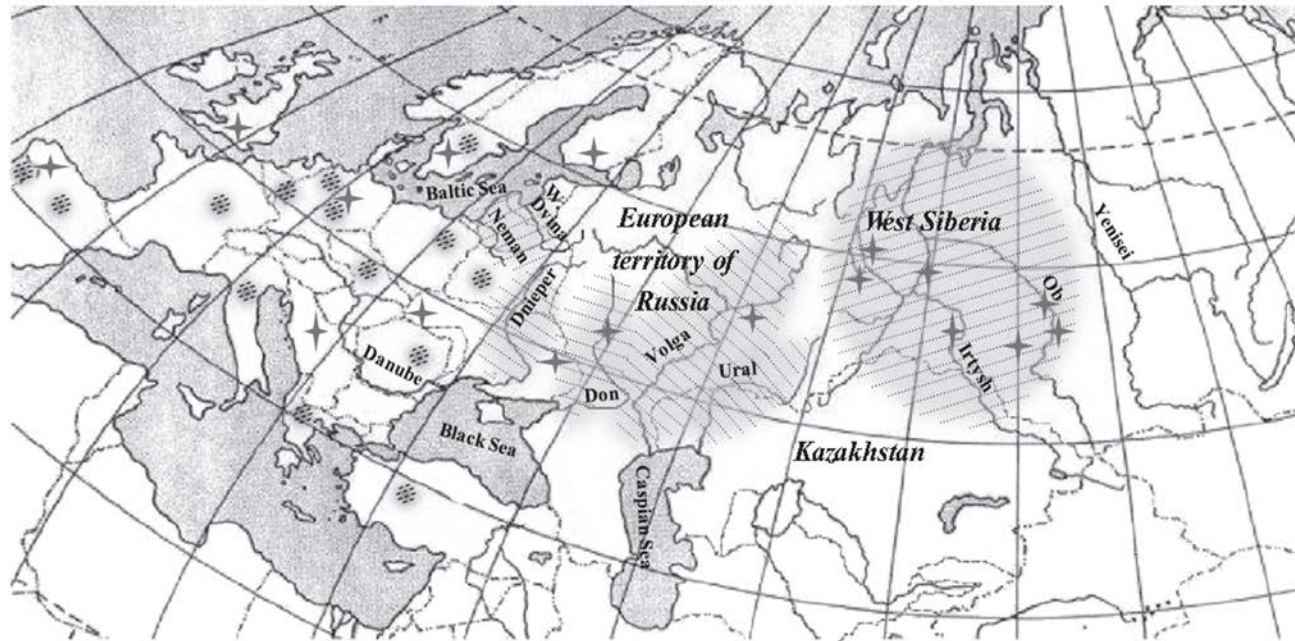
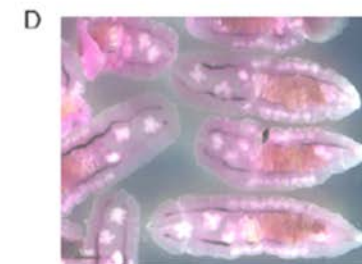
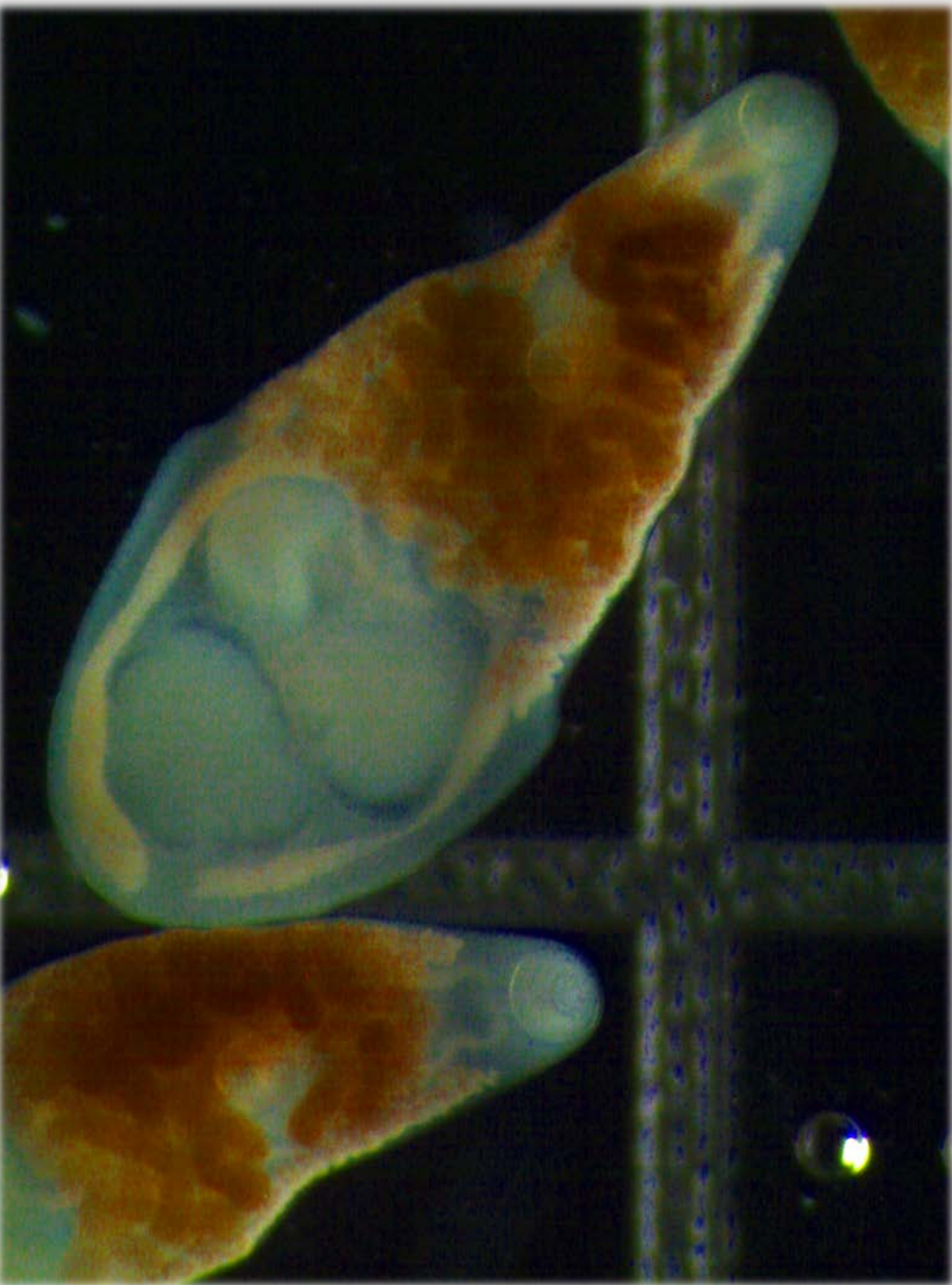


Fig. 4. Geographic range of *O. felinus* and *M. bilis* in Eurasia. Main opisthorchiasis foci in Eastern Europe and Western Siberia are shown by gray shaded areas around rivers.



