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— Bogor Indonesia —



FISH BEHAVIOR CHARACTERIZATION WITH AN RGB-LED INTENSITY BASED ON PULSE WIDTH MODULATION (PWM) SYSTEM IN FIXED LIFT NET

PRESENTED BY:

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- Introduction
- Methods
- Results & Discussions
- Conclusion

Design of RGB-LED

Design of RGB-LED
With the PWM system
based on *microcontroller*

Characterization of
RGB-LED in the air
and underwater
medium

The light
Intensity of RGB-LED
for applied in the
laboratory and field test

Experiments of RGB-
LED in the lift net

light
Intensity of RGB-
LED

Fish behavior by light
Intensity of RGB-LED

The technology of
RGB-LED test

The effectiveness
light intensity of RGB-
LED for fixed lift net

The specification
system of light
Intensity in lift net

The light
Intensity of RGB-LED
for hauling process

The LED-RGB
monitoring

Sumardi et al.
2018

Sumardi et al.
dan Sugandi et al.
2019

2019 - 2020

- Introduction
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The measurement of fixed lift net: 10 x 10 m of Length and Width
(Rudin *et al.* 2017)



Banten Bay



Fatmawati, 2019

7 m in water depth
(Susanto 2019)

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Issues

Application of the Red-Green-Blue Light-Emitting Diode (RGB-LED) based on Pulse Width Modulation (PWM) with a microcontroller system is considered as a possible measure for effectiveness in the fixed lift net.

The effectiveness of a fishing lamp can be determined from how fish attract the light and gather in the zone of catching lift net that can be monitored using fish behavior monitoring

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The Purpose of this study:

