

Supporting Information: Occasional sexual reproduction significantly affects the population structure of the widespread, predominantly asexually reproducing marine worm *Lineus sanguineus* (Nemertea: Piliidiophora)

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Supplementary Table 1 List of all included *Lineus sanguineus* specimens downloaded from. Sampling locality, region, number of specimens from one locality, GenBank accession numbers (COI & 16S), and reference are provided.

Locality	Region	No.	COI accession numbers	16S accession numbers	Reference
Anglesey, Wales	NE Atlantic	1	AJ436938	AJ436828	Thollesson and Norenburg (2003)
Crosby, Wales	NE Atlantic	1	GU392025	-	Strand and Sundberg (2011)
Rhos-on-Sea, Wales	NE Atlantic	1	KC812598	-	Strand et al. (2014)
Penmon, Wales	NE Atlantic	1	KC812599	-	Strand et al. (2014)
Dachangshan Dao, China	NW Pacific	3	KP213884- KP213886	-	Kang et al. (2015)
Dagong Dao, China	NW Pacific	26	KP213887- KP213912	-	Kang et al. (2015)
Daqin Dao, China	NW Pacific	4	KP213913- KP213916	-	Kang et al. (2015)
Cantabria, Spain	NE Atlantic	2	KP213917, KP213918	-	Kang et al. (2015)
Galicia, Spain	NE Atlantic	3	KP213919- KP213921	-	Kang et al. (2015)
Asturias, Spain	NE Atlantic	1	KP213922	-	Kang et al. (2015)
Lüshun, China	NW Pacific	7	KP213923- KP213926, KP213928- KP213930	-	Kang et al. (2015)
Lingshan Dao, China	NW Pacific	14	KP213931- KP213944	-	Kang et al. (2015)
Nanaimo, Canada	NE Pacific	29	KP213945- KP213973	-	Kang et al. (2015)
Nanchangshan Dao, China	NW Pacific	5	KP213974- KP213978	-	Kang et al. (2015)
Nuevo Gulf, Argentina	SW Atlantic	4	KP213979- KP213982	-	Kang et al. (2015)
Naozhou Dao, China	NW Pacific	1	KP213983	-	Kang et al. (2015)
Pingtian, China	NW Pacific	8	KP213984- KP213991	-	Kang et al. (2015)
Shengsi, China	NW Pacific	2	KP213992, KP213993	-	Kang et al. (2015)
Tofino, Canada	NE Pacific	13	KP213994- KP214006	-	Kang et al. (2015)
Catalonia, Spain	Mediterranean	5	KP214007- KP214011	-	Kang et al. (2015)
Crosby, Wales	NE Atlantic	8	KR606035, KR606037- KR606043	-	Kang et al. (2015)
Rhos-on-Sea, Wales	NE Atlantic	7	KR606036, KR606044- KR606049	-	Kang et al. (2015)
Coquimbo, Chile	SE Pacific	1	KR606050	-	Kang et al. (2015)
Totalillo, Chile	SE Pacific	2	KR606051, KR606052	-	Kang et al. (2015)
Punta Tumbes, Chile	SE Pacific	2	KR606053- KR606055	-	Kang et al. (2015)
Charleston, Oregon	NE Pacific	3	KU197836- KU197838	KU197552- KU197554	Hiebert (2016)
Charleston, Oregon	NE Pacific	1	-	KU197555	Hiebert (2016)

Crosby, Wales	NE Atlantic	7	KU840134, KU840237, KU840239, KU840240, KU840256, KU840257, KU840259	-	Sundberg et al. (2016)
Penmon, Wales	NE Atlantic	2	KU840236, KU840238	-	Sundberg et al. (2016)
Rhos-on-Sea, Wales	NE Atlantic	8	KU840262, KU840264- KU840270	-	Sundberg et al. (2016)
Roscoff, France	NE Atlantic	6	KX261775- KX261777, KX261781- KX261783	KX261723-KX261725, KX261730- KX261732	Ament-Velásquez et al. (2016)
Buenos Aires, Argentina	SW Atlantic	1	-	KX261729	Ament-Velásquez et al. (2016)
Buenos Aires, Argentina	SW Atlantic	4	MK047713-MK047716	MK067337- MK067340	Zattara et al. (2019)
Roscoff, France	NE Atlantic	1	MK047701	MK067325	Zattara et al. (2019)
Asturias, Spain	NE Atlantic	4	MK047704-MK047707	MK067328- MK067331	Zattara et al. (2019)
Kristineberg, Sweden	North Sea	1	MK047702	MK067326	Zattara et al. (2019)
Kaikoura, New Zealand	SW Pacific	1	MK047703	MK067327	Zattara et al. (2019)
Charleston, Oregon	NE Pacific	3	MK047708- MK047710	MK067332- MK067334	Zattara et al. (2019)
Nahant, Massachusetts	NW Atlantic	2	MK047711, MK047712	MK067335, MK067336	Zattara et al. (2019)
Wales	NE Atlantic	1	-	AF103761	Sundberg and Saur (1998)
unknown	-	4	-	EF124915, EF124916, EF178499, EF178500	