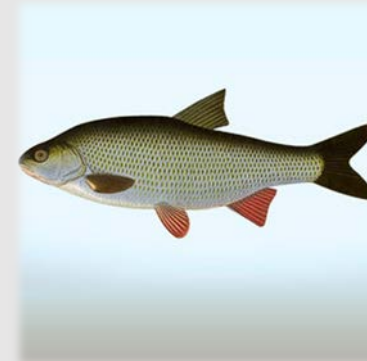


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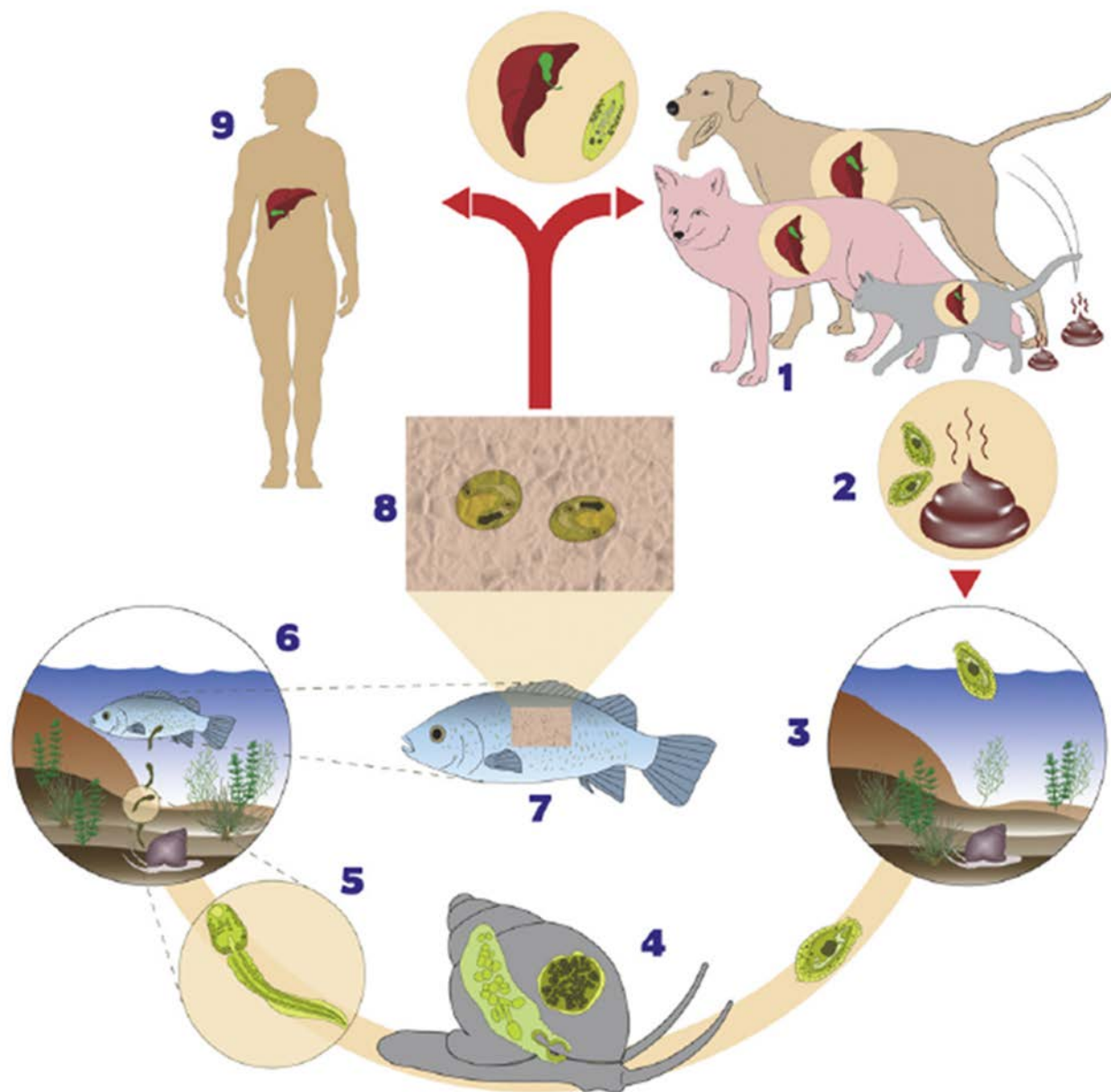




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Gösta Sundman: Suomen Kalat



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Acta Tropica

Volume 126, Issue 1, April 2013, Pages 54-62



Review

Opisthorchis felinus, an emerging infection in Italy and its implication for the European Union

Edoardo Pozio ^a✉, Orlando Armignacco ^b, Fabrizio Ferri ^b, Maria Angeles Gomez Morales ^a

Common-source outbreak of acute infection due to the North American liver fluke *Metorchis conjunctus*

J Dick MacLean, J Richard Arthur, Brian J Ward, Theresa W Gyorkos, Mark A Curtis, Evelyn Kokoskin

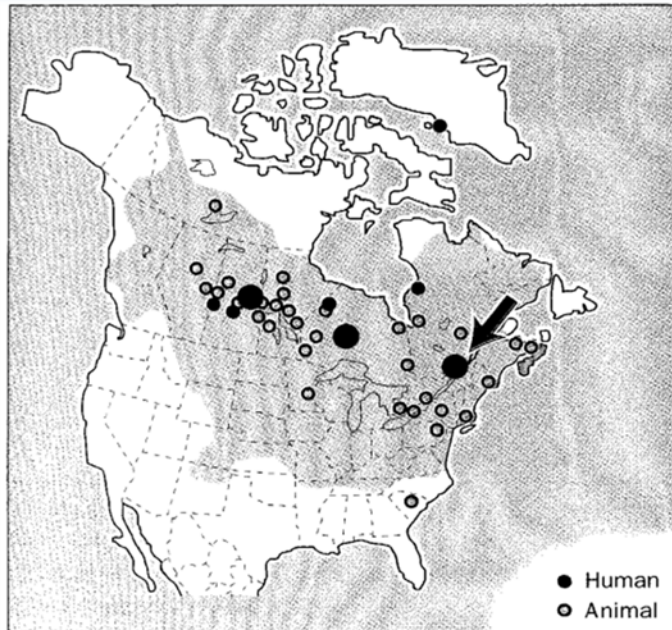


Figure 6: Range (shaded area) of *C commersoni* and of human and animal infection with *M conjunctus*. Arrow locates present outbreak.



<https://vtfishandwildlife.com/learn-more/vermont-critters/fish/white-sucker>



Ailo Huhtala, 1951

Eläintieteilijät, biologit, lääkärit. Meillä on kansallislainen, joka nujuaa sisälmyksissämme, imee lastemme elinvoiman eikä meillä ole edes kunnolla tutkittu, mitkä pikkuäyriäiset ja kalat voivat toimia sen väli-isäntinä. Emme tiedä kauanko vapaasti liikkuva toukka-muoto eri olosuhteissa voi elää vesissämme, emme liioin kauanko eri väli-isännissä elävät toukat pysyvät hengissä ja ovat tartuttavia eri ympäristöissä ja olosuhteissa, emmekä myöskään ovako sioissa, koirissa, kissoissa j.n.e. loisivien lapamatojen munat yhtä elin- ja kehityskykyisiä kuin ihmisissä loisivien. — Nuorille tieteenharjoittajille monta hedelmällistä väitöskirjan aihetta!

Säätiöt, mesenaatit. Tässä tarjoutuu mahdollisuus tukea kansallemme tärkeää ja hyödyllistä tutkimustyötä, joka varmasti voidaan kotimaassa suorittaa ja jota muut eivät puolestamme tee.

