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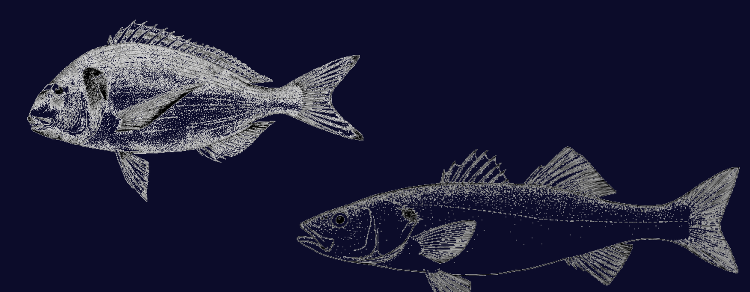
COMPARATIVE PARASITOLOGICAL STUDIES ON CULTURED GILTHEAD SEABREAM (*SPARUS AURATA*) AND EUROPEAN SEABASS (*DICENTRARCHUS LABRAX*) IN PORTUGUESE FISH FARMS



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INTRODUCTION : Portugal is a country surrounded by the sea and thus with a great aquaculture potential. The gilthead seabream (*Sparus aurata*) and European seabass (*Dicentrarchus labrax*) are two of the most important fish commonly produced in earth ponds, where the water is renewed with the tides. The gradual increase of production of fish resulted in parasitological outbreaks in this production system with significant effects on commercial production. Thus, focus has been placed on parasitic diseases in enterprises.

MATERIAL AND METHODS: Parasitological examinations were conducted on 271 fishes (138 seabass and 133 gilthead seabream) from semi-intensive fish farms from north, centre and south of Portugal in 2014 and 2023. Fish farms 1, 2 and 7 are supplied with brackish water by Sado estuary - Centre. Fish farms (3 and 8) and (4 and 9) are supplied with sea water from Ria de Alvor Lagoon and Ria Formosa respectively - South. Fish farms (5 and 6) and 10 are supplied with sea water from Ria de Aveiro Lagoon – North (Fig. 1).

The body surface (skin, fins) and the gills of the fish were examined for ectoparasites. Each gill arch was examined separately. The visceral cavity was opened and internal organs (external surfaces) scanned to nematodes. Biometrical measures were recorded. Prevalence, abundance and mean intensity of the infection were calculated (table 1 and 2.). Descriptive statistics were performed for each sampling site and compared the parasitic infection rates of gilthead seabream and European seabass from semi-intensive Portuguese fish farms in 2014 and 2023.