✓

To investigate the light intensity of RGB-LED

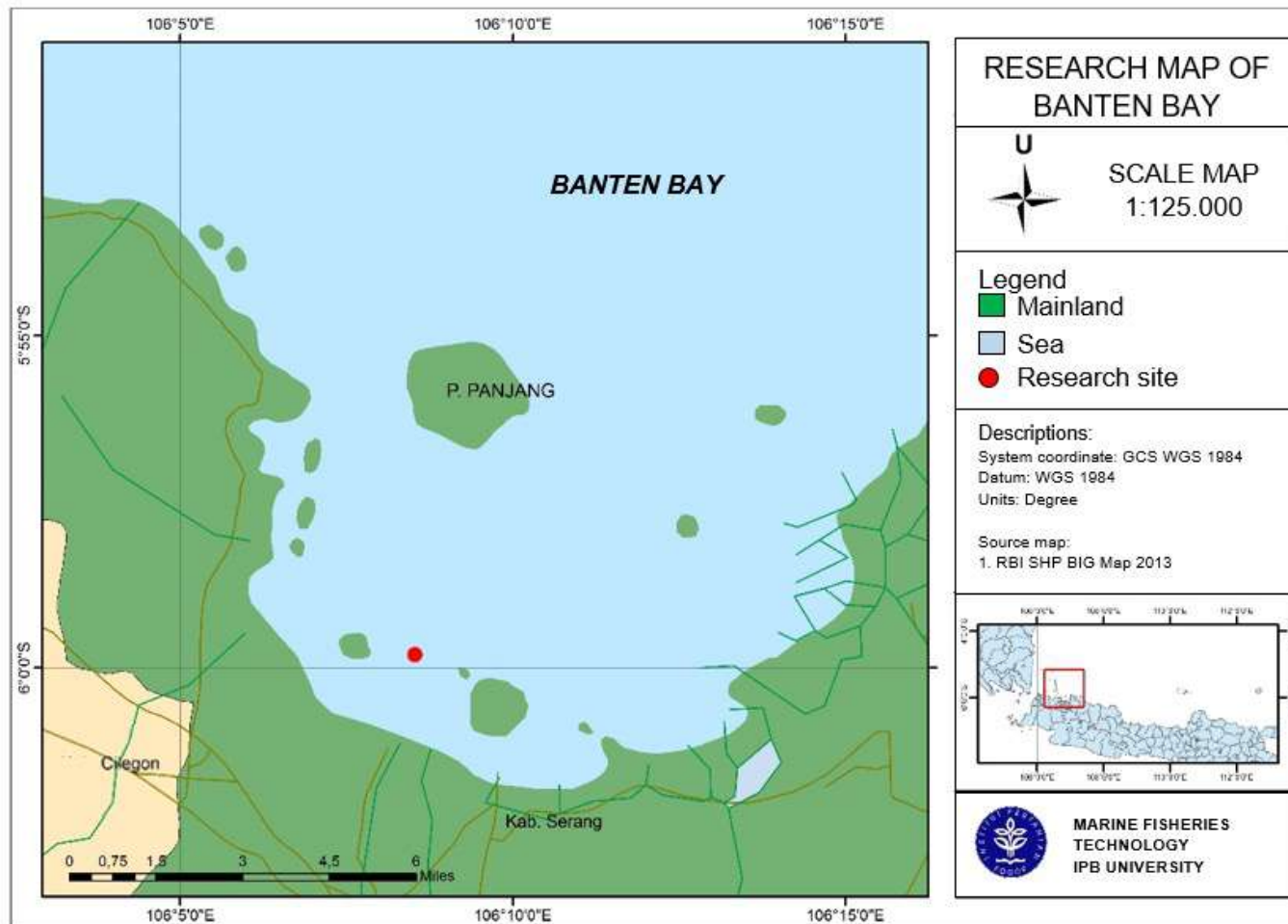
✓

The distribution of fish behavior in the fixed lift net



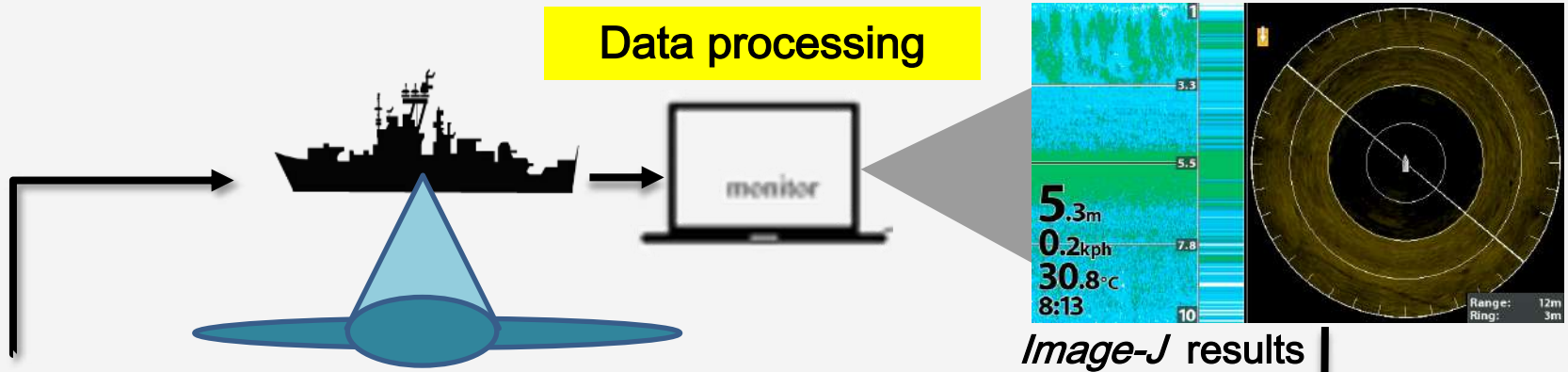
- Introduction
- **Methods**
- Results & Discussions
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Experiments were conducted on December 2019 at Banten Bay, West Java with the coordinate position of $5^{\circ}58'44''$ LS and $106^{\circ}10'15''$ BT



2 The proportion of schooling fish behavior

Data processing



Side imaging sonar simulation

Data analysis

$$P = \left(1 \frac{n}{N}\right) \times 100 \%$$

where:

n = representing white image

N = total of image

P = total are of proportion

Alhosseinni
et al.