Valtioneuvosto, Eduskunta, Kunnat. Rahaa tutkimustyöhön, joukkotarkastuksiin ja joukkomadonhäätöihin!

Lääkintöhallitus. Suurempaa huomiota kansallislaiseen ja yleensä suoliloiisiin. Valistusta. Ohjeita. Organisaatioita. Tutkimuksia.

Terveystieteiden tutkimuslaitokset. Etsäviä ja aktiivisia toimenpiteitä. Propaganda. Käymäläkalusteita kohentamaan!

Perheenemännät. Varjelkaa perheenne, erikokoista lapsenne matotartunnalta. Pois raaka, heikosti suolattu kala ja mätä ruokapöydiltänne!

Isännät. Käymälät kuntoon ja käymälälanta tunkioitettua sisään ja keskelle tai desinfioitava sammuttamattomalla kalkilla.

Lääkärit. Älkää nyt sitten tekään syökö kraavia kalaa tai mätää. Opettaka. Neuvokaa. Häädäkää matoja, mutta pienillä annoksilla. Pitäkää 5—10 min: n esitelmä henkilökohtaisen, ravintohygienian ja lapamatojen ja muiden suoliloisten merkityksestä kansakoulutarkastuksien yhteydessä. Siitä kyllä ei mitään makseta, mutta tehdään se kutsumuksesta. Ollaan sosiaalisia.

Kansa. Pinetti pois ja alas alve. Hornaan heisimatot.

KANSALLISLOINEN

Lääk. tri A. HUHTALA

Tämän kirjoituksen otsikko tuo jo täysin esiin sen aiheen. Se on kansallislaittemme lapamato, pinetti, alve tai myös leitimadon nimellä tunnettu loinen, joka kasteessa on saanut nimen leveä heisimato (Diphyllobothrium latum). Se on monen mielestä herttainen, kiltti ja hyödyllinen loinen.

*Inofficial
National Parasite*

Leveä heisimato on Suomessa levinnyt saunan laajalle alueelle ja kaikkien kansankokosten keskuuteen. Se puree porvaria ja vaivaa vasemmistoa, kiusaa kommunistia ja riistää ruotsalaista, se on pienviljelijän piina ja tilallisen tuska, se kipurtaa, koskee ja kolisee, se läiskii, loiskii ja lorisee. Se kalvaa Suomen kansan sisintä ja näivertää sen elinjuuria, sydäntä, suolta ja vorta.

Tämän kirjoittaja on tehnyt tutkimuksen leveän heisimadon levinneisyydestä Suomessa vuosina 1946—47 (kartta 1.) ja siinä kävi ilmi, että eri puolilla maata toimivien lääkärin arvioinnin mukaan n. 1/5 osa kansastamme on madon kantajia. Ja se on paljon se, 700 000—800 000 ihmistä. Lapamato on siis sanan varsinaisessa merkityksessä kansallislainen, jonka varsinainen levinneisyys on Suomen ja itäisen Järvi-Suomen, olematta myöskään Kokeen ja Pohjanlahden tunnasta puhtaista ja läntinen Uusimaasta Varsinais-Suomi ja etelä-Pohjan-

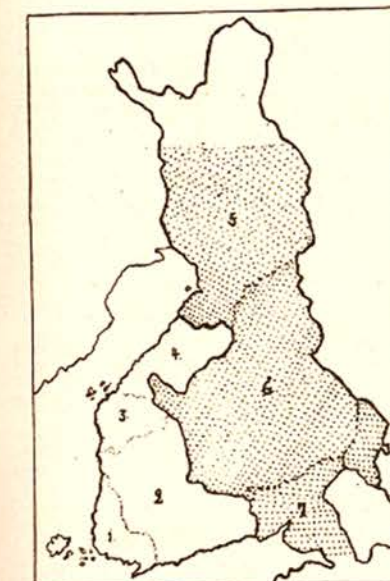
maan heisimadon levinneisyyden, missä itäsuomalaisen murteen vaikutusta on huomattavasti suurempi. Tämä merkitsee, että leveä heisimato on levinnyt maahamme idästä päin karjalaisten heimon mukana jo satoja vuosia sitten, ehkä jo heimojen vaellusten aikoina. Karjalaisella heimolla on siis ollut jokin yleinen tapa, joka hämäläisen heimon koskudessa on ollut tunteenmaton tai vastenmielinen. Se tapa on ollut ja on vieläkin raan, heikosti suolattu, ns. kraavin kalan ja kalanmädin syöminen. Me tiedämme sen nyt, kun tunnemme leveän heisimadon monimutkaisen kehityskulun: Leveän heisimadon varsinainen pääisäntä on ihminen, tilapäisiä pääisäntinä voivat esiintyä hyvin monet kaloja syövä imettävät, koti- ja petolaimet (koira, kissa, sika, hopeakettu, kettu, karhu jne.), joiden ulosteiden mukana madonmunat tulevat ulko-



Lihavuuden vastustajat ovat käyneet ankaraa taistelua ruotsalaista voileipäpöytä vastaan, joka on pesiytynyt Suomeenkin. Nyt ilmoittautuvat taisteluun myöskin heisimadon vastustajat. Kuvassa on oikein tyyppillinen pääkaupunkilainen matopöytä, jonka ympärillä Helsingin herrat kiertävät — lääkäreistä alkaen.



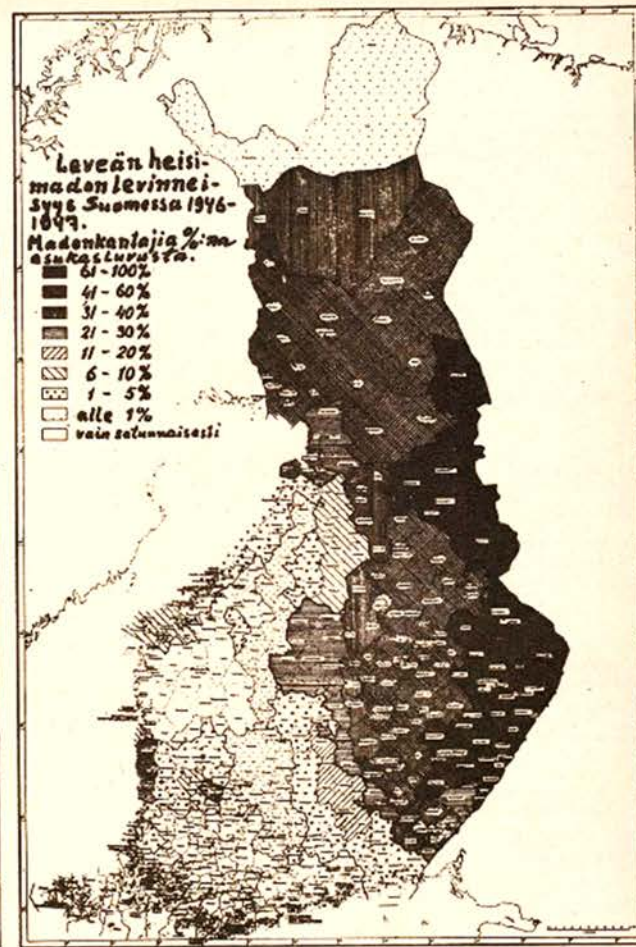
Vinokattoisen ja kalvon väärä sijoitus.



