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Original Article

Influence of continuous illumination at increasing light intensities on the growth and survival of early stage Snubnose Pompano, *Trachinotus blochii*

Marlon S. Alejos*[1,2], Fiona L. Pedroso[3], Valeriano L. Corre Jr.[2], Maximino R. Abejo III[4], Martha Joyce G. Garciano[4], Ryan V. Fabay[5]

[1]School of Agri-Fisheries, Department of Fisheries, Biliran Province State University, Biliran, Biliran, Philippines.
[2]Institute of Aquaculture, College of Fisheries and Ocean Sciences, University of the Philippine Visayas, Miagao, Iloilo, Philippines.
[3]School of Marine Fisheries and Technology, Mindanao State University at Naawan, Misamis Oriental, Philippines.
[4]Center for Limnological, Aquatic Biodiversity and Mariculture Studies, Cebu Technological University San Francisco Campus, Cebu, Philippines.
[5]College of Fisheries, Mindanao State University-Maguindanao Campus, Datu Odin Sinsuat, Maguindanao 9601, Philippines.

Abstract: The study investigated the influence of continuous illumination at increasing light intensities on feeding, growth, and survival of early-stage snubnose pompano, *Trachinotus blochii*, larvae from 1 to 10 days post-hatching (DPH). Fish larvae were exposed to 5 treatments with 3 replicates [T_1 - natural indoor 12 hours light (hL): 12 hours dark (hD), T_2 - 300-500 lux (lx), T_3 - 300-1000 lx, T_4 - 300-2000 lx, and T_5 - 300-3000 lx]. Newly hatched larvae were stocked at 15 ind. /L density and fed with enriched rotifers (*Brachionus plicatilis*; 50-250 µm) at 30 ind. /ml starting from 2 DPH. The number of rotifers in the digestive organ, feeding incidence, and total length of larvae were examined at 3-hour intervals from 0400 to 2200 hours (H) on 3 DPH, at 6-hour intervals from 4 to 5 DPH, and once on 8 DPH at 1000 H. The results justified that snubnose pompano was a visual feeder and exhibited diel rhythm within 24 hours of light, while larvae at natural photoperiod usually underwent diurnal rhythms. However, changing light intensity conditions from low to high levels altered the feeding behavior of the fish larvae. Better and consistent feeding and survival of larvae were obtained at moderate continuous illumination at increasing light intensities (300-500 lx). While higher light treatments (300-1000, 300-2000) can yield more remarkable fish growth, they adversely affect larval survival after 5 DPH. In conclusion, moderate continuous illumination (300–500 lx) promotes consistent feeding, resulting in a positive growth response and improved survival in early-stage snub nose pompano.

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Introduction

The snubnose pompano, *Trachinotus blochii*, is a highly valued aquaculture species in the Asia Pacific region (Haryanto et al., 2018; Mapunda et al., 2021). In the Philippines, the demand for pompano aquaculture is increasing domestically and in export markets. However, the supply of fish fingerlings for aquaculture faces challenges, particularly in the hatchery phase, where low survival rates have been observed (Alejos and Serrano Jr., 2018, 2024), leading to a bottleneck in global output (Mapunda et al., 2021).

Different factors such as nutrition, hormones, stocking density, and physical and chemical factors affect the growth and development of fish (Falahatkar et al., 2019). Light is one significant physical factor affecting aquaculture species' growth performance (Lundova et al., 2019). Understanding how light affects fish can enhance their survival, development, and growth, ultimately increasing the potential of aquaculture (Badruzzaman et al., 2021).

Illumination is an influential environmental factor that can positively and negatively impact fish (Ruchin, 2020). Continuous illumination (24 L: 0 D) has been shown to increase growth performance in zebrafish, *Danio rerio* (Abdollahpour et al., 2020), salmon, *Salmo salar* (Churova et al., 2019), and Nile tilapia, *Oreochromis niloticus* (Malambugi et al., 2020). It leads to increased growth through higher feed intake, improved feed conversion ratio, specific growth rate,

*Correspondence: Marlon S. Alejos
E-mail: marlonalejos33@gmail.com
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Table 1. Continuous illumination at increasing light intensities in between days.