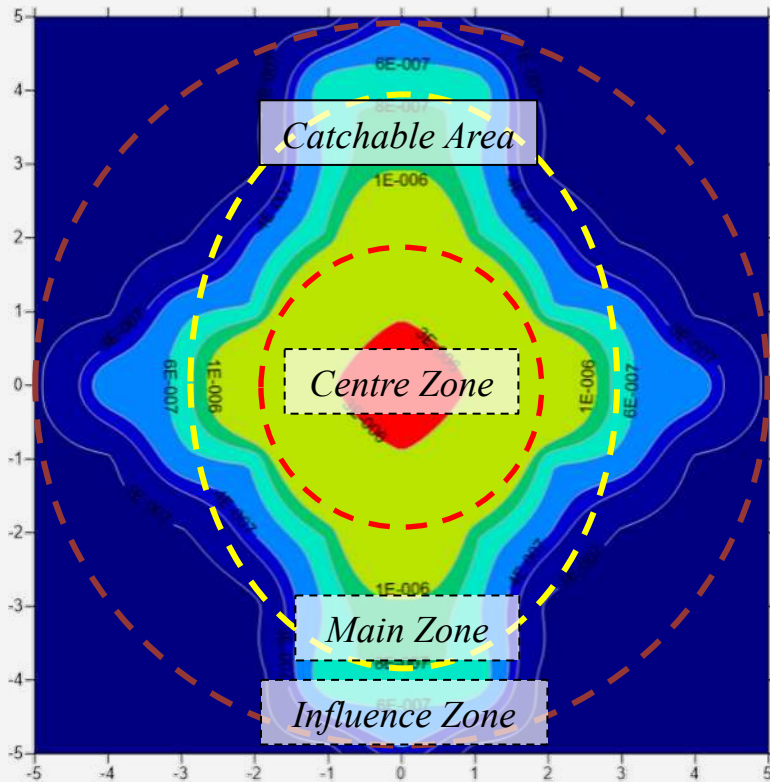
Data collection

- Introduction
- Methods
- Results & Discussions
- Conclusion

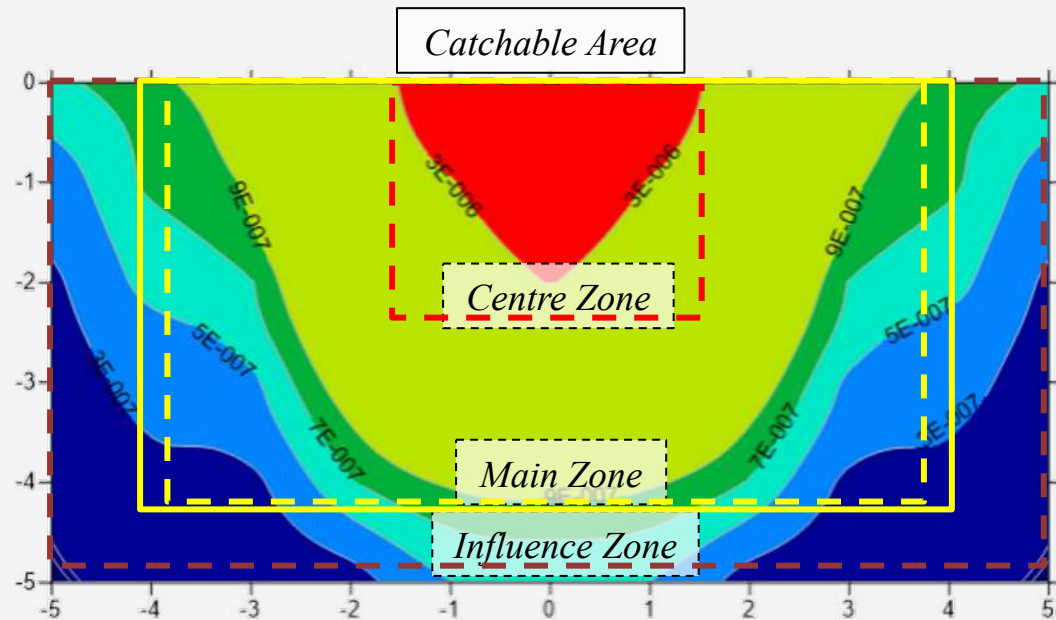
1

The light intensity of RGB-LED

Horizontal



Vertical



1

The light intensity of RGB-LED

Classification of light fishing areas in the fixed lift net

No	PWM/w/m ²	<i>Centre Zone (C Z)</i> meter		<i>Main Zone (M Z)</i> meter		<i>Influence Zone (I Z)</i> meter	
		V	H	V	H	V	H
1	Kondisi Awal	0-1	0-2	2-3	3-4	4-5	5
2	250-0/48,7	0-1	0-1	2-3	3-4	4-5	5
3	250-95/40,2	0-1	0-1	2-3	3	4-5	4-5
4	250-20/38,8	0-1	0-1	1-2	2-3	3-5	4-5
5	250-5/37,2	0-1	0-1	2	2	3-5	3-5
7	<i>Hauling</i> 150	0-1	0-2	2-3	3-4	5	5