Pisteillä merkitty alue osoittaa, minne asti itäsuomalaisen murteen vaikutus on todettavissa.

ilmaan ja tavalla tai toisella kulkeutuvat makeisiin vesiin, joista kolmen toukka-asteen ja kahden väli-isännän kautta tulevat takaisin pääisäntiin. Toisena väli-isäntänä toimivat eräät makeiden vesien kalalajit, joista siis ihminen saa tartunnan nauttimalla madontoukkien saastuttamaa lihaa, matia tai maitia.

Tärkeimmät leveän heisimatotartunnan levittäjät ovat, mikäli nykyisin tiedämme haiki, ahven, mado, kiiski, puro- ja järvelohi, harjus, siika, muikku ja kare sekä erikokoisesti maiten, muikun ja siian mätä. Myös ankeriaassa, jokinahkiaissa sekä merilohessa on madontoukkia tavattu, kun



Leveän heisimadon levinneisyys Suomessa 1946—1947.

taas särkeä, lahnassa, kuhassa ja säynävissä ei niitä ainakaan varmasti ole voitu todeta. Suolaisen meren kaloissa kuten silissä, silakassa, kampelassa, turskassa jne. ei leveän heisimadon toukkia ole löydetty. Edellä mainitulla puhtaalla alueella oli leveä heisimato ennen sotia melkein tunteenmaton loinen, mutta nyt se on siirtoväen mukana kulkeutunut sinnekin. Järvet, joet ja niissä elävät kalat on kohta täysin saastuttu ja matoinfektio leviää hyvää vauhtia näille alueille.

Mitä on tehty leveän heisimatoinfektion leviämisen estämiseksi? — Yksi filmi ja yksi lentokirjanen.

Mitä tekevät hallitusherrat, kansanedustajat, lääkintöhallitus, terveydenhoitoviranomaiset ja lääkärit? — He SYÖVÄT kraavia siikaa ja lohta, mutustavat muikunmätää, maistelevat mateemähnää. Ja mitä tekee mato? Sekin syö ja munnii. Se munnii satojatuhansia, miljoonia, kymmeniä miljoonia muna ja leviää yhä laajemmille alueille.

Lahtiessamme hävittämään leveitä heisimatoinfektioita maastamme tiedämme joutuvamme taisteluun ikivanhaa kansantapaa vastaan, eikä ainoastaan sitä, vaan sen tarjoamaa kulinaarista nautintoa vastaan, joka kuten kaikki nautinnot on vaikeasti vastustettavissa, mutta ei voittamaton.

70 years ago, estimated almost 1,000,000 Finns carried The Worm, and it was often regarded as an eternal escort to the people.



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However, the national epos **Kalevala**, compiled in 1835, obviously does not even mention the tapeworm, which supports the hypothesis that the most "Golden Era" of *Dibothriocephalus latus* was later, in the 1900s.

DR. T. B. MAGATH of the Mayo Clinic has done valuable service in drawing attention (*Minnesota Medicine*, 1927, x, 614) to the infestation of many species of fish and some mammals with *Diphyllbothrium latum*, or the broad tapeworm, which in a certain district of Minnesota is so prevalent

as to be truthfully called a dangerous menace.

It has been known for some time that fish in various localities, such as the Yellowstone National Park and the Great Lakes, are attacked by parasites of various kinds, which render them inedible. Now we learn

1364

with some dismay that there is an endemic centre of fish parasitism in and around Ely, Minnesota, and another—and this is of particular moment to us in Canada—in Winnipeg, Manitoba.

The fish of the Finnish lakes are infested with the larvæ of diphyllobothrium and the incidence of infestation of man in Finland is very high. The Finns are great fish eaters and prefer their victuals raw. Further, the district of Minnesota in question has had two influxes of Finns since 1888, and some of these people did not stop there, but continued on into Manitoba.

The fish commonly attacked are the pike, pickerel, perch and trout. Salmon and some other species of fish found in Finland are occasionally infested.

The life history of this parasite has been worked out by Janicki and Rosen, (1917). When the eggs are hatched, which takes from nine to fourteen days, a ciliated embryo, known as an onchosphere, makes its way out. It is remarkable, from a zoological

worm. When infected fish are eaten raw or imperfectly cooked they develop into a tapeworm, upwards of three feet in length, located in the ileum of the primary host, which is usually man, or a dog, or cat.

Dr. Magath brought out the alarming fact that in Long Lake, on which Ely is situated, all the pike and pickerel were infested, and that other lakes in the district were involved, in a degree directly proportional to their proximity to this city.

It seems to be proved that the life history of this dangerous parasite can be initiated and carried out entirely in North America. The disease is acquired through the custom of eating raw fish, and will become endemic where this is practised; particularly, if the sewage system in the locality is defective. Dr. Magath places the blame on the Finns. They are fishermen and eat raw fish. Many in Canada are very doubtful of the propriety of settling large bodies of foreigners from Northern Europe in our North West. Their ways are not our ways, nor are their thoughts



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Case Reports

AN UNUSUAL TERMINATION IN A CASE OF TUBERCULOUS SPINE

called "Gerullachtz" meaning "filth or dressing." As Magath²⁰ has described, the Finlanders became infected from eating raw fish

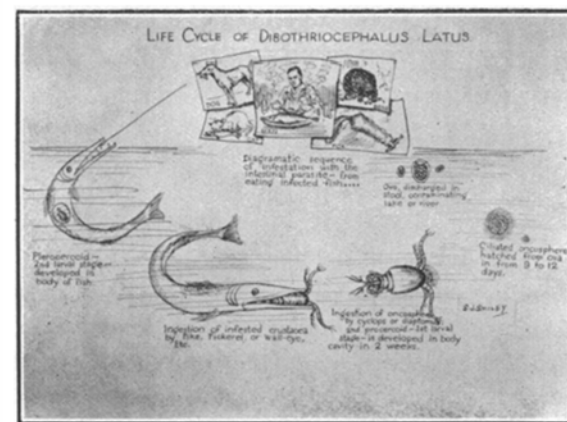


FIG. 1

alone or from eating one of their favourite fish dishes, namely, fresh fish soaked in brine for twenty-four hours and then served with green peppers, cabbage or cucumbers.

laboratory report showed organisms to be gram-negative rods belonging to the *B. coli* group.

The patient rapidly became weaker and was apparently close to death when, on December 10th, he had a number of hæmorrhages of bright red blood from the bowel. These continued for

A CASE OF INFESTATION WITH DIPHYLLOBOTHRIUM LATUM

BY W. B. McCLURE, M.B., D.P.H. AND

LUKE TESKEY, M.B.,

Toronto

Infestation with the fish tapeworm has very occasionally been found in Toronto. From June, 1926, to December, 1932, in the Toronto General Hospital 6 cases are recorded. The case recorded here presents several interesting features, and is presented in the hope that other cases may be reported, and an endeavour made to determine whether any native cases are to be found in Toronto.