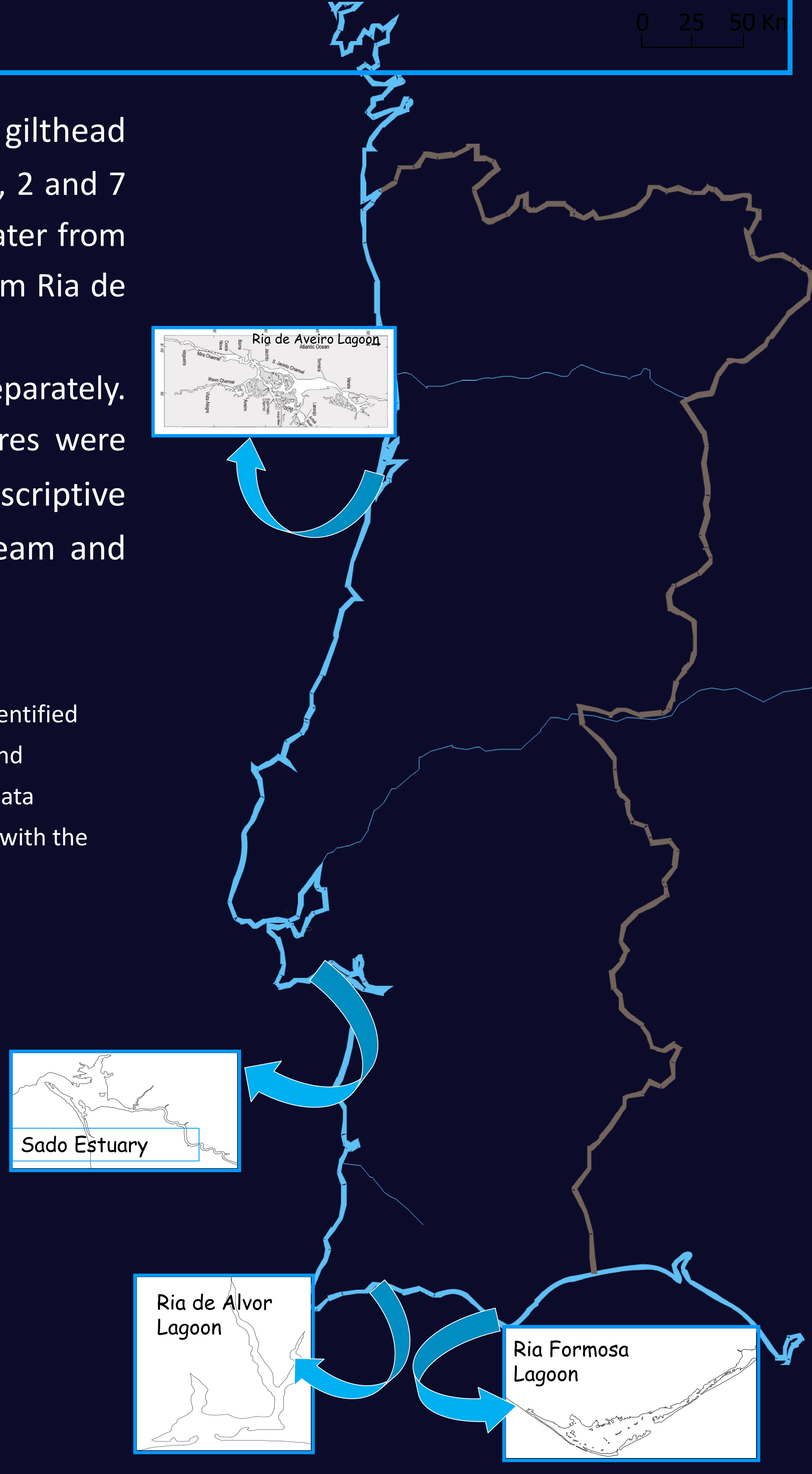


Fig. 1. Map of Portugal showing the fish farms location.

