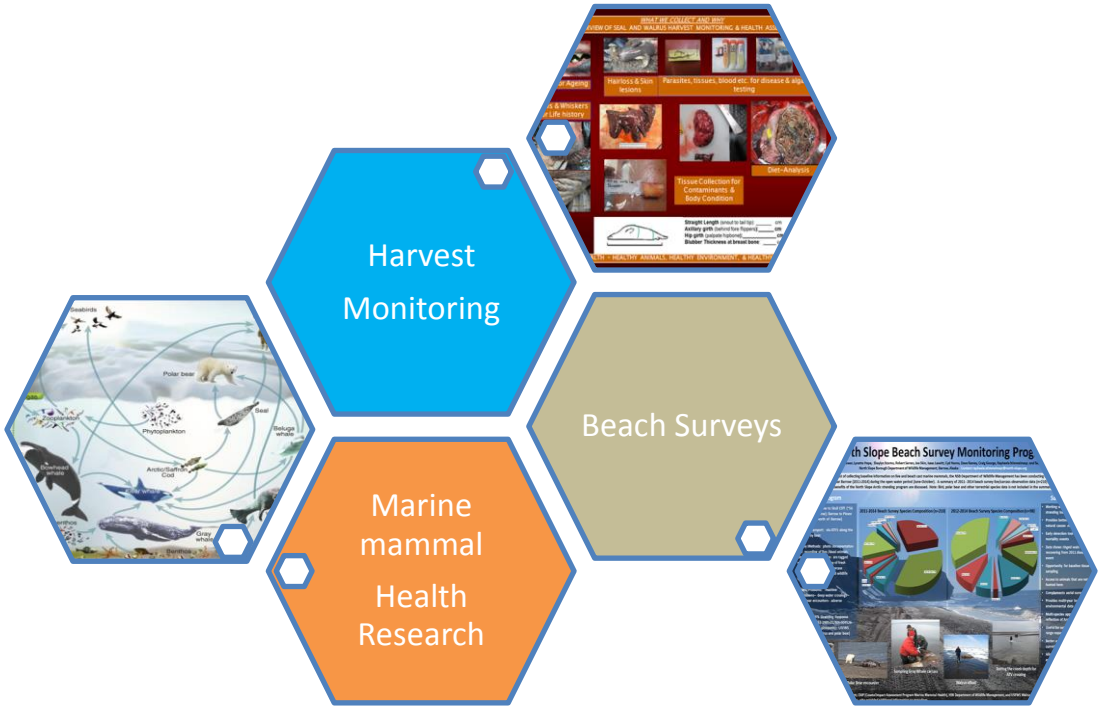
2020
Research Update



NSB DWM
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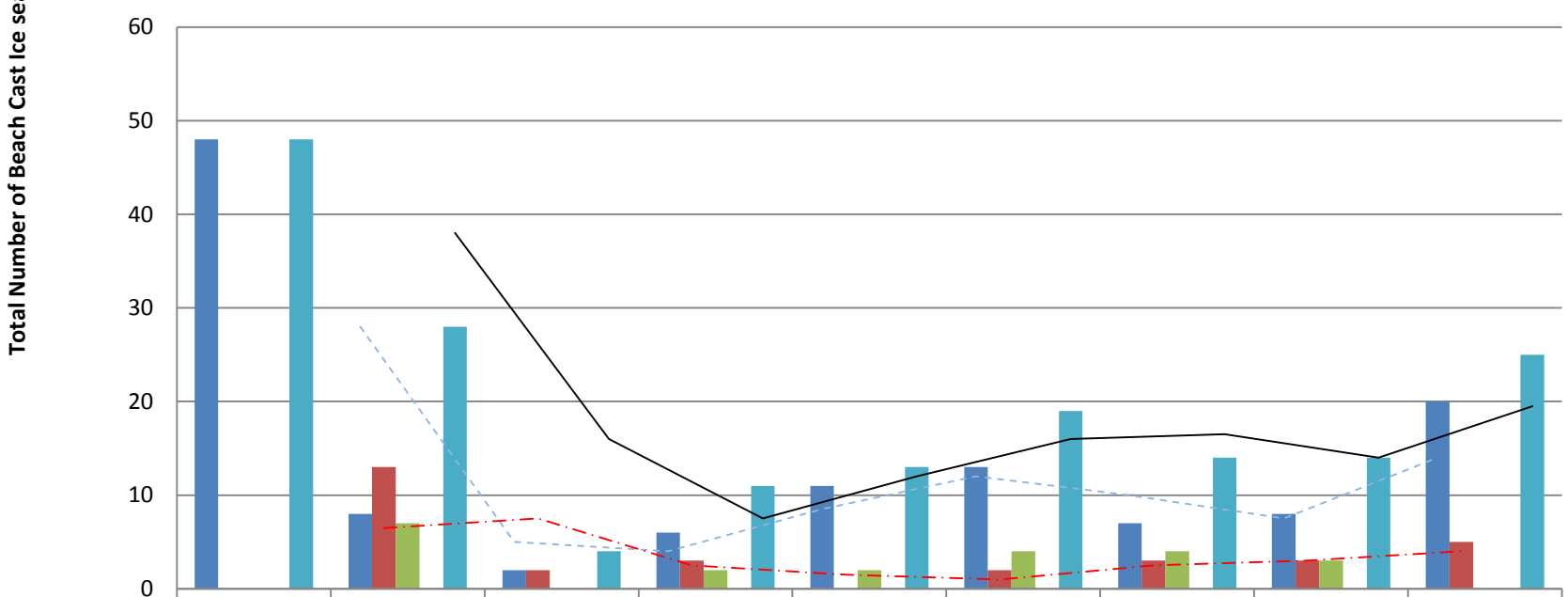
2011 to 2019 Ice seals Strandings (DEAD), Utgiagvik, Alaska
Survey period June -October

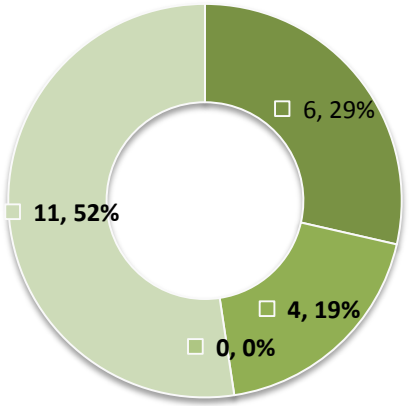


	2011	2012	2013	2014	2015	2016	2017	2018	2019
Ringed Seal	48	8	2	6	11	13	7	8	20
Bearded Seal	0	13	2	3	0	2	3	3	5
Spotted Seal	0	7	0	2	2	4	4	3	0