- Introduction
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1

The light intensity of RGB-LED

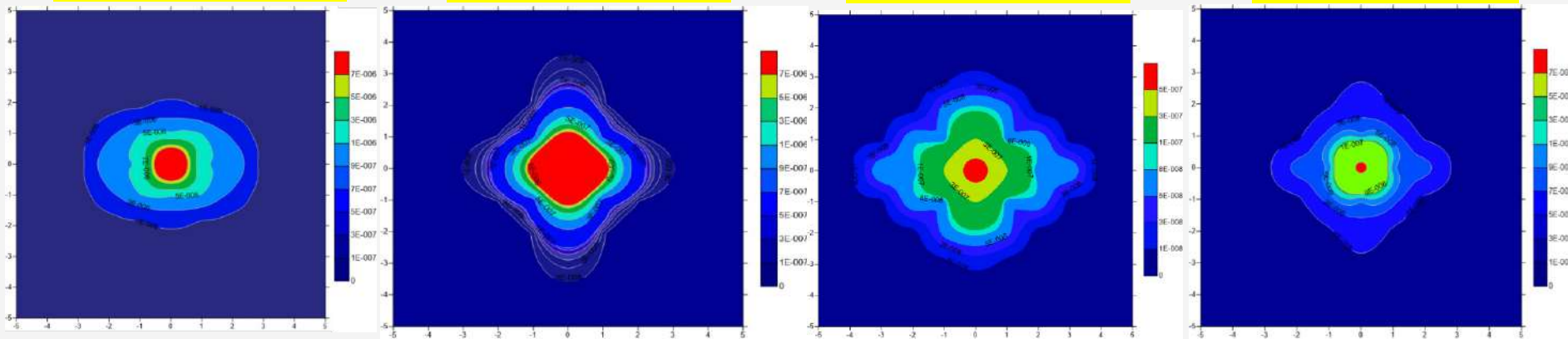
Setting/ 250 PWM

Hauling/ 95 PWM

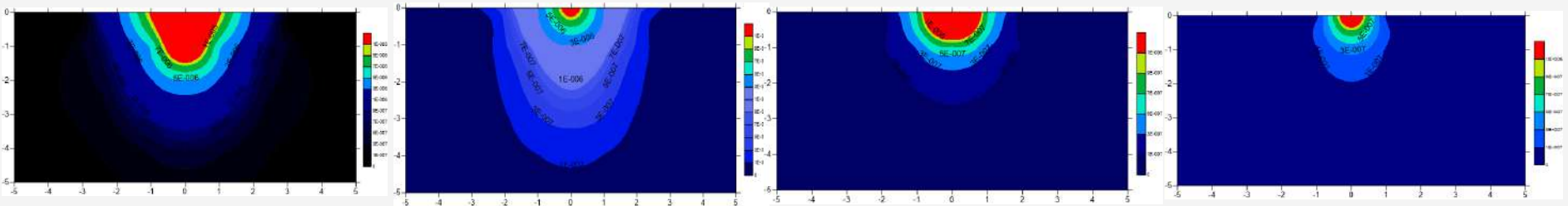
Hauling/ 20 PWM

Hauling/ 5 PWM

HORIZONTAL



VERTICAL



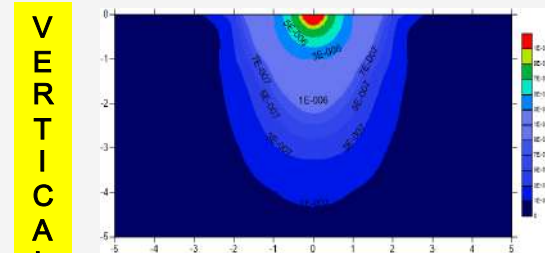
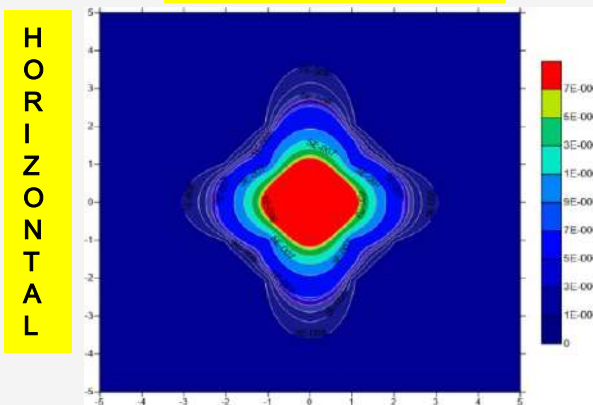
Time observation
(10-90 minutes)

Time observation (100-120 minutes)