RESULTS

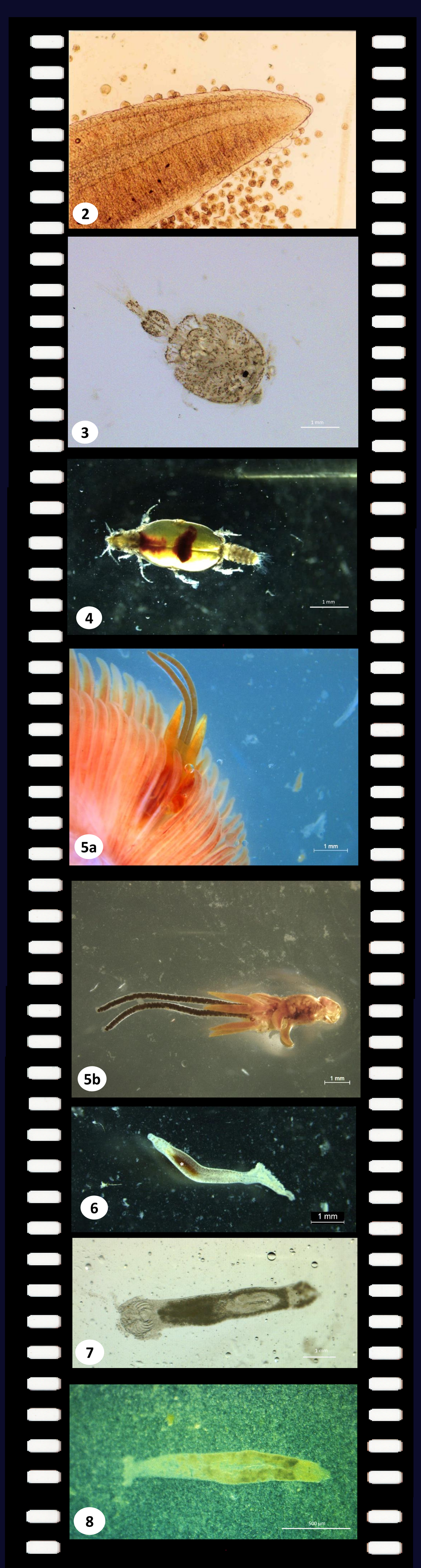
2014

Sampling site	Sampling date	Species	n	Weight (g)	Length (cm)	Found parasites	Parasites n=	Prevalence (%)	Abundance (± DP)	Intensity (± DP)
1 (Sado river)	12.02.2014	*Sparus aurata*	7	156.44 (±38.83)	21.52 (±1.69)	*Caligus sp.*	1	14	0.14 (±0.38)	1
		Dicentrarchus labrax	3	162.72 (±22.15)	26.2 (±1.06)	*Caligus sp.*	3	33	1 (±1.73)	3
						Lernanthropus kroyeri	3	33	1 (±1.73)	3
2 (Sado river)	12.02.2014	*Sparus aurata*	10	441.83 (±61.69)	27.85 (±5.18)	-	-	-	-	-
3 (Ria de Alvor Lagoon)	10.03.2014	*Dicentrarchus labrax*	12	314.73 (±39.74)	26.36 (±1.35)	*Diplectanum aequans*	449	83	37.4 (±44.1)	44.9 (±44.8)
						Trichodina sp.	-	8	-	-
4 (Ria Formosa lagoon)	10.03.2014	*Dicentrarchus labrax*	10	342.01 (±42.82)	30.44 (±0.97)	*Diplectanum aequans*	187	100	18.7 (±10.9)	18.7 (±10.9)
5 (Ria de Aveiro)	20.05.2014	*Dicentrarchus labrax*	13	94.73 (±18.83)	20.35(±1.41)	*Diplectanum aequans*	329	92	25.3 (±24.1)	27.4 (±23.8)
						Trichodina sp.	-	16	-	-
6 (Ria de Aveiro)	20.05.2014	*Dicentrarchus labrax*	10	300.42 (±81.27)	35.1(±19.63)	*Diplectanum aequans*	127	100	12.7 (±6.0)	12.7 (±6.0)
						Trichodina sp.	-	10	-	-
						Praniza	5	40	0.5 (±0.71)	1.25 (±0.5)
		Sparus aurata	9	231.65(±38.58)	25.23(±1.11)	Praniza	14	67	1.56 (±1.51)	2.33 (±1.21)
						Sparocotyle chrysophrii	1	11	0.11 (±0.33)	1
5 (Ria de Aveiro)	28.10.2014	*Dicentrarchus labrax*	16	210.90(±63.63)	27.03(±2.48)	*Diplectanum aequans*	448	100	28 (±21.1)	28 (±21.1)
6 (Ria de Aveiro)	28.10.2014	*Dicentrarchus labrax*	15	339.83(±85.20)	31.33(±3.30)	*Diplectanum aequans*	532	100	35.47 (±22.8)	35.47 (±22.8)
1 (Sado river)	9.12.2014	*Dicentrarchus labrax*	11	229.55(±46.36)	27.45(±1.53)	*Diplectanum aequans*	123	64	11.2 (±14.9)	17.6(±15.5)
						Praniza	1	9	0.09 (±0.30)	1
		Sparus aurata	10	311.37(±23.43)	26.36(±0.55)	*Dactylogyrus sp.*	77	100	7.7 (±2.87)	7.7 (±2.87)
2 (Sado river)	9.12.2014	*Dicentrarchus labrax*	2	317.24(±41.51)	34.2(±7.50)	*Diplectanum aequans*	2	50	1 (±1.41)	2
		Sparus aurata	10	488.89 (±37.0)	30.51 (±1.25)	*Dactylogyrus sp.*	96	100	9.6(±3.1)	9.6(±3.1)
						Sparocotyle chrysophrii	7	40	0.7 (±0.95)	1.75(±0.5)