Ribbon seal	0	0	0	0	0	0	0	0	0
Total	48	28	4	11	13	19	14	14	25

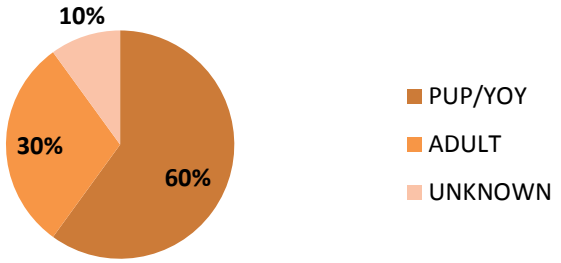
POST UME HAIRLOSS MONITORING

Prevalence of Molt disorders (i.e. patchy to diffuse hair loss; lots of black skin, old coat, delayed molt) in harvested (n=11) and found dead (n=10) ice seals North Slope , Alaska (2019)

Point Hope SA
Bearded seal



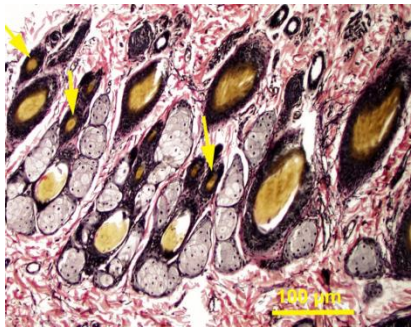
Age Composition of ice seals with molt disorders (n=10).