1

The light intensity of RGB-LED

Hauling/ 95 PWM



**Time observation
(100-120 minutes)**

The light intensity RGB-LED with PWM was designed in such a way that the difference in the distribution light intensity in all mediums is minimized

The specific light intensity had a small distribution in water, approximately 120°

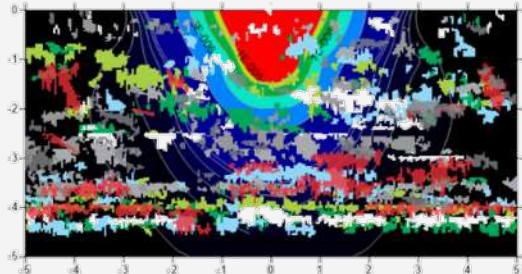
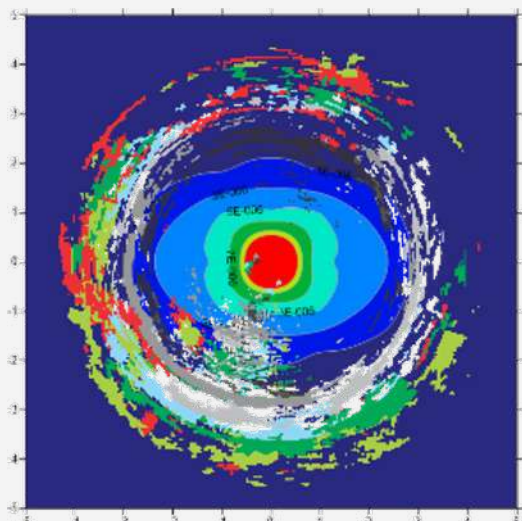
A small distribution could increase the concentration of light intensity at a certain point [Kehayias et al, Sumardi et al]

the distribution light intensity RGB-LED with PWM could increase the fish concentrated in a certain radius during operating fixed lift net

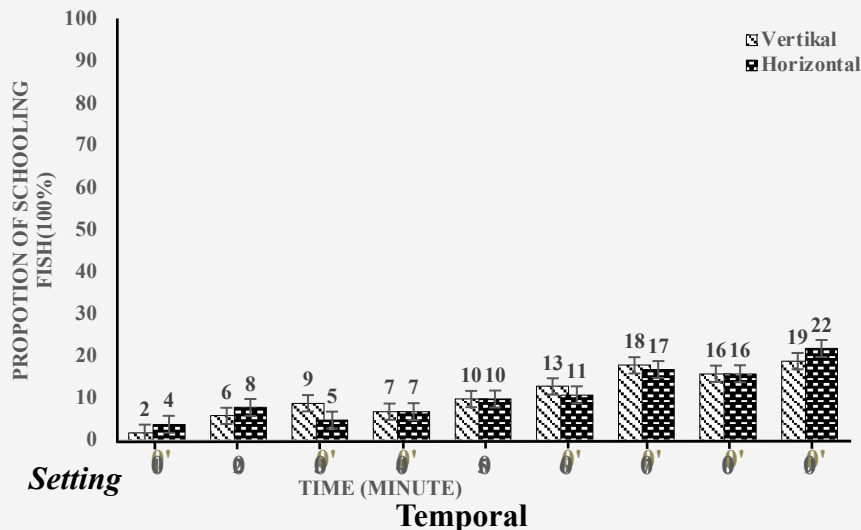
2

The distribution of fish behavior in the lift net

Setting/ 250 PWM



Time observation
(10-90 minutes)



