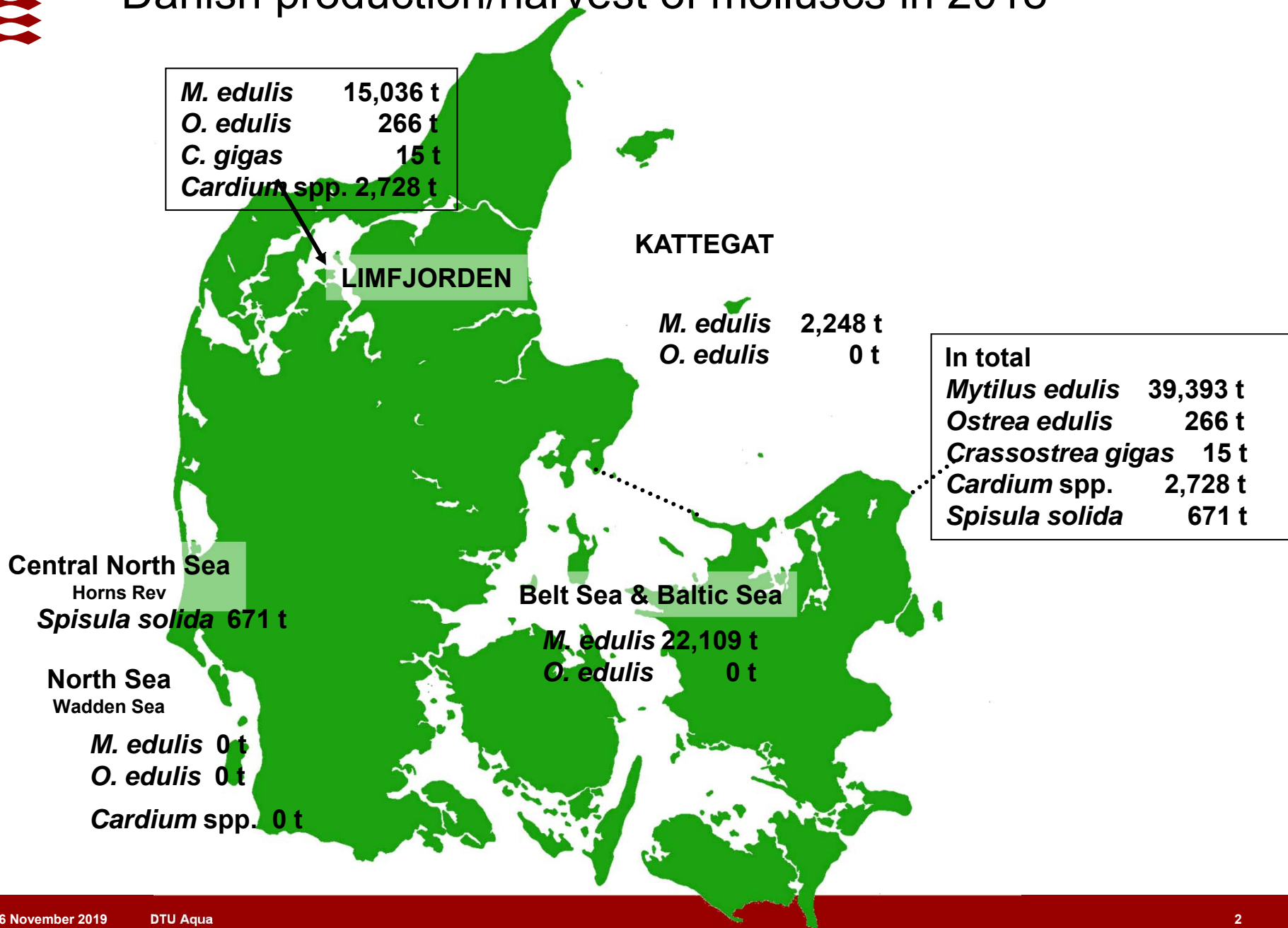


Bonamia ostreae in Limfjorden in Denmark; when and where?