Nome SA/A
Bearded seal
(STR-335-19)

Utgiagvik YOY
Ringed seal

- **Gross vs Histopathology Findings**
- follicular atrophy/arrest, inflammation, sebaceous gland atrophy, and fibrosis.
- Absence of vasculitis or etiologic agents
- Environmental/hormonal-related causes?
  - no evidence for endocrine lesions (thyroid; adrenal)
  - Molting cycle X Energetics X Nutrition X Environment (warm waters ?, prolonged time in water, disrupted skin integrity, salinity changes ??



Example of Hair follicles and Glands in harbor seal skin

Utgiagvik YOY
Spotted seal

- Please continue to report seals with abnormal coats to your regional Ice seal commissioner !
- There are funds for shipping carcasses and having them examined and sampled !!!
- Take photos !

2019 Harmful Algae (HABS) Monitoring update
Data: Lefebvre - WARRN-West/NOAA/NWFSC; Don Anderson WHOI)

STUDY: Analysis for marine biotoxins (DA/STX) of marine mammals and invertebrate that were part of a large-scale multi-species die-off during June/July 2019 in the Bering Strait Region and Norton Sound.

OBJECTIVE: to determine if Harmful Algal Bloom (HAB) toxins played a role in the mortality event

SPECIES: clams, krill, stranded bowhead and minke whale, ringed, bearded and spotted seals and walruses from the Bering Sea region

Collection Date:	Animal:	Sample Type:	Location Found:	DA (ng/mL)	STX (ng/g)
6/25/19	Bivalves	intact clams	N. shore of Sarichef Island	BDL	5.1
6/25/19	Bivalves	intact clams	N. shore of Sarichef Island	BDL	BDL
6/25/19	Bivalves	intact clams	N. shore of Sarichef Island	BDL	BDL
6/25/19	Bivalves	intact clams	N. shore of Sarichef Island	BDL	BDL
6/25/19	Bivalves	intact clams	N. shore of Sarichef Island	BDL	BDL
6/25/19	Bivalves	intact clams	N. shore of Sarichef Island	BDL	BDL
6/25/19	Euphausiids	intact krill	N. shore of Sarichef Island	BDL	5.9
6/23/19	Bowhead whale	intestinal fluid	Near Third Channel	BDL	BDL
6/24/19	Minke whale	intestinal fluid	Liguvik (Ocean side Arctic Lagoon)	BDL	BDL
6/24/19	Bearded seal	Stomach fluid	Liguvik (Ocean side Arctic Lagoon)	BDL	BDL
6/24/19	Bearded seal	feces	Liguvik (Ocean side Arctic Lagoon)	BDL	4.1
6/25/19	Ringed seal	Stomach liquid	Sarichef Island	BDL	BDL
6/25/19	Ringed seal	stomach contents	Sarichef Island	BDL	BDL
6/24/19	Spotted seal	Intestines	Liguvik (Ocean side Arctic Lagoon)	BDL	BDL
6/23/19	Walrus	intestinal fluid	Third channel	BDL	3.1
6/23/19	Walrus	intestine	Third channel	BDL	BDL
6/23/19	Walrus	intestine	Near Third Channel	BDL	BDL
6/25/19	Walrus	intestinal fluid	Sarichef Island	BDL	3.8
6/25/19	Walrus	intestine	Sarichef Island	BDL	BDL
6/25/19	Walrus	intestinal fluid	Sarichef Island	BDL	3.2
6/25/19	Walrus	intestine	Sarichef Island	BDL	BDL
6/25/19	Walrus	intestinal fluid	Liguvik (Ocean side Arctic Lagoon)	BDL	BDL
7/8/19	Walrus	intestinal fluid	Beach / York Mts	BDL	3.8
7/8/19	Walrus	intestine	Beach / York Mts	BDL	BDL
7/8/19	Walrus	intestinal fluid	East of Tin City	BDL	5.8
7/8/19	Walrus	intestine	East of Tin City	BDL	BDL