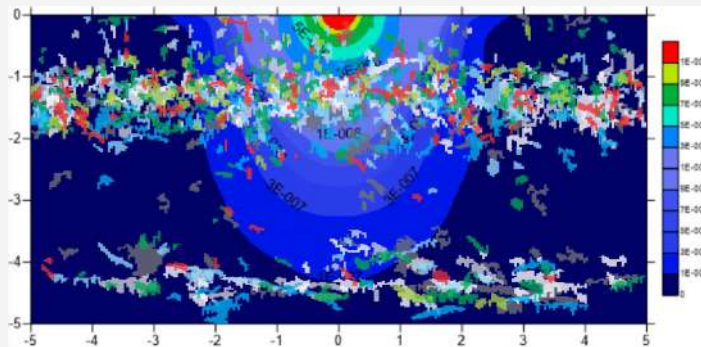
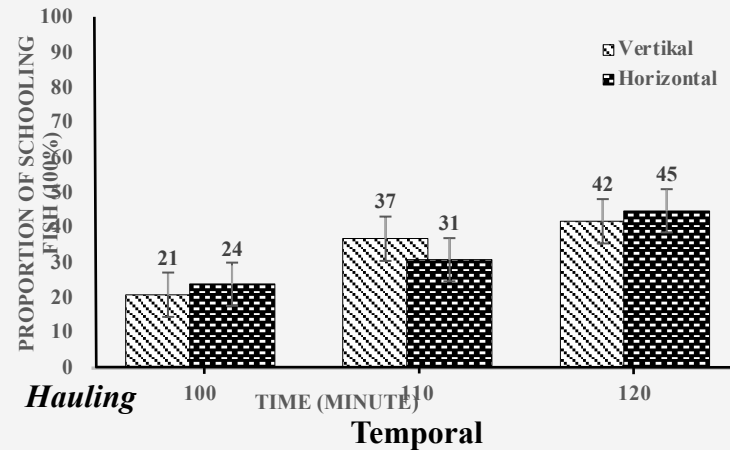
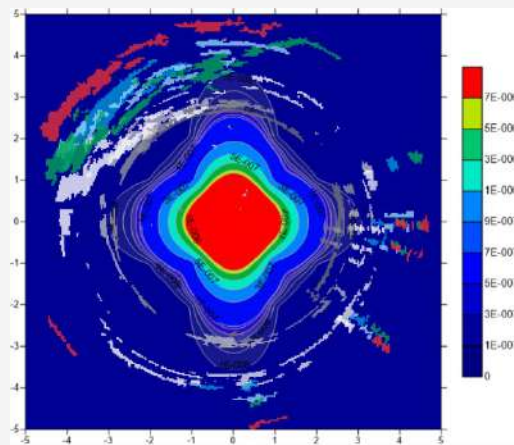
Setting	Zone	Temporal			Spatial		
		10'	20'	30'	40'	50'	60'
CA	C Z	0	12	13	16	17	29
	M Z	35	48	34	35	37	32
	I Z	65	40	53	49	46	39
CA	C Z	17	51	21	25	23	28
	M Z	40	49	41	36	42	52
	I Z	43	0	38	39	35	20
CA	C Z	25	22	12	24	20	27
	M Z	55	38	66	40	45	43
	I Z	20	40	22	36	35	30

C A: Catchable area
C Z: Centre zone
M Z: Main zone
I Z: Influence zone
Time: 10',
20',30',40',50',60', 70', 80',
90'

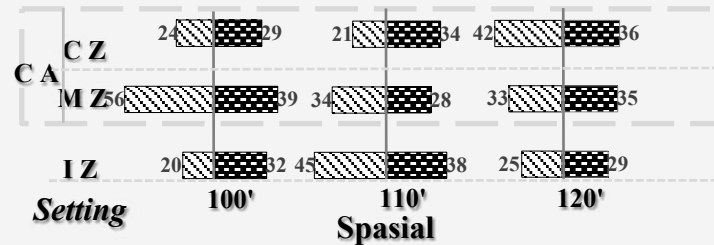
2

The distribution of fish behavior in the lift net

Hauling/95 PWM



Time observation
(100-120 minutes)

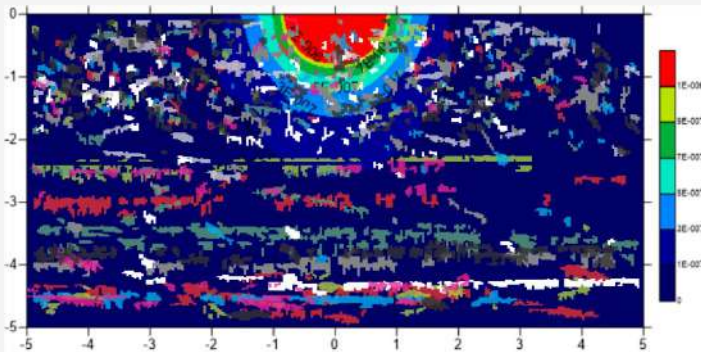
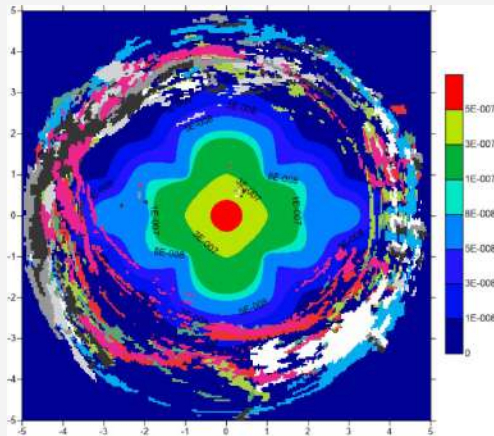