<table>
<tr><th rowspan="2">Treatment</th><th colspan="10">Day post-hatching (DPH)</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th></tr>
<tr><td>T1 (control)</td><td colspan="10">Indoor-Natural photoperiod (12 hL:12 hD)</td></tr>
<tr><td>T2 (300-500lx)</td><td colspan="7">300 lx</td><td colspan="3">500 lx</td></tr>
<tr><td>T3 (300-1000lx)</td><td colspan="4">300 lx</td><td colspan="3">500lx</td><td colspan="3">1000 lx</td></tr>
<tr><td>T4 (300-2000lx)</td><td colspan="2">300 lx</td><td colspan="2">500 lx</td><td colspan="3">1000lx</td><td colspan="3">2000 lx</td></tr>
<tr><td>T5 (300-3000lx)</td><td>300 lx</td><td>500 lx</td><td colspan="2">1000 lx</td><td colspan="3">2000 lx</td><td colspan="3">3000 lx</td></tr>
</table>

and increased survival (Al-Emran et al., 2024). However, continuous illumination has also been found to harm the growth of ruho, *Labeo rohita* (Shahjahan et al., 2020), salmon, *Salmo salar* (Churova et al., 2019), and Nile tilapia *Oreochromis niloticus* (Alejos et al., 2019). For *T. blochii*, the fish larvae are particularly responsive to the application of artificial light systems and extended day length (photoperiod). Continuous illumination has influenced the feeding, growth, and survival of early-stage *T. blochii* larvae. However, determining the optimal light intensity for early-stage larvae remains challenging due to low survival rates (16.22%; Alejos and Serrano Jr., 2018, 2024). Another study found that increasing sunlight intensity under natural photoperiods can reduce growth and cause delays in metamorphosis for *T. blochii* larvae (Jayakumar et al., 2018).

Optimizing rearing conditions is crucial, considering the response of *T. blochii* to light and extended photoperiods. Early-stage fish larvae may require continuous illumination under specific light intensity ranges. The effects of continuous illumination at increasing light intensities through an artificial system on fish larvae remain unknown. Thus, the present study aimed to determine its influence on feeding, early survival, and growth of early-stage snubnose pompano, *T. blochii*.

Materials and Methods

The study was conducted at the Southeast Asian Fisheries Development Center Aquaculture Department (SEAFDEC/AQD) in Tigbauan, Iloilo, Philippines. Early-stage snubnose pompano, *T. blochii* larvae, produced based on Alejos and Serrano Jr. (2018, 2024), were subjected to five treatments with three replicates (Table 1) from 1 to 10 days post-hatching (DPH). The experimental design followed a Completely Randomized Design (CRD), with treatments randomly assigned to 15 tanks (200 L capacity). Incandescent bulbs (Firefly, frosted standard, 100 watts, 230V 60Hz, E27 medium base) were positioned 30 cm above the water surface for the 300-500 lx and 300-1000 lx treatments, and 80 cm for the 300-2000 lx and 300-3000 lx treatments. Each tank was completely covered with black sacks to eliminate the influence of background light. Light intensity was controlled using a dimmer switch (Omni, model WDM-501-PK, 500 watts). The control treatment involved tanks covered with transparent plastic cellophane and maintained under an indoor natural photoperiod of 12 hours light and 12 hours dark. Surface light intensity in the various treatments was measured using a light meter (EXTECH Instruments, EA30-EasyView™ Wide Range Light Meter). Natural light intensity in the control treatment was measured thrice daily (0900, 1200, and 1500 H).

Fish larval culture and the sampling method for data collection followed the procedures outlined by Alejos and Serrano Jr. (2018, 2024). Data were analyzed using SPSS version 20 software, and One-way ANOVA was applied. In cases where a significant difference between treatment means was observed, orthogonal contrast was utilized with a significance level set at $P<0.05$.