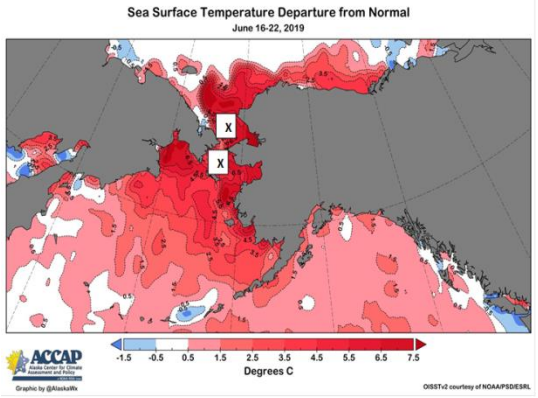


Figure 1: *Anomalously warm sea surface temperatures (SST) in Arctic waters. Sampling sites for multispecies die-off animals are marked with an X.*

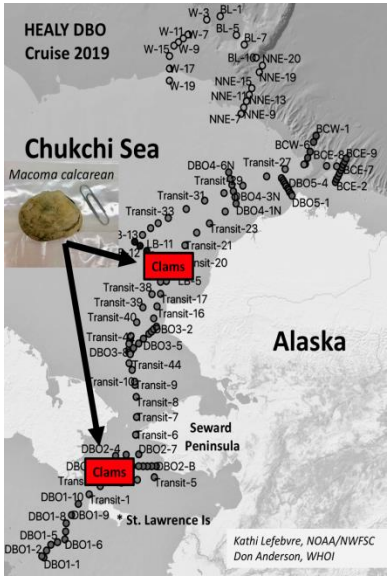


Figure 2: *Sampling station grid for the HEALY DBO 2019 Cruise (Courtesy of Don Anderson). Low to moderate levels of both domoic acid (DA) and saxitoxin (STX) were found in all regions. At two offshore locations (red boxes at 50 miles north of Cape Lisburne and 70 miles north of St. Lawrence Island), clams had STX levels above the regulatory limit (>80 µg STX/100 g shellfish).*

RESULTS: Based on these data, there is no evidence for significant algal toxin involvement in this multispecies die-off. Caveat - many of the marine mammal samples were in advanced stages of decomposition. Algae toxins degrade quickly in animals as they decompose. This data is not conclusive that algal toxins were not involved. DA/STX were present in August in clams, krill, copepods (HEALY DBO). Alexandrium cells (PSP) were at bloom densities where a few **hot clams (above sea food safety limit)** were found.

WHAT DOES IT MEAN : Given that warming ocean temperatures and decreasing ice cover will expand the spatial and temporal window for HABs in the Arctic cooperative long-term monitoring efforts by researchers, hunters and communities are essential.

Torsion of left uterine horn in a pregnant ringed seal ”natchiq” Utqiagvik , Alaska

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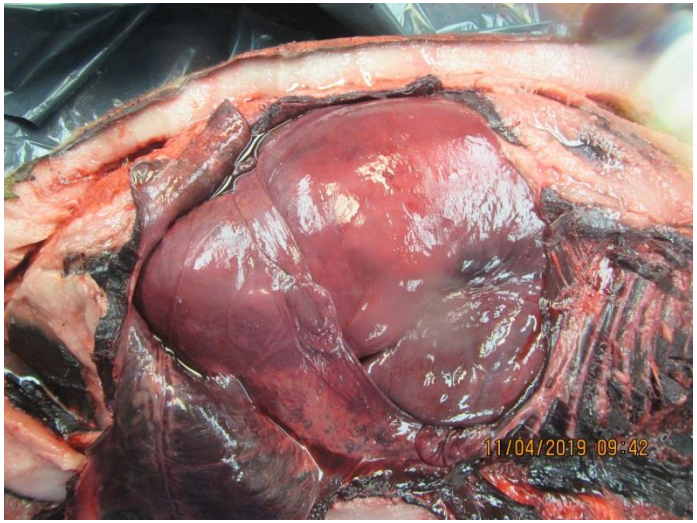
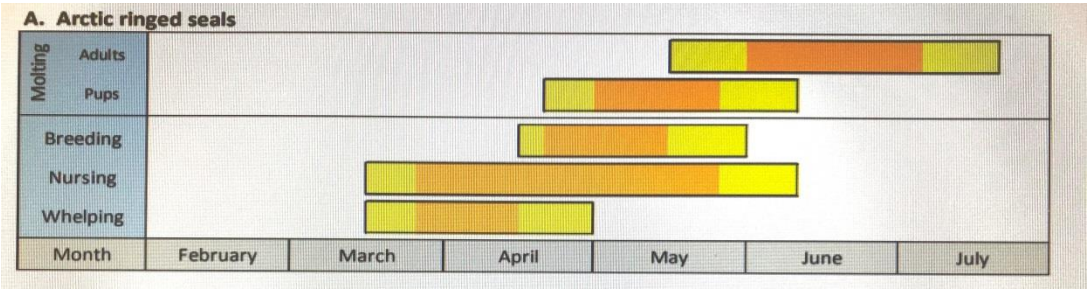
Case history: found dead adult (SL 113 cm ; 3.7 ‘) ringed seal (2019 RS 0607 FD), excellent body condition (5cm blubber depth)