CASE REPORT

Clinical history.—Mrs. L.M., aged 27, a fairly well developed woman, was born in Vlaama, Finland. Her father was a fisherman and fish was a constant article of diet in the home. At the age of 6 years she passed segments of tapeworm and was treated by home remedies. At 15 years of age, although she had not been entirely free and continued to pass segments of

Taenia lata (Linnaeus, 1758)
Dibothriocephalus latus
Diphyllobothrium latum



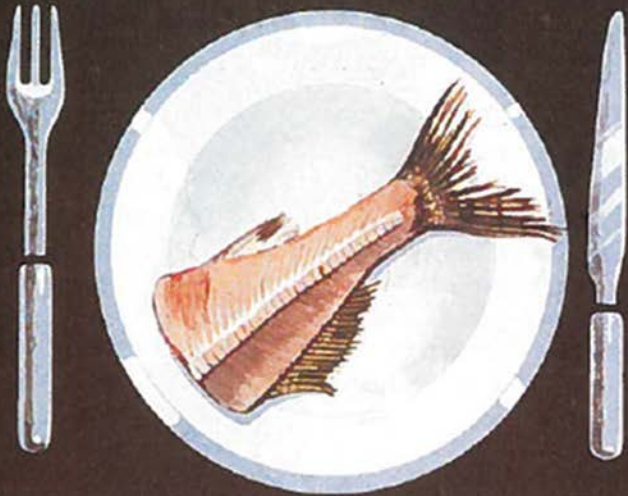
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Dryopteris filix-mas (Male Fern)



raaka kala



matomato

siitä suuri munasato
josta tulee lapamato

Se vie voimasi – se tuhlaa
ruokasi. Älä elätä loista!



SUOMEN PUNAISEN RISTIN TERVEYSTIETO



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In 1953, it was calculated that tapeworms in Finland consumed 66,000 kg of butter and 120,000 kg of bread a day. (population 4.1 million)