Results and Discussions

The impact of continuous illumination at increasing light intensities was evident in the feeding incidence and food intake of the larvae during both day and night phases (Tables 2, 3). Significant differences were observed at 1900 H 3 DPH, with larvae exposed to 300-500 lx displaying the highest feeding incidence (Table 2). However, no significant differences in larval food intake were identified from 0400 to 2200

Table 2. Changes in the feeding incidence (±SE) of early-stage snubnose pompano larvae under continuous illumination at increasing light intensities.

Treatments	3 DPH						
	0400 H	0700 H	1000 H	1300 H	1600 H	1900 H	2200 H
Control	0.00±0.00	3.33±3.33	23.33±3.33	40.00±10.00	30.00±11.54	0.00±00.00^{a}	0.00±0.00
300-500 lx	0.00±0.00	6.67±6.67	16.67±8.82	40.00±10.00	36.67±3.33	60.00±11.55^{c}	26.67±21.86
300-1000 lx	3.33±3.33	16.67±6.67	33.33±8.82	36.67±14.53	46.67±6.67	43.33±17.64^{bc}	23.33±14.52
300-2000 lx	3.33±3.33	3.33±3.33	20.00±0.00	16.67±3.333	20.00±15.27	10.00±0.00^{ab}	6.67±3.33
300-3000 lx	10.00±5.77	10.00±5.77	36.67±8.82	33.33±3.33	40.00±10.00	20.00±15.27^{ab}	6.67±3.33
	4 DPH				5 DPH		
	0400 H	1000 H	1600 H	2200 H	0400 H	1000 H	1600 H
Control	6.67±3.33	63.33±12.02^{a}	30.00±0.00	0.00±0.00^{a}	0.00±0.00^{a}	90.00±0.00^{a}	70.00±0.00
300-500 lx	16.67±8.82	23.33±3.33^{b}	33.33±18.56	30.00±17.32^{b}	30.00±5.77^{b}	40.00±5.77^{b}	36.67±13.33
300-1000 lx	16.67±8.82	6.67±3.33^{c}	50.00±5.77	53.33±3.33^{bc}	53.33±8.82^{c}	15.00±15.00^{cb}	70.00±20.00
300-2000 lx	3.33±3.33	13.33±3.33^{bc}	36.67±3.33	56.67±8.82^{bc}	33.33±3.33^{c}	5.00±5.00^{c}	50.00±10.00
300-3000 lx	3.33±3.33	16.67±6.67^{bc}	46.67±8.82	70.00±5.77^{c}	53.33±3.33^{c}	35.00±15.00^{cb}	40.00±10.00

Different superscript letters differ significantly (P<0.05).

Table 3. Changes in the food intake (±SE) of early-stage snubnose pompano under continuous illumination at increasing light intensities.

Treatments	**3 DPH**						
	0400 H	0700 H	1000 H	1300 H	1600 H	1900 H	2200 H
Control	0.00±0.00	0.03±0.03	0.27±0.07	0.57±0.13	0.30±0.11	0.00±0.00	0.00±0.00
300-500 lx	0.00±0.00	0.07±0.07	0.23±0.12	0.77±0.24	0.60±0.06	2.43±0.79	1.00±0.95
300-1000 lx	0.03±0.03	0.17±0.06	0.53±0.14	0.67±0.32	0.63±0.23	1.50±1.02	1.33±1.13
300-2000 lx	0.03±0.03	0.03±0.03	0.23±0.03	0.17±0.03	0.20±0.15	0.10±0.00	0.07±0.03
300-3000 lx	0.10±0.06	0.10±0.06	0.43±0.12	0.43±0.03	0.50±0.15	0.47±0.42	0.10±0.06
	4 DPH				**5 DPH**		
	0400 H	1000 H	1600 H	2200 H	0400 H	1000 H	1600 H
Control	0.07±0.03	1.37±0.43^{a}	0.47±0.12	0.00±0.00^{a}	0.00±0.00^{a}	1.95±0.04^{a}	1.40±0.08
300-500 lx	0.53±0.44	0.77±0.42^{ab}	0.63±0.30	0.50±0.32^{a}	0.57±0.22^{b}	0.67±0.18^{b}	1.43±0.52
300-1000 lx	0.53±0.43	0.07±0.03^{b}	2.27±0.67	1.63±0.27^{b}	1.37±0.22^{b}	0.15±0.12^{b}	2.95±0.04
300-2000 lx	0.03±0.03	0.20±0.10^{b}	1.50±0.55	0.87±0.18^{ab}	1.20±0.36^{b}	0.05±0.04^{b}	1.70±0.49
300-3000 lx	0.03±0.03	0.53±0.12^{ab}	1.10±0.20	2.83±0.42^{b}	1.70±0.05^{b}	0.85±0.53^{ab}	1.35±0.12

Different superscript letters differ significantly (P<0.05).