Diagnosis: swollen external vulva; blood discharge; left uterine horn torsion with full term fetus (SL: 57 cm; body mass 3.52 kg) Cause of death dystocia with probable toxemia.

Clinical Significance: Dystocia is rare in ice seals with one case (adult RS July 16, 2011) reported prior in Utgiagvik (NSB DWM unpubl.data). Uterine torsion has bene reported in California sea lions. Seeing a female natchiq with a full term fetus that late in the season is unusual since peak pupping season is March to April. Variation in duration of pregnancy has been seen in Antarctic fur seals with duration of pregnancy increased (up to 50 days) in years associated with low availability of food, and this corresponded with later births.

*Delayed implantation: 105 days post breeding in ringed seals

I. L. Boyd, Individual Variation in the Duration of Pregnancy and Birth Date in Antarctic Fur Seals: The Role of Environment, Age, and Sex of Fetus, *Journal of Mammalogy*, Volume 77, Issue 1, 16 February 1996, Pages 124–133,

Demographics of Heart worm (Acanthocheilonema spirocauda) infection in ice seals, Alaska

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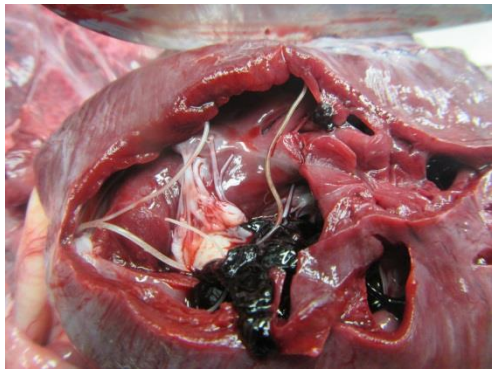

Fig.1a heartworm right ventricle 2017 SS 0802 S

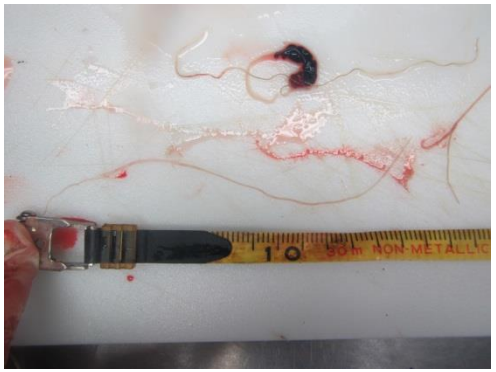

Fig.1 Heartworm *Acanthocheilonema spirocauda*

Diagnosis: *Acanthocheilonema spirocauda*

Clinical Significance: Heart worm infection is rare in ice seals in Alaska. The life cycle is not well understood. Insects i.e. seal louse (*Echinophthirius horridus*) are thought to be a vector. Pending worm burden diving capacity of infected seals negatively influenced. Mostly juvenile animals, possible high mortality as few cases in adults.

Leidenberger S, Harding K, Härkönen T (2007) Phocid seals, seal lice and heartworms: a terrestrial host–parasite system conveyed to the marine environment. Dis Aquat Org 77:235-253.