RAAKA KALA
matomaha
KUNTOSI KYYY
sairautesi syy



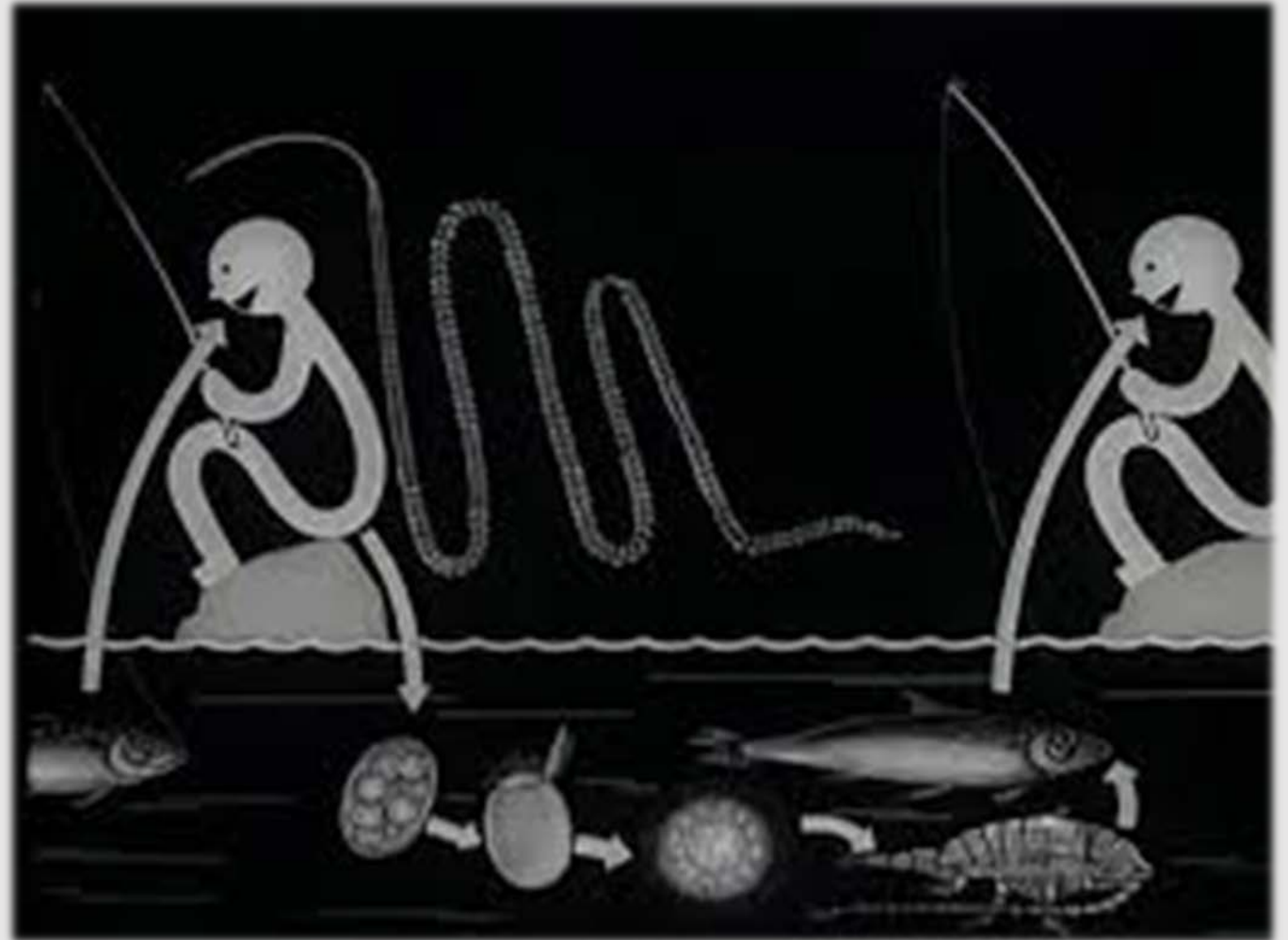
Torin luotas mato



nüssä madon kato

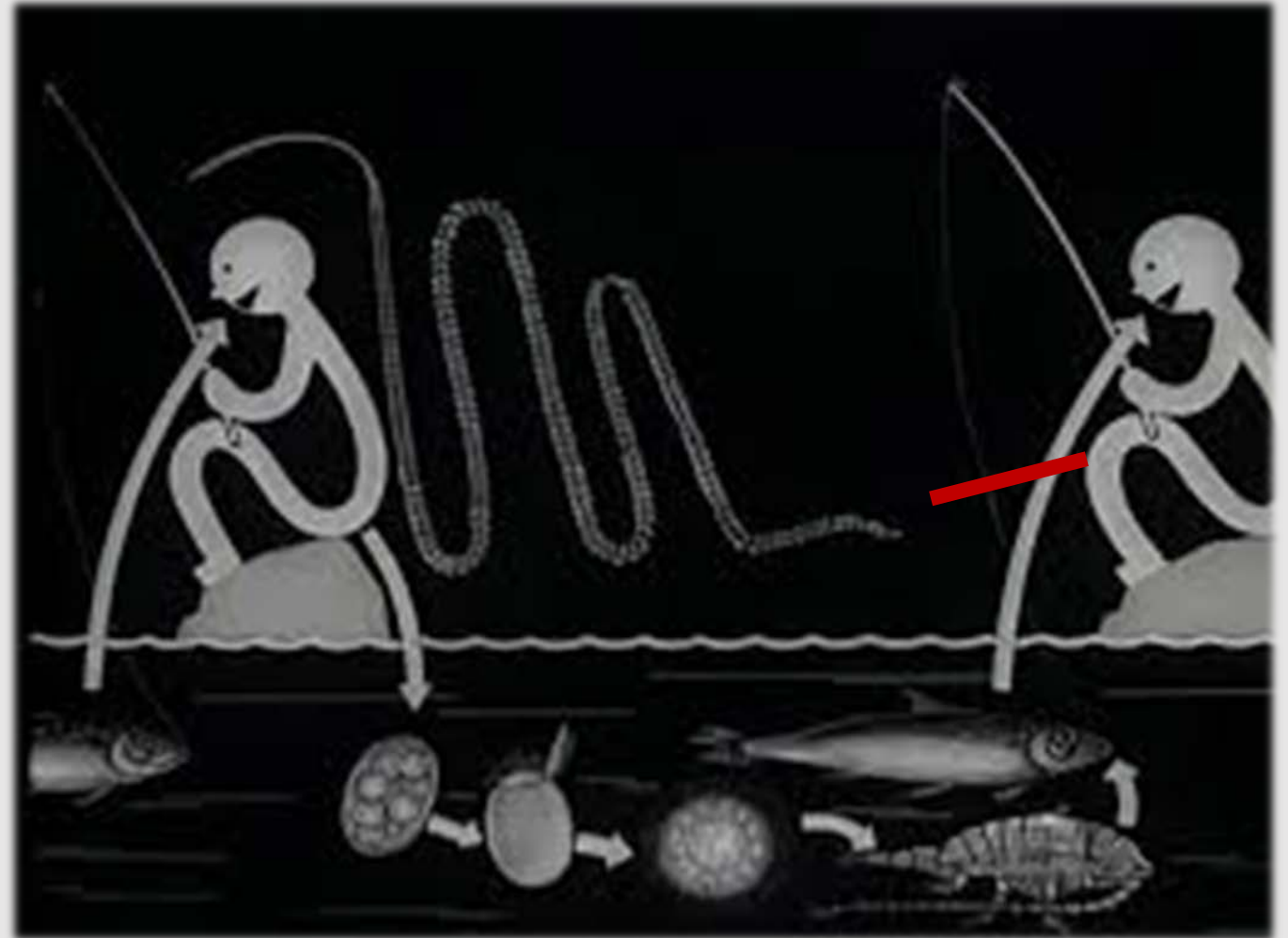


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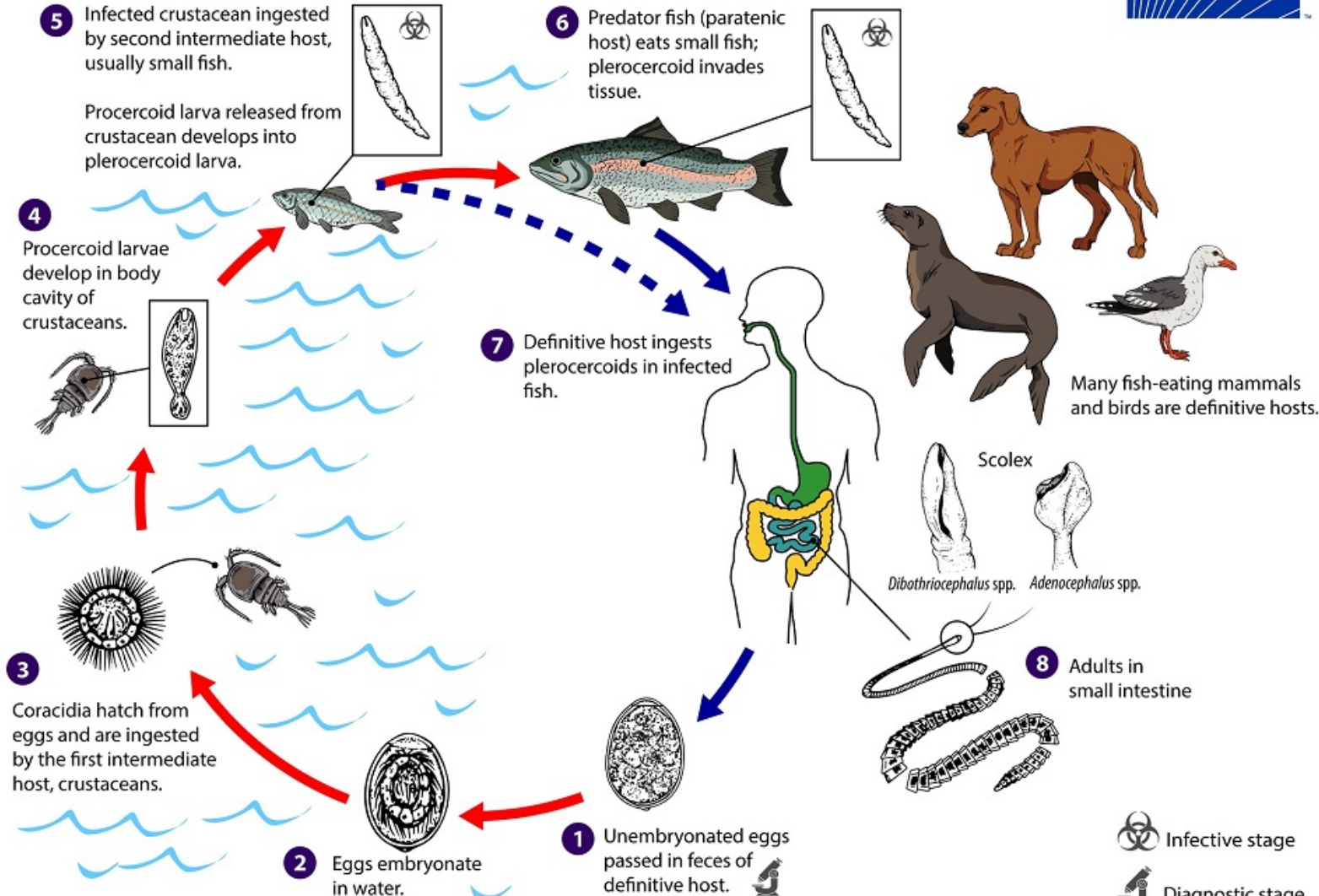
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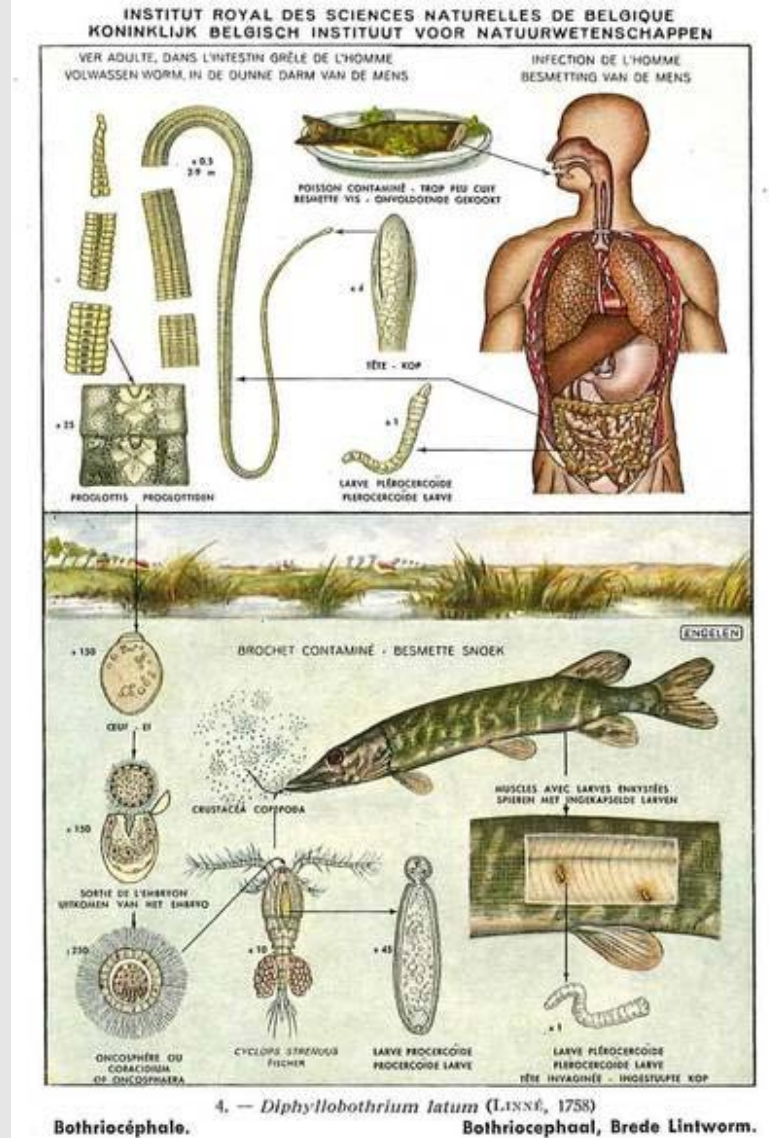
Dibothriocephalus latus: humans are the primary definitive hosts