H on 3 DPH. Larvae under natural photoperiod exhibited significantly higher feeding incidence and food intake during the day phase at 1000 H than the light treatments on 4 and 5 DPH. Conversely, during the night phases at 2200 and 0400 H, larvae under natural photoperiod had significantly lower feeding incidence and food intake. At 0400 and 1600 H on 4 DPH and 1600 H on 5 DPH, no significant differences in food intake and feeding incidence were observed between the treatments.

A comparison of the day and night phases in terms of feeding incidence and food intake of fish larvae exposed to different treatments is presented in Tables 4 and 5. Significant differences were observed on 5 DPH, with larvae under natural photoperiod displaying higher feeding incidence during the day phase than those under the light treatments. Conversely, from 4 to 5 DPH during the night phase, larvae under the light treatments exhibited significantly higher feeding incidence than those under natural photoperiod. Regarding food intake, no significant differences were observed on 3 DPH during the night phase and 5 DPH during the day phase. However, significant differences were observed in 3 DPH during the day phase, 4 DPH in the day and night phases, and 5 DPH during the night

Table 4. Comparison of the day- and night-phase feeding incidence (±SE) of early-stage snubnose pompano under continuous illumination at increasing light intensities.

Treatments	3 DPH		4 DPH		5 DPH		8 DPH
	Day phase	Night phase	Day phase	Night phase	Day phase	Night phase	Day phase
Control	24.17±6.51	0.00±0.00^{a}	46.67±6.01	3.33±1.67^{a}	80.00±0.00^{a}	0.00±0.00^{a}	40.00
	Natural photoperiod (12 L: 12 D)						
300-500 lx	25.00±3.82	28.89±10.94^{b}	28.33±8.33	23.33 ±6.67^{b}	38.33±7.26^{bc}	30.00±5.77^{b}	66.67±6.67
	300 lx						500 lx
300-1000 lx	33.33±4.41	23.33±9.62^{b}	28.33±3.33	35.00±2.89^{b}	42.50±2.50^{b}	53.33±8.82^{c}	60.00
	300 lx		500 lx				1000 lx
300-2000 lx	15.00±5.20	6.67±0.00^{ab}	25.00±2.87	30.00±5.00^{b}	27.50±2.50^{c}	33.33±3.33^{b}	60.00
	500 lx				1000 lx		2000 lx
300-3000 lx	30.0±5.77	12.22±7.78^{ab}	31.67±7.26	36.67±1.67^{b}	37.50±12.50^{abc}	53.33±3.33^{c}	50.00
	1000 lx				2000 lx		3000 lx

Different superscript letters differ significantly (P<0.05); Control, 300-1000 lx, 300-2000 lx, and 300-3000 lx at 8 DPH (n=1).

Table 5. Comparison of the day- and night-phase food intake (ANR, ±SE) of early-stage snubnose pompano under continuous illumination at increasing light intensities.