ID	2019 SS XXXX S	2017 SS 0802 S	2016 RS 0914 FD	2019 RS0913 FD	ADF&G	ADF&G	CFK-001-14 *
Species	P.Larga	P.Larga	P.Hispida	P.Hispida	E. Barbatus	P.Larga	P.vitulina
Year	2019	2017	2016	2019	2009	2008	2014
Village	Point Hope	Utgiagvik	Utgiagvik	Utgiagvik	Diomede	Point Hope	Chefornak
Age/Sex,	Pup, ♀	0 claw; ♀	pup, ♂	0 claw ; ♀	SA; ♂	0 claw; ♀	Uk
WB/WL	~ 30; < 5 cm	10-15; ~ 15 cm	~5;< 5 cm	~ 5/< 10 cm			~ 5; < 5 cm
BC	Poor	Good	Good	Fair	Good	Unknown	unknown
Heart	RV/LV	RV; Aortic arch	LV	RV	heart	Found in lungs	Heart blood
Lung worms	Yes	No	No	Yes	No	No	uk
Lice	No	No	No	No	No	No	UK

WB =worm burden; WL = worm length; * images only

Preliminary findings on incidence of cataracts in ringed seals Alaska

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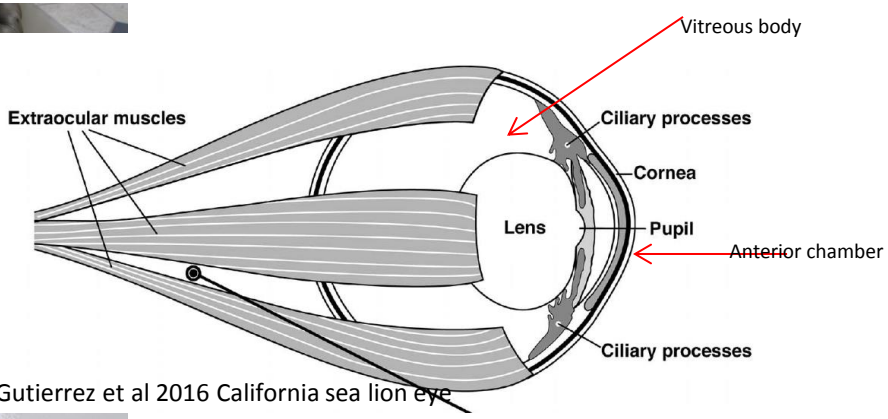
Vision is an important source of information for free-ranging seals and lens disorders have the potential to affect overall fitness. The incidence of cataracts (partial to complete clouding of lens) in free-ranging ringed seals is unknown. The objective of the study was to determine incidence of cataracts in found dead and subsistence harvested ringed seals (2010 -2019). When present eye globes were collected during routine postmortem examination and stored whole frozen (- 20° Celsius) or formalin fixated until analyzed. Lenses were removed from the globe by an anterior approach.



Gutierrez et al 2016 California sea lion eye

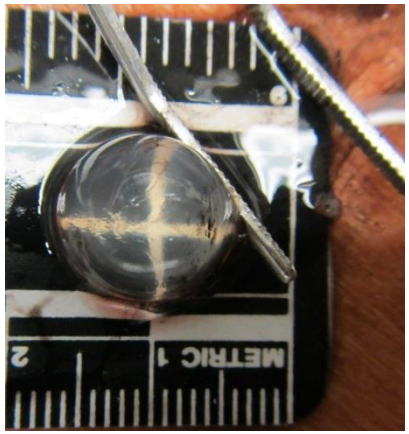


Fig. 1. Example of a clear lens in a pup

Fig.2. Cataract in a female Pup

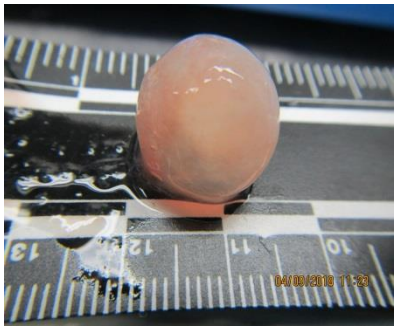


Fig.3. Cataract in a male sub adult (2-4 yr.)

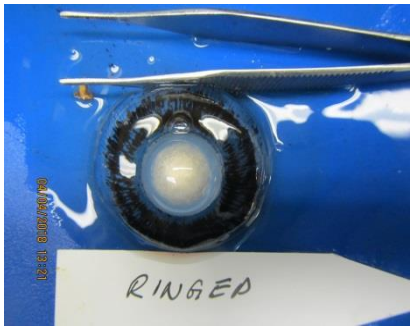


Fig.4. Nuclear cataract in an 8 year old male ringed seal.