DPDx

Diphyllobothriid Tapeworms



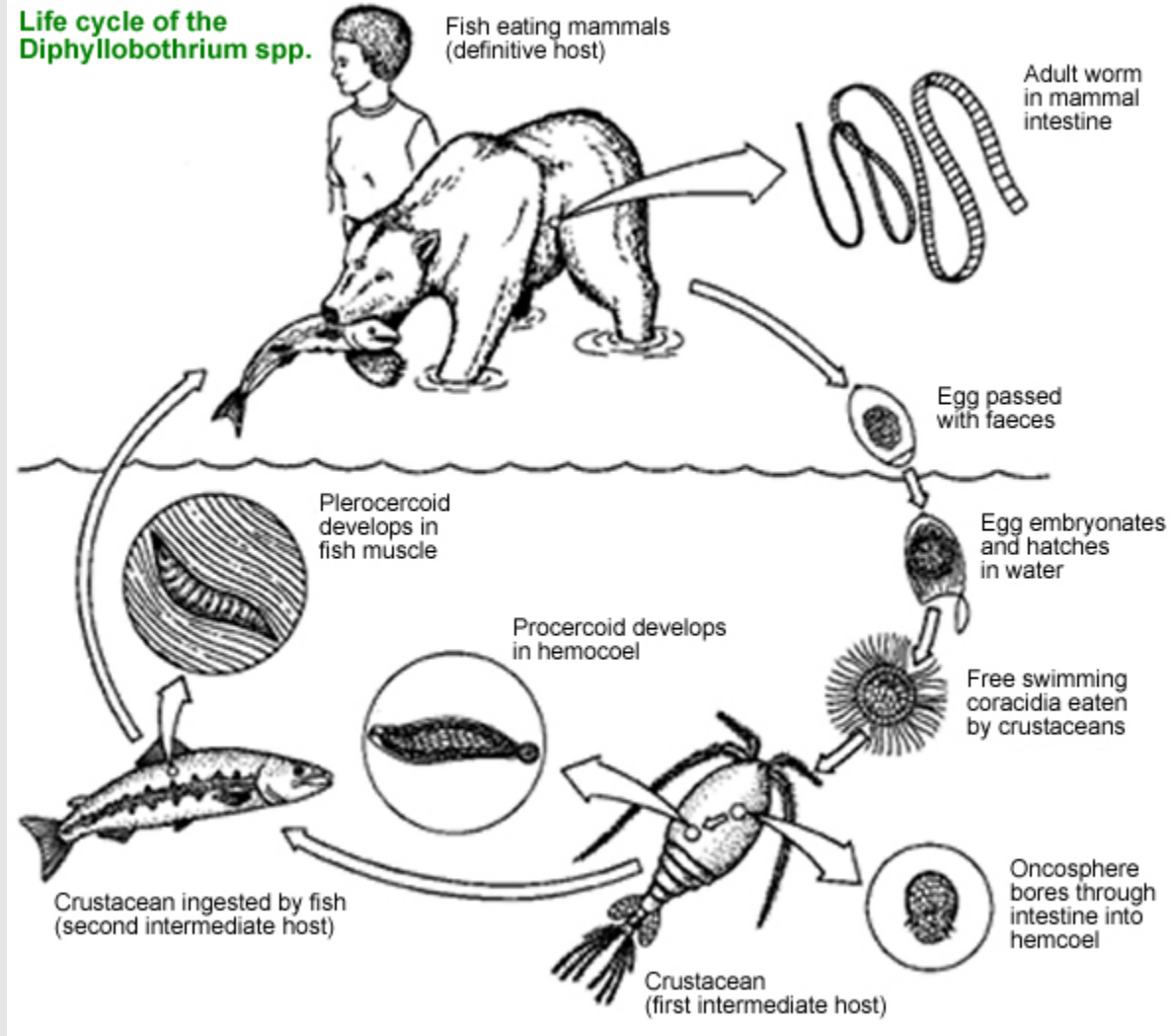
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Life cycle of the *Diphyllobothrium* spp.



Six species of broad tapeworms considered to infect humans; another 13 species have been rarely reported

control of these challenging

does-a-bear-poo-in-the-woods?
in the rivers?



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“The man ate masu salmon. After a time, a strange object emerged from the anus and was pulled out: it turned out to be 2–3 m long.”

Yamai no Soushi (Diseases and Deformities), Daizennosuke Koan (1850)

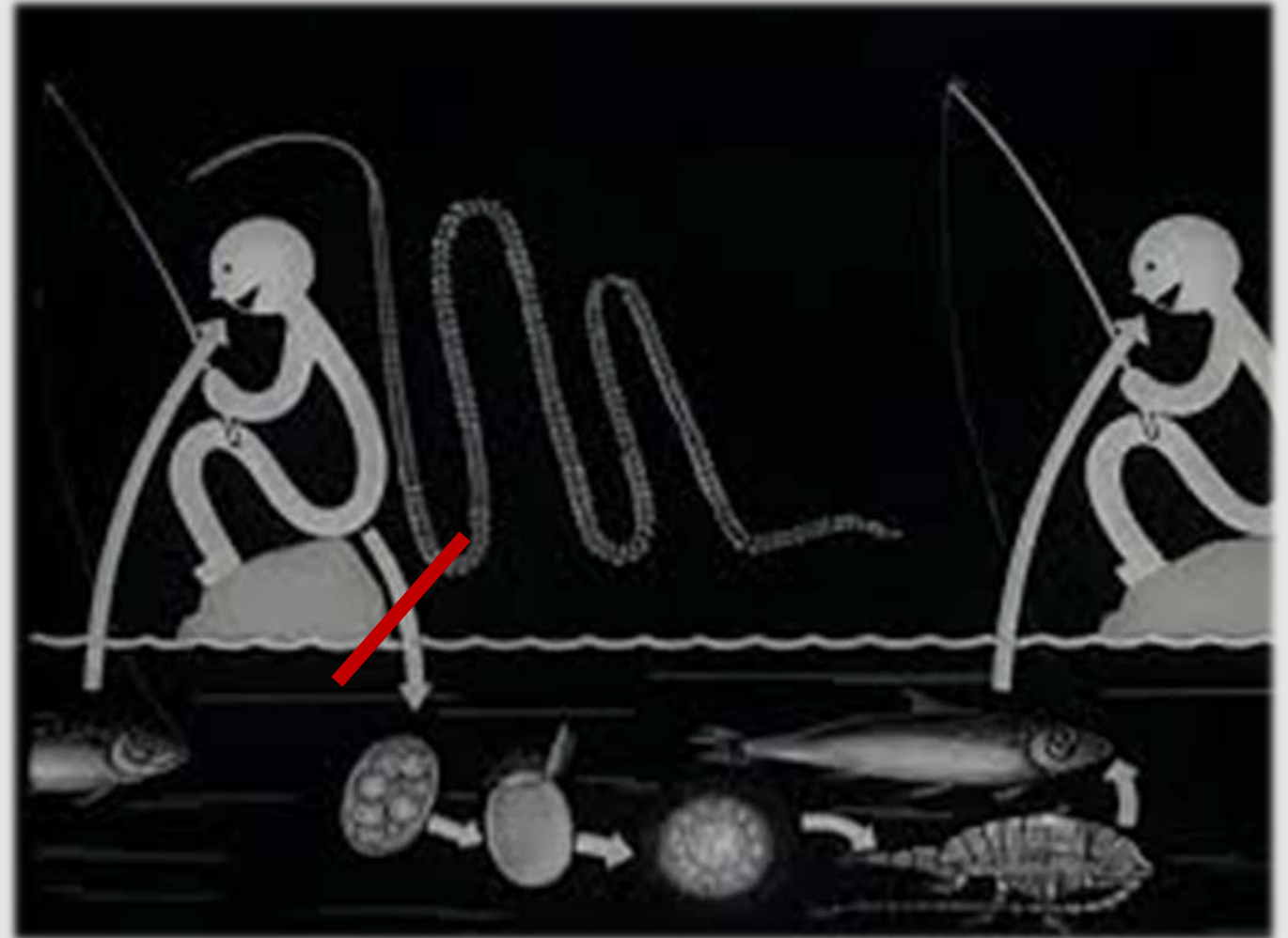
Dibothriocephalus nihonkaiense (?)

