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The effect of different oxygen levels on the European sea bass health under conditions of acute stress

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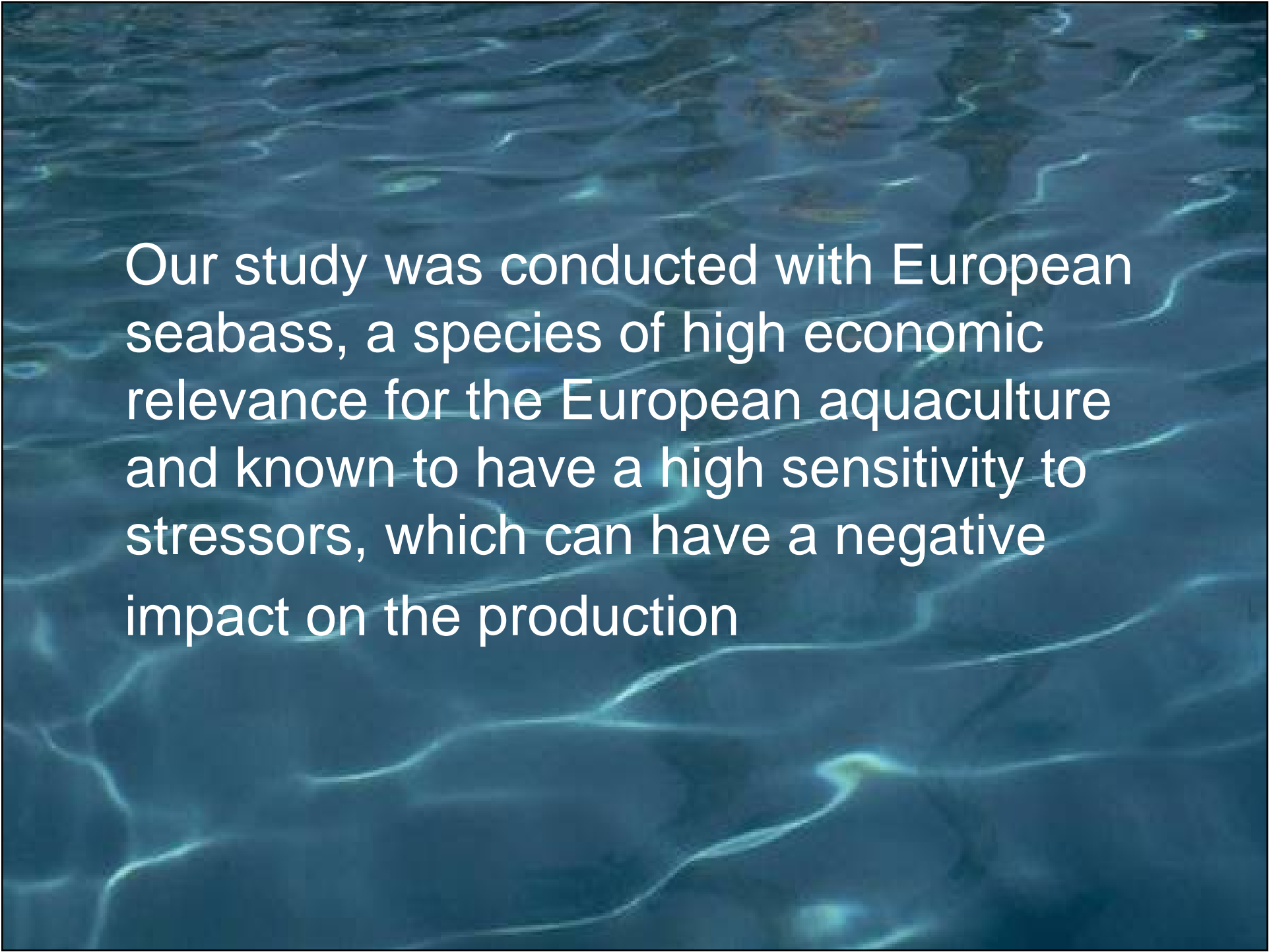
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- Low dissolved oxygen (DO) levels are major limiting water quality variable in intensive aquaculture
- Chronically low DO levels can reduce growth and feeding





Our study was conducted with European seabass, a species of high economic relevance for the European aquaculture and known to have a high sensitivity to stressors, which can have a negative impact on the production

- Three experimental groups of sea bass, with average weight of 110 grams, were reared for two months under different dissolved oxygen levels (2.2, 3.5 and 7 ppm O₂) but under the same sea water flow 30 l kg⁻¹ h⁻¹.