Lone Madsen
DTU Aqua

Danish production/harvest of molluscs in 2018



Results of flat oyster survey 1996-2019

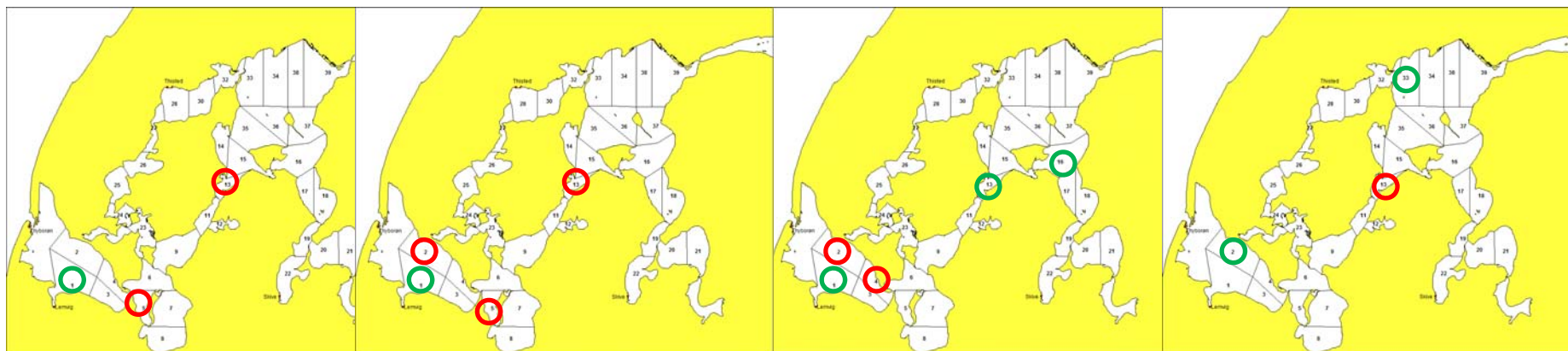
Site	<i>Bonamia</i> sp.													
	1996-2013	Nov 2014	June 2015	Aug 2015	Oct-Nov 2015	Sep 2016	Nov 2016	Dec 2016	June 2017	Sep-Nov 2017	April 2018	Nov 2018	May 2019	Nov 2019
1	0 % (0 of >5600)	0 % (0 of 31)	0 % (0 of 33)	-	0 % (0 of 33)	0 % (0 of 38)	ND	-	-	0 % (0 of 60)	-	-	-	
2		-	-	-	-	-	2.5 % (1 of 40)	-	-	3.3 % (2 of 60)	-	-	-	0 % (0 of 60)
4		-	-	-	-	-	-	-	0 % (0 of 40)	2.5 % (1 of 40)	-	-	-	
5		6 % (2 of 31)	3 % (1 of 33)	25 % (3 of 12)	0 % (0 of 34)	-	15 % (6 of 40)	5 % (2 of 40)	-	-	-	-	-	
13		58 % (18 of 31)	12 % (4 of 33)	-	63 % (20 of 32)	-	50 % (20 of 40)	-	-	0 % (0 of 58) (0 of 40)	0 % (0 of 40)	0 % (0 of 32)	6 % (1 of 18)	
16		-	-	-	-	-	-	-	-	-	-	0 % (0 of 31) (0 of 40)	-	
33		-	-	-	-	-	-	-	-	-	-	-	-	0 % (0 of 50)

2014-2015

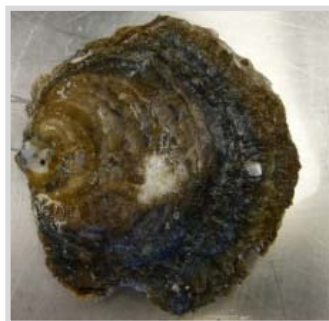
2016

2017-2018

2019

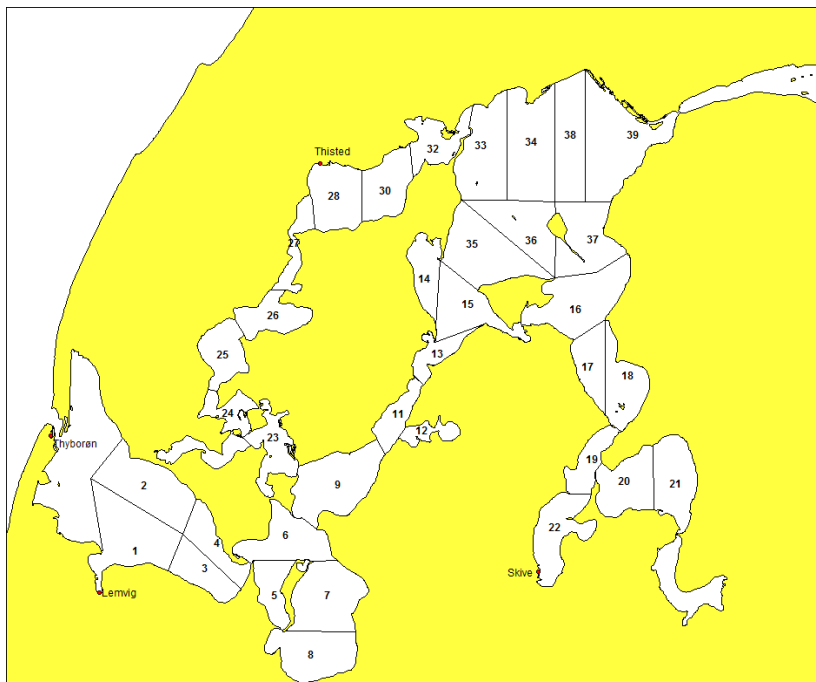


Mollusc production in Limfjorden



2014	83 t	0 t	22,549 t
2015	137 t	0 t	21,724 t
2016	145 t	0 t	17,302 t
2017	149 t	10 t	15,819 t
2018	266 t	15 t	15,036 t