Treatments	3 DPH		4 DPH		5 DPH		8 DPH
	Day phase	Night phase	Day phase	Night phase	Day phase	Night phase	Day phase
Control	0.29±0.08^{a}	0.00±0.00	0.92±0.23	0.03±0.02^{a}	1.67±0.07	0.00±0.00^{a}	0.40
	Natural photoperiod (12 L: 1 2D)						
300-500 lx	0.42±0.06^{ab}	1.14±0.57	0.70±0.13	0.52±0.23^{ab}	1.05±0.24	0.57±0.21^{ab}	2.70±6.67
	300 lx						500 lx
300-1000 lx	0.50±0.06^{b}	0.96±0.71	1.17±0.32	1.08±0.10^{bc}	1.55±0.05	1.37±0.21^{bc}	1.60
	300 lx		500 lx				1000 lx
300-2000 lx	0.16±0.06^{ab}	0.07±0.00	0.85±0.27	0.45±0.07^{ab}	0.87±0.27	1.20±0.36^{bc}	1.70
	500 lx				1000 lx		2000 lx
300-3000 lx	0.37±0.^{07ab}	0.22±0.15	0.82±0.13	1.43±0.19^{c}	1.10±0.40	1.70±0.06^{c}	0.50
	1000 lx				2000 lx		3000 lx

Different superscript letters are significantly different (P<0.05): Control, 300-1000 lx, 300-2000 lx, and 300-3000 lx at 8 DPH (n=1).

phase. The larval first-feeding was observed at higher light treatments (300-1000, 300-2000, and 300-2000 lx) at 0400H on 3 DPH, while no feeding activity was observed for larvae under moderate light treatment (300-500 lx) and natural photoperiod. However, during light treatments, the larvae's food cycle was unclear.

A comparison of feeding incidence and food intake during the day and night phases (Tables 4, 5) revealed that larvae were more active during the day phase on 3 DPH but shifted to the night phase from 4 to 5 DPH. The feeding incidence of larvae under light treatments gradually increased from 0400 H during 3 DPH. Notably, decreased at 0400 H for 300-500, 300-2000, and 300-3000 lx, and at 1000 H for 300-1000 lx on 4 DPH. Subsequently, larvae under 300-1000, 300-2000, and 300-3000 lx exhibited an increasing feeding incidence during the day phase from 4 to 5 DPH and a marked decrease at 1000 H on 5 DPH. The feeding incidence for larvae under 300-500 lx showed minimal changes over time, both during the day and night phases, after 3 DPH.

Larvae increased daily food intake in all treatments (Table 5). However, the negative effect of high light intensity became apparent after the onset of feeding at 0400 H on 3 DPH. Larvae under 300-2000 and 300-3000 lx showed considerably lower and slight changes in food intake from 0400 H on 3 DPH to 1000H on 4 DPH. For larvae under 300-500 and 300-1000 lx, food intake gradually increased from 0400 and 0700 H on 3 DPH and markedly decreased at 0400 and 1000 H, respectively, on 4 DPH. Subsequently, larvae under 300-1000, 300-2000, and 300-3000 lx exhibited an increasing feeding incidence during the day phase from 4 to 5 DPH and a marked decrease at 1000 H on 5 DPH. For larvae under 300-500 lx, food intake showed slight changes over time, during the day and night phases, after 3 DPH. In contrast, larvae under

Table 6. Changes in the total length (±SE) of early-stage snubnose pompano larvae under continuous illumination at increasing light intensities.

Treatments	3 DPH						
	0400 H	0700 H	1000 H	1300 H	1600 H	1900 H	2200 H
Control	2.22±0.09	2.07±0.10	2.07±0.35	2.18±0.10	2.12±0.06	2.33±0.05	2.14±0.04
300-500 lx	2.38±0.06	2.19±0.08	2.09±0.03	2.51±0.08	2.09±0.02	2.36±0.05	2.19±0.07
300-1000 lx	2.29±0.01	2.11±0.06	2.14±0.16	2.45±0.07	2.09±0.04	2.27±0.20	2.20±0.13
300-2000 lx	1.97±0.05	1.94±0.02	1.92±0.07	2.19±0.03	1.86±0.02	1.93±0.08	2.07±0.04
300-3000 lx	2.08±0.16	1.89±0.12	2.01±0.06	2.18±0.16	2.02±0.10	2.22±0.19	2.12±0.11
	4 DPH				5 DPH		
	0400 H	1000 H	1600 H	2200 H	0400 H	1000 H	1600 H
Control	2.13±0.04	2.37±0.11	2.11±0.09	2.17±0.08	2.39±0.05^{a}	2.38±0.02^{a}	2.29±0.11^{a}
300-500 lx	2.31±0.09	2.36±0.13	2.20±0.06	2.51±0.11	2.62±0.07^{b}	2.71±0.07^{b}	2.77±0.03^{b}
300-1000 lx	2.19±0.18	2.56±0.23	2.32±0.08	2.44±0.08	2.59±0.02^{ab}	2.56±0.02^{ab}	2.65±0.02^{b}
300-2000 lx	2.13±0.16	2.55±0.02	2.25±0.06	2.33±0.12	2.67±0.04^{b}	2.61±0.04^{b}	2.72±0.05^{b}
300-3000 lx	2.29±0.05	2.46±0.05	2.19±0.03	2.34±0.04	2.42±0.10^{a}	2.60±0.02^{b}	2.60±0.04^{b}