Conditions

Low oxygen 3.5 ppm		Lower oxygen 2.2ppm		Normal oxygen, 7ppm	
Tank 1B	Tank 3B	Tank 2B	Tank 4B	Tank 4A	Tank 1A
173,79	175,39	154,95	162,91	218,61	194,82

Tanks

Mean
weigh

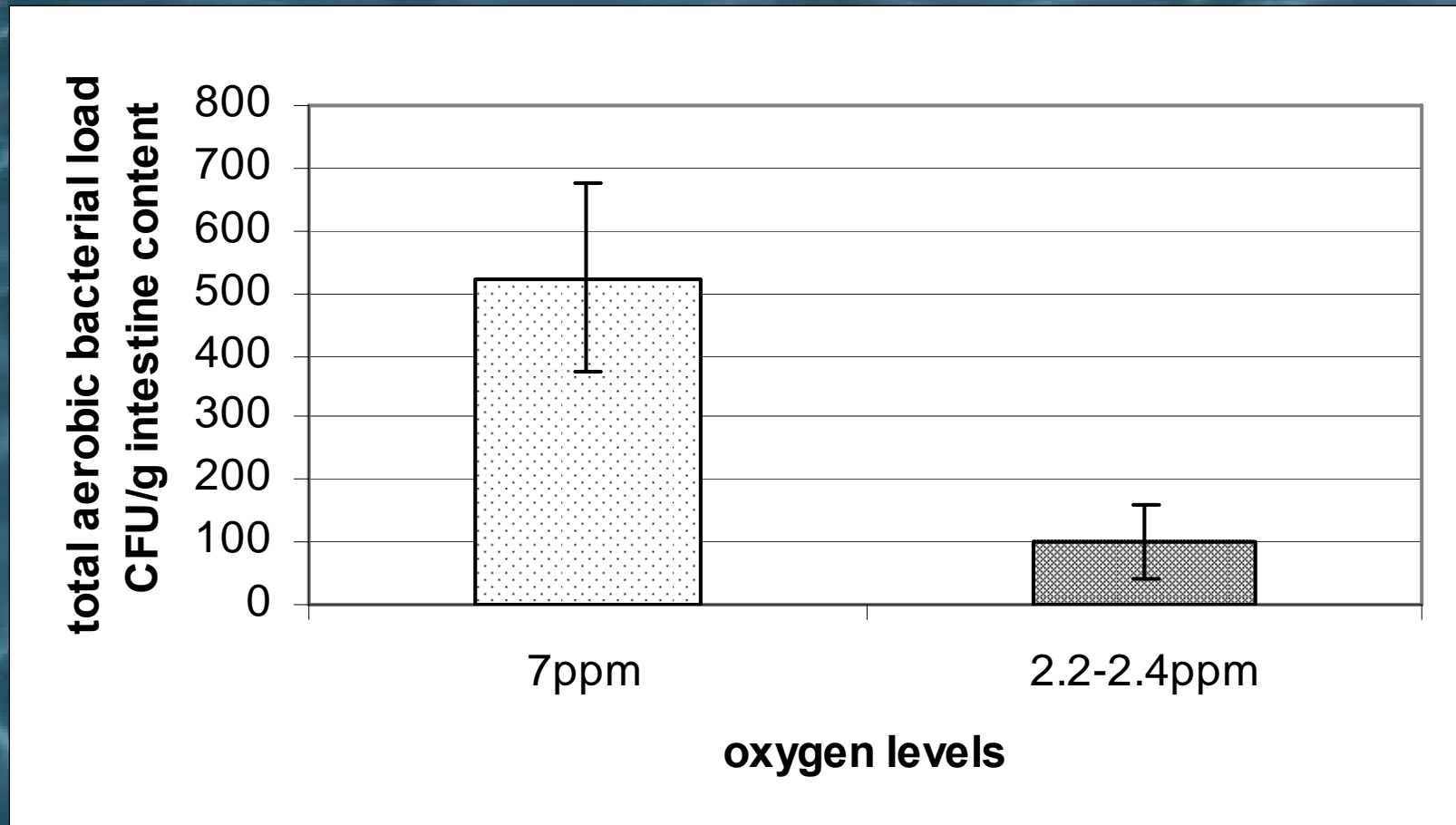


Quality of sea bass intestinal microflora reared under different oxygen levels before acute stress.

Tanks	Frequency of bacterial species isolated from intestinal microflora	
Low oxygen 2.2ppm	<i>Vibrio harveyi</i> 40%	<i>Vibrio costicola</i> 60%
Normal oxugen 7ppm	<i>Vibrio harveyi</i> 80%	<i>Vibrio costicola</i> 20%



The higher food intake in normal oxygen level compared with the lower level, resulted in an increase in the total aerobic intestinal microflora load of at least 5 times, compared to the lowest level.



Acute stress

At the end of rearing, an acute stress was performed in the form of **intense handling** by transferring sea bass to **small tanks** of 10 liters, for five minutes, without aeration and water renewal, and then **returned to their own rearing tanks**



Bacterial infestation after experimental acute stress									
	Oxygen levels-Transfer to the rearing tanks			Oxygen levels-Transfer to new tanks					
	2.2 ppm 15 fish 2B	3.5 ppm 15 fish 1B	7 ppm 15 fish 4A	2.2 ppm 10 fish (5+5)		3.5 ppm 10 fish (5+5)		7 ppm 10 fish (5+5)	
				Tank 1	Tank 2	Tank 1	Tank 2	Tank 1	Tank 2
stress	0	0	0	1	1	0	0	0	0
Day 1	0	0	0	1*	1*	0	0	0	0
Day 2	0	0	0	1*	1*	0	0	0	0
Day 3	0	1*	2*	0	1*	1*	1*	1*	1*
Day 4		1*	1*	0	0	0	0	1*	1*
Days 5th- 14th	0	0	1*	0	0	0	0	0	0
% infestation	0	13.3	26.6	60	80	20	20	40	40
%mean infestation	0	13.3	26.6	70		20		40	

* *Vibrio harveyi* isolation from head kidney



Conclusions