Results of mollusc survey 2016-2019



Sample ID explanation (e.g. SOE33-19-1):

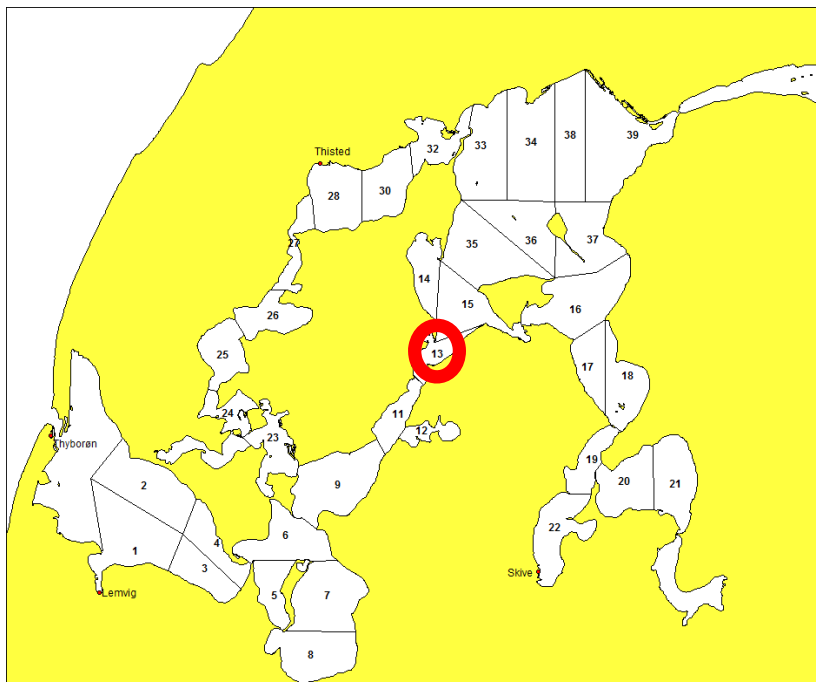
Mollusc species (M=blue mussel, OE=flat oyster, SOE=Pacific oyster)

Zone (1, 2, 4, 5, 13, 16 or 33)

Year

Sampling no.

Sample ID	Year/month	Mollusc species	Animals in total	Alive/dead animals	Bonamia-positive animals	Percent with Bonamia	Bonamia +/-
OE1-16-A-1	16/09	<i>O. edulis</i>	38	Alive	0	0	-
SOE1-16-A-1	16/09	<i>C. gigas</i>	18	Alive	0	0	-
OE1-17-1	17/11	<i>O. edulis</i>	60	Alive	0	0	-
SOE1-17-1	17/11	<i>C. gigas</i>	29	Alive	0	0	-
OE2-16-1	16/11	<i>O. edulis</i>	40	Alive	1	2.5	+
OE2-17-1	17/11	<i>O. edulis</i>	60	Alive	2	3.3	+
OE2-19-1	19/03	<i>O. edulis</i>	60	Alive	0	0	-
SOE2-19-1	19/03	<i>C. gigas</i>	90	Alive	0	0	-
OE4-17-1	17/06	<i>O. edulis</i>	40	Alive	0	0	-
OE4-17-2	17/10	<i>O. edulis</i>	40	Alive	1	2.5	+
OE5-16-1	16/11	<i>O. edulis</i>	40	Alive	6	15	+
OE5-16-2	16/12	<i>O. edulis</i>	40	Alive	2	5	+
OE13-16-1	16/11	<i>O. edulis</i>	40	Alive	20	50	+
OE13-16-X	16/11	<i>O. edulis</i>	17	Dead	11	65	+
M13-16-1	16/11	<i>M. edulis</i>	40	Alive	0	0	-
SOE13-17-1	17/01	<i>C. gigas</i>	40	Alive	0	0	-
OE13-17-1	17/09	<i>O. edulis</i>	58*	Alive	0	0	-
SOE13-17-2	17/11	<i>C. gigas</i>	40	Alive	0	0	-
OE13-17-2	17/11	<i>O. edulis</i>	40	Alive	0	0	-
M13-17-2	17/11	<i>M. edulis</i>	40	Alive	0	0	-
OE13-18-1	18/04	<i>O. edulis</i>	40	Alive	0	0	-
OE13-18-X	18/11	<i>O. edulis</i>	8	Dead	0	0	-
OE13-18-2	18/11	<i>O. edulis</i>	32	Alive	0	0	-
OE13-19-1	19/04	<i>O. edulis</i>	17	Moribund	0	0	-
OE13-19-2	19/05	<i>O. edulis</i>	1	Dead	1	100	+
OE16-18-1	18/11	<i>O. edulis</i>	31	Alive	0	0	-
OE16-18-2	18/11	<i>O. edulis</i>	40	Alive	0	0	-
M16-18-1	18/11	<i>M. edulis</i>	40	Alive	0	0	-
OE33-19-1	19/04	<i>O. edulis</i>	50	Alive	0	0	-
SOE33-19-1	19/04	<i>C. gigas</i>	50	Alive	0	0	-