Supplementary Table 2 Bergen, winter conditions (9°C, 8h light). Number of specimens with head and number of fragments for the six months of the experiments are provided, in addition to the length of both regenerated specimens and fragments. The presence of gonads (G) at any time of the experiments is indicated (N = gonads absent, √ = gonads present, n.a. = not applicable).

No.	Month 1		Month 2		Month 3		Month 4		Month 5		Month 6	
	Length	G	Length	G	Length	G	Length	G	Length	G	Length	G
1	85	√	110	n.a.	20	√	88	√	115	N	114	N
2	150	√	65	n.a.	35	N	94	√	95	√	95	N
3	125	√	100	n.a.	44	N	22	N	93	N	492	√*
4	75	√	65	n.a.	64	N	110	√	70	N	112	N
5	75	√	90	n.a.	25	N	23	√	103	√	135	N
6	120	√	95	n.a.	68	N	119	√	80	√	169	√
7	100	√	97	n.a.	68	N	93	√	90	N	141	√
8	80	√	25	n.a.	80	√	112	N	114	N	115	N
9	90	√	38	n.a.	70	N	110	√	111	√	140	√
10	55	√	95	n.a.	95	√	60	√	104	√	120	√
11	80	√	90	n.a.	96	√	132	√	129	N	136	√
12	65	√	90	n.a.	95	√	75	N	81	√	81	N
13	70	√	89	n.a.	94	√	88	√	83	√	40	√
14	80	N	62	n.a.	83	√	95	√	38	√	133	√
15	80	N	80	n.a.	73	√	100	N	25	N	120	N
16	40	√	130	n.a.	1105	√	59	√	45	√	31	N
17	45	N	75	n.a.	110	√	105	√	36	N	50	√
18	90	√	52	n.a.	93	√	80	√	29	N	23	N
19	95	√	63	n.a.	99	√	13	N	19	N	32	N
20	40	N	53	n.a.					97	√	26	N
21			80	n.a.					9	N		
22			17	n.a.					9	√		
Fragments												
1			42	n.a.	77	√	5	N	54	√	29	√
2			11	n.a.	93	√	3	N	32	N	12	N
3			5	n.a.	40	√	1.2	N	21	N	18	N
4					37	N	1	N	23	N	20	N
5					6	N	35	N	18	√	15	N
6					4	√	7	N	25	N	9	N
7					10	N	17	N	30	√	3	N
8					9	N	25	N	15	√	15	N
9							13	√	7	N	18	N
10							40	N	26	√	8	N
11							23	N	17	N	20	N
12							33	√	11	N	8	N
13							35	N	8	N	15	N
14							558	√	8	N	3	N
15							30	N	5	N	4	N
16							5	N	4	N	6	N
17							5	N	5	√	<1	N
18							3	N	6	N	<1	N
19							<1	N	2	N	<1	N
20							<1	N	<1	N	4	N
21							<1	N	<1	N	6	N

22							<1	N			4	N
23							<1	N			2	N
24							<1	N			<1	√
25							<1	N			<1	√
26							<1	N			4	N
27							<1	N			5	N

Supplementary Table 3 Bergen, summer conditions (18°C, 16h light). Number of specimens with head and number of fragments for the six months of the experiments are provided, in addition to the length of both regenerated specimens and fragments. The presence of gonads (G) at any time of the experiments is indicated (N = gonads absent, √ = gonads present, n.a. = not applicable).