Oncorhynchus masou
Cherry trout





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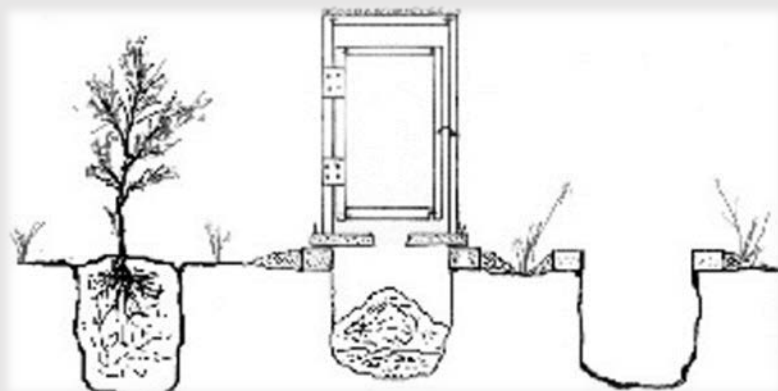
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Olavinlinna Castle since 1475 (Wikipedia)



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1950s on...



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HISTORICAL REVIEW

History of *Taenia saginata* Tapeworms in Northern Russia

Sergey V. Konyaev, Minoru Nakao, Akira Ito, Antti Lavikainen

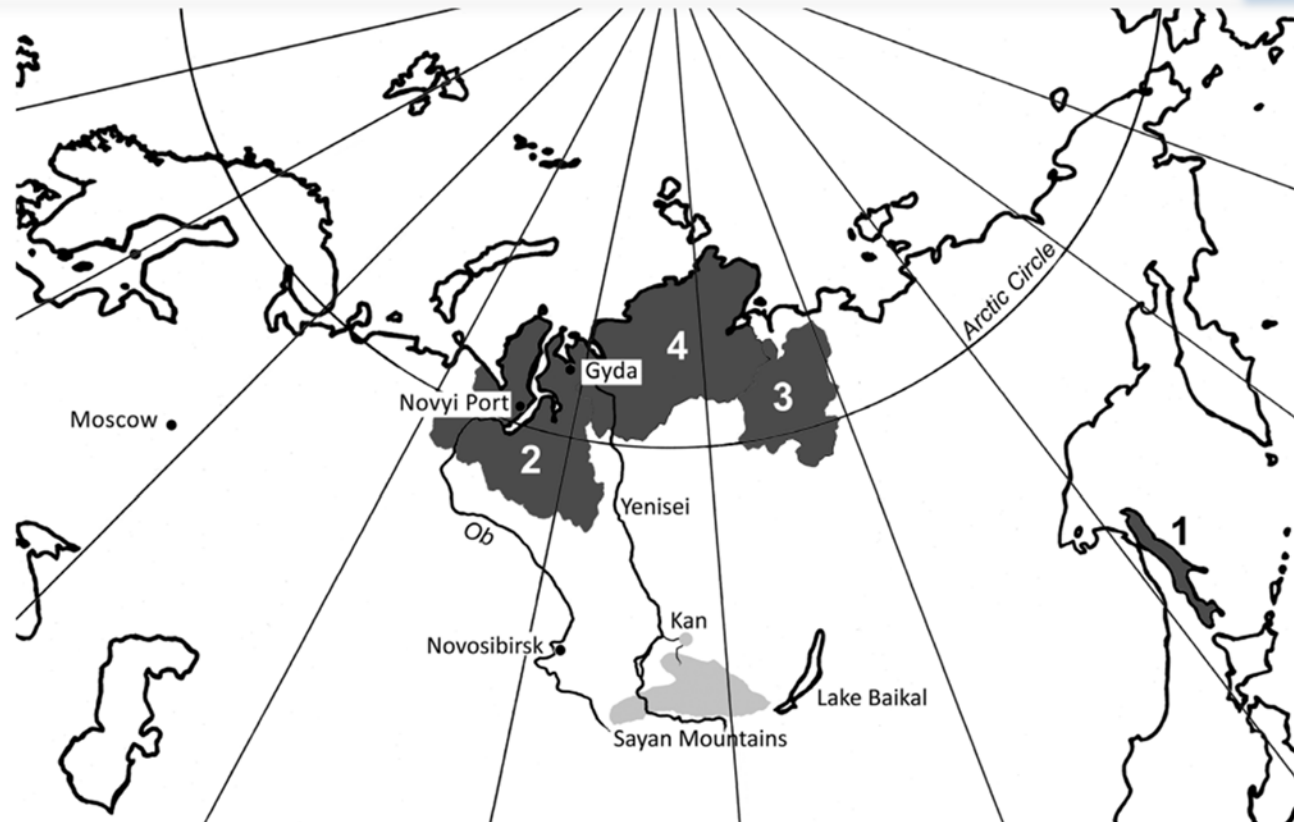


Figure 1. Regions where infections with the northern strain of *Taenia saginata* tapeworms in Siberia and the Far East region of Russia were detected (dark gray shading). 1, Sakhalin Island in 1872 and 1955; 2, Yamalo-Nenets Autonomous Okrug, since the 19th century to the present time; 3, Olenyoksky District, Yakutia, 1958; 4, Taymyr Autonomous Okrug, 1977. The probable cradle of reindeer herding in Asia and site of the host switch from cattle to reindeer (the Sayan Mountains) is indicated by light gray shading. The light gray dot indicates the Kan River archaeological site where taeniid eggs were found from human remains buried 3,000–4,000 years ago.