- Low level of DO does not cause increase to the total aerobic bacterial load of intestinal microflora compared to the normal level.
- **Higher intake of food** at the normal level of DO compared to the lower level DO had probably as effect the **increase of total aerobic bacterial load at least 5 times**.
- Hi frequency (80%) of *Vibrio harveyi* in the sea bass intestinal microflora of normal level DO might play a role to the higher percentage of bacterial infection (26,6%) after acute stress in case of returning of fish in the rearing tanks.
- The **additional stress** due to change of environment (tank) caused an increase in the average bacterial infection of the bass at all levels of oxygen, especially in the group of lowest oxygen.
- **Higher % of bacterial infection at the normal level DO** –higher weigh of sea bass –**higher population density during stress**.
- The **additional stress** due to change of environment (tank) caused an increase in the average bacterial infection of the bass at all levels of oxygen, especially in the group of lowest oxygen.

Discussion

- Acute stress is often measured as a transient change in metabolic activities in an attempt to counteract the stress event
- However assessing chronic stress in fish is more difficult than assessing acute stress
- One way to overcome this problem is to impose an acute stress after fish are exposed to chronic stress.
- As chronic stressors can deplete the fishes' energy reserves, a differential stress response can be expected when fish are exposed to an acute stress.
- Prevention of chronic stress exposure is of great relevance in aquaculture due to its negative impact on welfare and performance of farmed fish

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Thank you very much!