No.	Month 1		Month 2		Month 3		Month 4		Month 5		Month 6	
	Length	G	Length	G	Length	G	Length	G	Length	G	Length	G
1	120	√	120	n.a.	136	√	90	N	137	n.a.	141	√
2	105	√	120	n.a.	83	N	18	N	195	n.a.	210	√
3	80	√	122	n.a.	55	N	12	N	58	n.a.	131	√
4	80	√	87	n.a.	105	√	11	N	50	n.a.	142	√
5	60	√	97	n.a.	93	N	7	N	21	n.a.	132	√
6	105	N	84	n.a.	73	N	29	N	54	n.a.	138	√
7	60	N	104	n.a.	78	N	53	N	45	n.a.	90	N
8	60	N	86	n.a.	117	√	10	N	48	n.a.	96	N
9	60	N	145	n.a.	44	N	8	N	18	n.a.	116	N
10	75	N	132	n.a.	60	N	9	N	14	n.a.	81	√
11	70	√	57	n.a.	84	N	113	N	126	n.a.	67	N
12	65	√	47	n.a.	103	√	175	N	117	n.a.	62	N
13	75	√	68	n.a.	123	√	166	N	111	n.a.	52	N
14	55	√	55	n.a.	125	√	136	N	103	n.a.	47	N
15	80	√	96	n.a.	122	√	129	√	80	n.a.	75	N
16	100	√	134	n.a.	156	√	110	N	138	n.a.	50	N
17	80	√	118	n.a.	78	N	132	N	46	n.a.	37	N
18	70	√	106	n.a.	127	√	86	N	89	n.a.	32	N
19	10	√	80	n.a.	68	N	110	N	23	n.a.	42	N
20	60	N	99	n.a.	90	N	45	N	142	n.a.	41	N
21							87	N	45	n.a.	12	N
22							65	N	92	n.a.	13	N
23							51	N	71	n.a.	10	N
24							52	N			20	N
25							54	N			13	N
26							33	N			10	N
27							37	N			12	N
28							43	N			14	N
29											13	N
30											7	N
31											3	N
32											3	N
Fragments												
1					7	N	16	N	11	n.a.	21	N
2					7	N	5	N	12	n.a.		
3					10	N	10	N	12	n.a.		
4					10	N	20	N	10	n.a.		
5					8	N	5	N	10	n.a.		
6							9	N	5	n.a.		
7							5	N	3	n.a.		
8							6	N	9	n.a.		
9							5	N	7	n.a.		
10							5	N	7	n.a.		
11							4	N	4	n.a.		
12							3	N	5	n.a.		
13							6	N	2	n.a.		
14							5	N	3	n.a.		

15							12	N	2	n.a.		
16							4	N	22	n.a.		
17							3	N	8	n.a.		
18							30	N	3	n.a.		
19							45	N	1	n.a.		

Supplementary References

- Ament-Velásquez SL, Figuet E, Ballenghien M, Zattara EE, Norenburg JL, Fernández-Álvarez FA, Bierne J, Bierne N, Galtier N (2016) Population genomics of sexual and asexual lineages in fissiparous ribbon worms (Lineus, Nemertea): hybridization, polyploidy and the Meselson effect. *Mol Ecol* 25(14):3356–3369. <https://doi.org/10.1111/mec.13717>
- Hiebert TC (2016) New Nemertean Diversity Discovered in the Northeast Pacific, Using Surveys of Both Planktonic Larvae and Benthic Adults. Ph.D, University of Oregon
- Kang X-X, Fernández-Álvarez FÁ, Alfaya JEF, Machordom A, Strand M, Sundberg P, Sun S-C (2015) Species Diversity of *Ramphogordius sanguineus*/*Lineus ruber*-Like Nemerteans (Nemertea: Heteronemertea) and Geographic Distribution of *R. sanguineus*. *Zool Sci* 32(6):579–589. <https://doi.org/10.2108/zs150064>
- Strand M, Herrera-Bachiller A, Nygren A, Kånneby T (2014) A new nemertean species: what are the useful characters for ribbon worm descriptions? *J. Mar. Biol. Ass.* 94(2):317–330. <https://doi.org/10.1017/S002531541300146X>
- Strand M, Sundberg P (2011) A DNA-based description of a new nemertean (phylum Nemertea) species. *Mar Biol Res* 7(1):63–70. <https://doi.org/10.1080/17451001003713563>
- Sundberg P, Kvist S, Strand M (2016) Evaluating the Utility of Single-Locus DNA Barcoding for the Identification of Ribbon Worms (Phylum Nemertea). *PLOS ONE* 11(5):e0155541. <https://doi.org/10.1371/journal.pone.0155541>
- Sundberg P, Saur M (1998) Molecular phylogeny of some European heteronemertean (Nemertea) species and the monophyletic status of *Riseriellus*, *Lineus*, and *Micrura*. *Mol Phylogenet Evol* 10(3):271–280. <https://doi.org/10.1006/mpev.1998.0543>
- Thollesson M, Norenburg JL (2003) Ribbon worm relationships: a phylogeny of the phylum Nemertea. *Proc Royal Soc B* 270(1513):407–415. <https://doi.org/10.1098/rspb.2002.2254>
- Zattara EE, Fernandez-Alvarez FA, Hiebert TC, Bely AE, Norenburg JL (2019) A phylum-wide survey reveals multiple independent gains of head regeneration ability in Nemertea. *Proc Royal Soc B*:20182524. <https://doi.org/10.1098/rspb.2018.2524>