Different superscript letters differ significantly ($P<0.05$).

natural photoperiod typically fed during the day phase. Unexpectedly, around 3% feeding incidence was observed during the night phase at 0400 H on 4 DPH. Feeding incidence and food intake gradually increased during the morning and decreased during noon, with the highest feeding usually occurring between 1000 and 1600 H. Recorded natural light intensity inside the control treatment (indoor) ranged from 9 to 372 lx from day 1 to 10 DPH. On 8 DPH, inconsistent data on larval feeding were obtained, indicating a clear negative impact of daylight intensity fluctuation under natural photoperiod and high light levels (300-1000, 300-2000, and 300-3000 lx).

The feeding response of the larvae indicates that, regardless of how lighting methods are applied, average feeding success increases as the larvae develop in all treatments. However, significantly lower success was observed in larvae under the natural photoperiod, which aligns with Alejos and Serrano Jr. (2018, 2024) findings. The larvae exhibited diurnal rhythms, and the ever-changing daylight intensity (ranging from 9 to 372 lx) affected their foraging activity. Based on Al-Emran et al. (2024), altered light and dark cycles have varying impacts on fish, influenced by the light-dark ratio. Continuous light exposure can potentially stimulate maximum larval feeding incidence, as noted by Őnder et al. (2016) and Litvak et al. (2020).

The feeding response of the larvae also suggests that changing light intensity conditions from low to high levels during rearing altered the feeding behavior of early-stage snubnose pompano larvae, as there was no clear indication of a consistent feeding pattern. Thus, the larvae may exhibit active feeding during the night and day phases (Table 5). In Alejos and Serrano Jr. (2018, 2024) study, larvae reared under continuous illumination at 500 lx displayed precise diurnal feeding patterns despite being exposed to 24 hours of light. It suggests that adapting to different ranges of increasing light intensity may influence the feeding rhythms of early-stage snubnose pompano larvae. As per Al-Emran et al. (2024), adjusting environmental factors like day length or photoperiod acts as an artificial synchronizer, controlling the daily internal rhythms in fish.

The growth and survival of the fish exposed to the treatments are summarized in Table 6. No significant differences were observed in the larvae's total length (TL) from 3 to 4 DPH. However, on 3 DPH, larvae under 300-1000 and 300-2000 lx had smaller total lengths. Significant differences in TL among the larvae became apparent on 5 DPH. At 0400 H, larvae under the light treatments were significantly larger than those under the natural photoperiod. From 3 to 5 DPH, a gradual increase in TL was observed in larvae under 300-500, 300-2000, and 300-3000 lx compared to those under 300-1000 lx and the natural photoperiod. However, the negative impact of higher light intensity levels on larval survival became apparent after 5 DPH, leading to mass mortality at 7

Table 7. Growth and survival of early-stage snubnose pompano larvae under continuous illumination at increasing light intensities after 10 DPH.

Treatment	Total length (mm)	Weight (mg)	Survival (%)
Control	3.64	0.59	4.10
300-500 lx	5.29±0.19	2.42±.07	16.25±2.10
300-1000 lx	5.84	2.89	20.33
300-2000 lx	6.31	3.50	12.73
300-3000 lx	5.75	1.97	20.23

Values were expressed as mean ± SEM (300-500 lx); *Control, 300-1000 lx, 300-2000 lx, and 300-3000 lx (n=1).