2023

Sampling site	Sampling date	Species	n	Weight (g)	Length (cm)	Found parasites	Parasites *n* =	Prevalence (%)	Abundance (± DP)	Intensity [m-M]
1 (Sado river)	01.02.2023	*Sparus aurata*	20	451.54 ± 52.15	30.65 ± 1.15	*Dactylogyrus sp.*	46	60	2.30±2.72	3.83 [1-9]
						Sparocotyle chrysophrii	39	50	1.95±2.39	3.9 [2-7]
2 (Ria de Alvor)	27.02.2023	*Sparus aurata*	28	486.16 ± 4.84	30.72 ± 0.56	*Furnestinia echeneis*	602	89.29	21.5±23.31	24.08 [2-109]
	07.02.2023	*Dicentrarchus labrax*	27	264.42 ± 22.68	28.34 ± 0.91	*Diplectanum aequans*	3194	100	118.30±90.63	118.30 [9-388]
						Lernanthropus kroyeri	112	92.59	4.15±2.25	4.48 [1-9]
						Caligus sp.	13	40.74	0.48±0.64	1.18 [1-2]
3 (Ria Formosa)	16.01.2023	*Sparus aurata*	27	437.35 ± 67.83	30.53 ± 2.29	*Dactylogyrus sp.*	322	92,3	11,93±9.27	12,39 [1-46]
	06.04.2023	*Dicentrarchus labrax*	19	332.11 ± 93.08	31.51 ± 2.01	*Dactylogyrus sp.*	573	100	30.16±29.35	30.16 [5-122]
						Caligus sp.	42	78.95	2.21±1.79	2.8 [1-6]
						Praniza	1	5.23	0.05±0.23	1 [0-1]
4 (Ria de Aveiro)	11.04.2023	*Sparus aurata*	12	342.81 ± 60.32	28.02 ± 1.23	*Dactylogyrus sp.*	76	100	6.3±4.64	6.3 [1-15]
						Sparocotyle chrysophrii	33	75	2.75±4.09	3.67 [1-13]
						Caligus sp.	2	16.67	0.17±0.39	1 [0-1]
						Praniza	54	100	4.5±1.9	4.5 [2-8]

Table 1. Identified parasites and statistical data associated with the infections.



- ❑ Three classes of parasites were found attached to the gills of the European seabass or gilthead seabream (Figures 2 to 9)¶, namely the copepod crustaceans *Lernanthropus kroyeri, Caligus* sp. and the gnathiid isopod praniza; the protozoan *Trichodina* sp. and the monogenean species *Diplectanum aequans, Dactylogyrus* sp., *Sparocotyle chrysophrii* and *Lamellodiscus* (syn. *Furnestinia*) *echeneis.* No nematodes were identified in the samples. In the 2023 samples, two new species of Monogenea were identified in both gilthead seabream and European seabass: *Dactylogyrus* sp. was identified in European seabass from one fish farm with production of both fish species. *Lamellodiscus* (syn. *Furnestinia*) *echeneis* is a new specimen identified in gilthead seabream.
- ❑ There were no significant statistical differences between samples and sampling sites.

CONCLUSION: This paper addresses the concern that the presence of parasites in semi-intensive aquaculture systems can spread within and between semi-intensive fish farms and to wild fish by the seawater flow supplied by the tide. In these cases, infected fish farms should keep parasite density low at all times in order to reduce as much as possible the infection of neighbouring semi-intensive fish farms and wild fish. Three possible ways of infection of fish in these semi-intensive farms can be pointed out: a) infected fingerlings stocks were used to stock uninfected ponds; b) the characteristics of the production systems that make use of the tides for water renewal; c) the environmental conditions, namely the increase in water temperature that directly influences the parasite fauna of fishes. We must remain vigilant and monitor the evolution of the parasite infections.

LEGENDS:
Figure 2 – *Trichodina* sp. (Protozoa: Ciliophora: Trichodinidae) in the gills
Figure 3 – *Caligus* sp. (Copepoda: Caligidae)
Figure 4 – Praniza larvae of a Gnathiid (Isopoda, Gnathiidae)
Figure 5a – *Lernanthropus kroyeri*, parasitic Copepoda (Siphonostomatoidae, Lernanthropidae) attached horizontally to the gills
Figure 5b – Adult female specimen of the parasitic copepod, *Lernanthropus kroyeri*
Figure 6 – Adult female of the monogenean *Sparocotyle chrysophrii.* Presence of fertilised eggs within the uterous (*)
Figure 7 – The monogenean *Dactylogyrus* sp.
Figure 8 –*Diplectanum aequans* (Monogenea, Diplectanidae)
¶ The photos exhibited the morphological details of the parasites used to their identification

Acknowledgements
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