C A: Catchable area
C Z: Centre zone
M Z: Main zone
I Z: Influence zone
Time: 100',110',120'

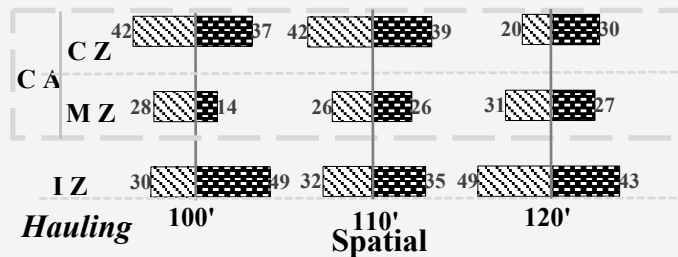
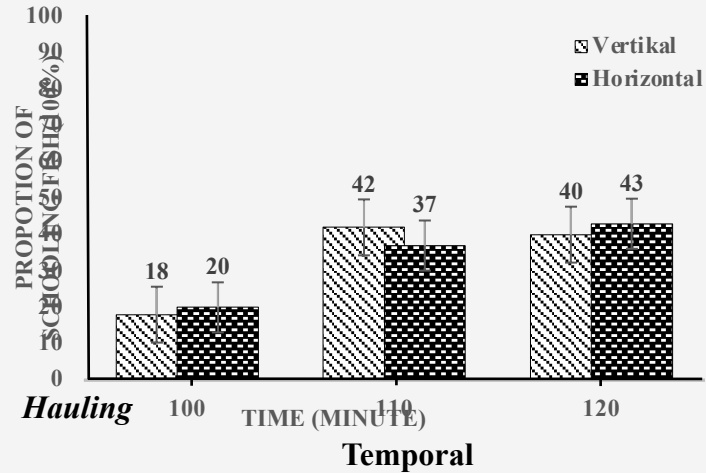
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The distribution of fish behavior in the lift net

Hauling/20 PWM



**Time observation
(100-120 minutes)**

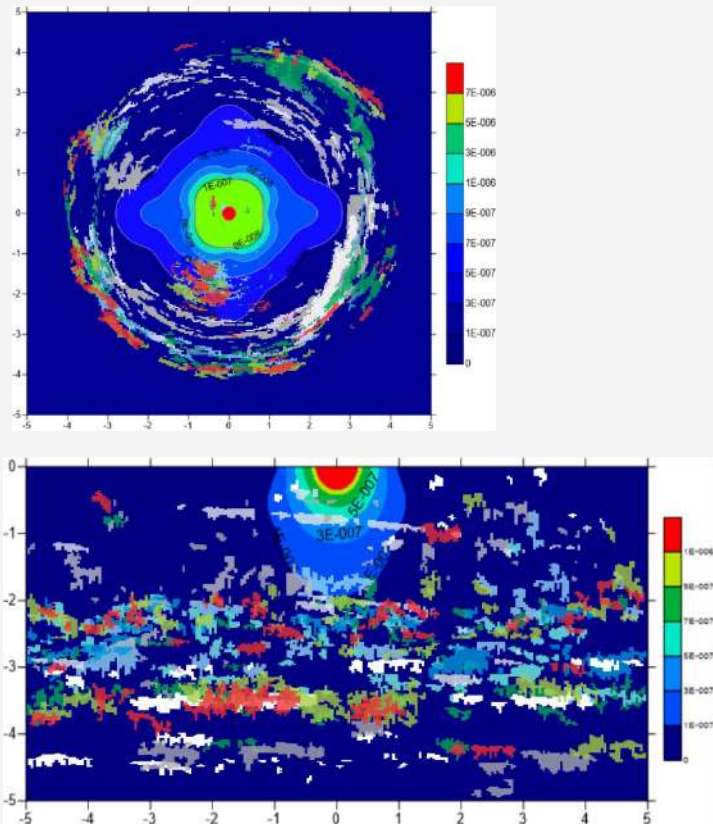


C A: Catchable area
C Z: Centre zone
M Z: Main zone
I Z: Influence zone
Time: 100', 110', 120'