Sample ID explanation (e.g. SOE13-17-1):

Mollusc species (M=blue mussel, OE=flat oyster, SOE=Pacific oyster)

Zone (1, 2, 4, 5, 13, 16 or 33)

Year

Sampling no.

Sample ID	Year/month	Mollusc species	Animals in total	Alive/dead animals	Bonamia-positive animals	Percent with Bonamia	Bonamia +/-
OE1-16-A-1	16/09	<i>O. edulis</i>	38	Alive	0	0	-
SOE1-16-A-1	16/09	<i>C. gigas</i>	18	Alive	0	0	-
OE1-17-1	17/11	<i>O. edulis</i>	60	Alive	0	0	-
SOE1-17-1	17/11	<i>C. gigas</i>	29	Alive	0	0	-
OE2-16-1	16/11	<i>O. edulis</i>	40	Alive	1	2.5	+
OE2-17-1	17/11	<i>O. edulis</i>	60	Alive	2	3.3	+
OE2-19-1	19/03	<i>O. edulis</i>	60	Alive	0	0	-
SOE2-19-1	19/03	<i>C. gigas</i>	90	Alive	0	0	-
OE4-17-1	17/06	<i>O. edulis</i>	40	Alive	0	0	-
OE4-17-2	17/10	<i>O. edulis</i>	40	Alive	1	2.5	+
OE5-16-1	16/11	<i>O. edulis</i>	40	Alive	6	15	+
OE5-16-2	16/12	<i>O. edulis</i>	40	Alive	2	5	+
OE13-16-1	16/11	<i>O. edulis</i>	40	Alive	20	50	+
OE13-16-X	16/11	<i>O. edulis</i>	17	Dead	11	65	+
M13-16-1	16/11	<i>M. edulis</i>	40	Alive	0	0	-
SOE13-17-1	17/01	<i>C. gigas</i>	40	Alive	0	0	-
OE13-17-1	17/05	<i>O. edulis</i>	38	Alive	0	0	-
SOE13-17-2	17/11	<i>C. gigas</i>	40	Alive	0	0	-
OE13-17-2	17/11	<i>O. edulis</i>	40	Alive	0	0	-
M13-17-2	17/11	<i>M. edulis</i>	40	Alive	0	0	-
OE13-18-1	18/04	<i>O. edulis</i>	40	Alive	0	0	-
OE13-18-X	18/11	<i>O. edulis</i>	8	Dead	0	0	-
OE13-18-2	18/11	<i>O. edulis</i>	32	Alive	0	0	-
OE13-19-1	19/04	<i>O. edulis</i>	17	Moribund	0	0	-
OE13-19-2	19/05	<i>O. edulis</i>	1	Dead	1	100	+
OE16-18-1	18/11	<i>O. edulis</i>	31	Alive	0	0	-
OE16-18-2	18/11	<i>O. edulis</i>	40	Alive	0	0	-
M16-18-1	18/11	<i>M. edulis</i>	40	Alive	0	0	-
OE33-19-1	19/04	<i>O. edulis</i>	50	Alive	0	0	-
SOE33-19-1	19/04	<i>C. gigas</i>	50	Alive	0	0	-

Conclusions

- *Bonamia ostreae* in flat oysters from several zones in Limfjorden – low levels in wild flat oysters
- No higher mortalities in wild flat oyster stocks due to *Bonamia*
- No *Bonamia* in Pacific oysters and blue mussels sampled in close connection with the *Bonamia*-positive flat oysters
- No indication of Pacific oyster and blue mussel in Limfjorden being passive vectors (nor hosts) for the parasite

Acknowledgements

- Colleagues from DTU Aqua, Unit for Fish and Shellfish Diseases and Danish Shellfish Center



DTU