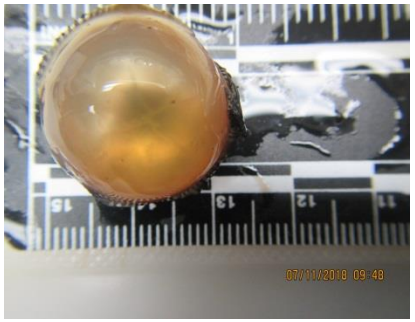
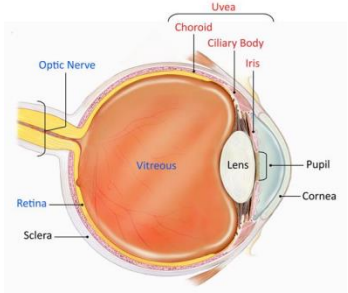


Fig.5. Cataract in a 15 yr. old female ringed seal .

	Time period (# animals)	# of Animals	# of Animals with cataracts	# of lenses	# of Cataracts	Prevalence (%) Among eyes examined	Prevalence (%) among Animals examined
RINGED	2010 -2019	26	**22**	35	27	77	**84 %**
• PUP/YRL		8	**5**	13	6	46	**62 %**
• SA		4	**4**	4	4	100	**100 %**
• AD **		13	**13**	17	16	94	**100 %**
• UK		1	**1**	1	1	100	**100%**

* Age range : 8-19 yrs. (harvested seals) ; > 6 claw rings (found dead seals)

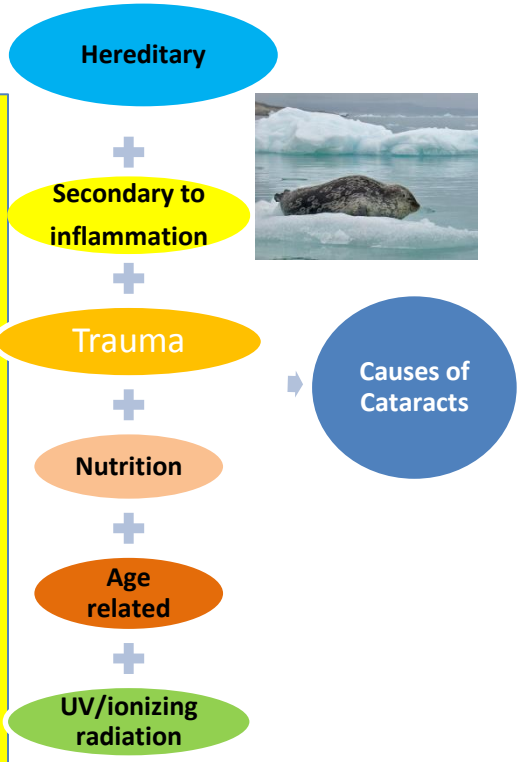


What does it mean ?

- Cataracts occur in ringed seal (novel finding/first reported) across age classes [similar to California Sea lions]
  - Higher (84%) Prevalence than in California sea lion [38/111 (34.2 %)]
    - What causes it ? Difficult to sort out given small sample sizes and unequal age cohorts
      - Species X Habitat interaction? For example ringed seals are more prone to cataracts as they live in an uv-radiation rich environment; cataracts in ringed seals are hereditary etc.
      - Post UME Effect? 68 % (24/35) of lenses included in study are from 2011 to 2014 and 100% (24/24) had cataracts. Lenses collected from 2017 onward 40% (4/10) had cataracts.
  - Complex and limited data (# of lenses, unequal age distribution) to draw solid conclusions about causes
  - Independent of origin of cataracts ? -What Do you as hunters think are the fitness effects of poor vision on ringed seals and ice seals in general with respect to foraging, predator avoidance, getting lost ?

What's the plan ?

- Continue eye collection and lens examinations to better understand the causes for cataracts in ringed and other ice seals
- Complete lens analysis for bearded seal
- Present update data to committee



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