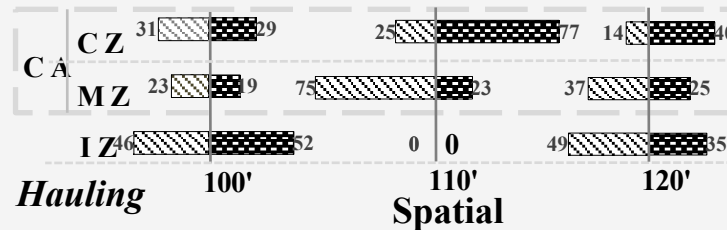
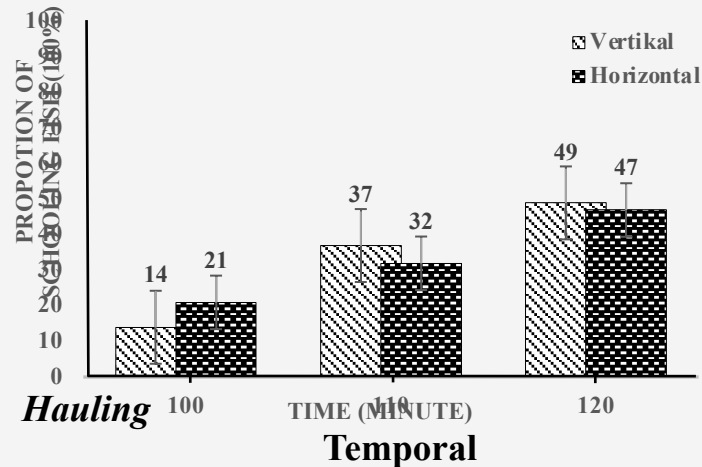
2

The distribution of fish behavior in the lift net

Hauling/5 PWM



Time observation (100-120 minutes)



C A: Catchable area
C Z: Centre zone
M Z: Main zone
I Z: Influence zone
Time: 100', 110', 120'

- Introduction
- Methods
- Results & Discussions
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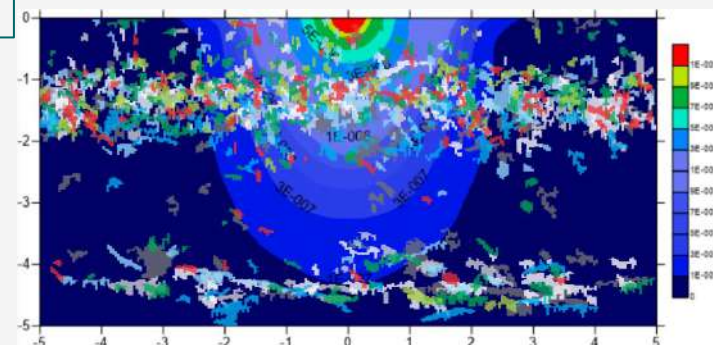
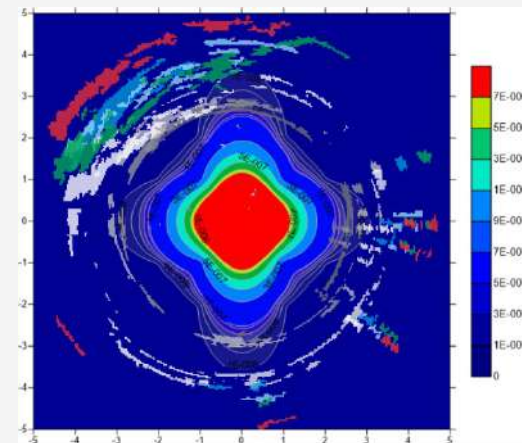
2

The distribution of fish behavior in the lift net

The light intensity RGB-LED with 95 PWM was useful, which induces good light adaptation and relatively constant

The target fish provides a faster and more consistent adaptation response. so the behavior of the fish that occurs is relatively constant (Jolles et al; Ford et al)

Hauling/95 PWM



Time observation (100-120 minutes)

- The 250 PWM had dispersed intensity distance, whereas the 95 PWM, 20 PWM, and 5 PWM had focused more onto the front

- The schooling fish was dominated in the main zone ($1 \times 10^{-6} \text{ W cm}^{-2}$ - $3 \times 10^{-7} \text{ W cm}^{-2}$). The highest value light intensity was found on 95 PWM with accounted for 48.67% because the fish schooling adaptation is relatively consistent



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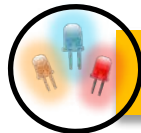
Thank You



Photo by : Seaspeard



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Introduction



Methods



Issues



Results & Discussion



Aims



Conclusion



Photo by : Seaspeard