DPH.

As a result, consistent data on growth and survival during the late stage of the experiment were not obtained. Only a single replicate remained for 300-1000, 300-2000, 300-3000 lx, and the natural photoperiod (12 hL: 12 hD). Exposing the fish larvae to continuous illumination at increasing light intensities (Table 7) resulted in greater weight and total length at 300-1000 and 300-2000 lx, respectively. However, larvae exposed to 300-500 lx exhibited consistent survival rates. In contrast, larvae under the indoor natural photoperiod showed the poorest growth and survival performance.

The application of continuous illumination at different light intensities influenced the larval culture performance of early-stage snubnose pompano larvae, as described by Alejos and Serrano Jr. (2018, 2024). Larval feeding, growth, and survival were favored when reared under 500 lx continuous illumination from 1 to 10 DPH. However, in this study, the larval culture performance of the fish larvae showed different results when exposed to continuous illumination at increasing light intensities. From 3 to 5 DPH, there was a noticeable decrease in the rate of total length development and a decline in foraging success. However, more significant growth and improved survival were observed after 10 DPH. The duration of light exposure significantly influences the early growth, development, and survival of fish larvae (Al-Emran et al., 2024). Research indicates that extended photoperiod enhances growth and development in diurnal fish species (Arambam et al., 2020; Ma et al., 2021). Moreover, a prolonged photoperiod leads to larger larvae size, increased larval feeding rates, higher weight gain, and improved survival rates, as demonstrated by Őnder et al. (2016) and Litvak et al. (2020).

Conclusions

The study's findings indicate moderate continuous illumination (300-500 lx) promotes consistent feeding, resulting in positive growth response and improved survival in early-stage snubnose pompano (*T. blochii*). Although more remarkable fish growth was observed at higher light treatments (300-1000 and 300-2000 lx), it harmed the survival of the fish larvae after 5 DPH. It is important to note that changing light intensity conditions from low to high levels during rearing altered the feeding behavior of the fish larvae. Under the natural photoperiod, the larvae followed diurnal rhythms, and the ever-changing daylight intensity influenced their foraging activity. It resulted in poorer growth and survival than the larvae under the light treatments.

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References

Abdollahpour H., Falahatkar B., Lawrence C. (2020). The effect of photoperiod on growth and spawning performance of zebrafish *Danio rerio*. Aquaculture Reports, 17: 100295.

Alejos M.S., Serrano Jr. A.E. (2018). Continuous illumination improves growth and survival in the early stage of snubnose pompano *Trachinotus blochii*. Aquaculture, Aquarium, Conservation and Legislation, 11: 1557-1563.

Alejos M.S., Jumah Y. U., Serrano Jr. A.E., Laureta L.V. (2019). Effect of different satiation level on the growth and survival of Nile tilapia *Oreochromis niloticus* L. under continuous illumination. IOSR Journal of Agriculture and Veterinary Science, 12: 15-20.

Alejos M.S., Serrano Jr. A.E. (2024). Effect of Photoperiod on the Growth and Survival in the Early Stage of Snubnose Pompano *Trachinotus blochii*. In: Innovations in Biological Science (Hussain, I), Vol. 3. B P International. pp: 01-11.

Al-Emran M., Zahangir M.M., Badruzzaman M., Shahjahan M. (2024). Influences of photoperiod on growth and reproduction of farmed fishes - prospects in aquaculture. Aquaculture Reports, 35: 101978.

Arambam K., Singh S.K., Biswas P., Patel A.B., Jena A.K., Pandey P.K. (2020). Influence of light intensity and photoperiod on embryonic development, survival and growth of threatened catfish *Ompok bimaculatus* early larvae. Journal of Fish Biology, 97: 740-752.

Churova M., Shulgina N., Kuritsyn A., Krupnova M., Nemova N. (2019). Muscle specific gene expression and metabolic enzyme activities in Atlantic salmon *Salmo salar* L. fry reared under different photoperiod regimes. Comparative Biochemistry and Physiology Part B, 239: 110330.

Falahatkar B., Bagheri M., Efatpanah I. (2019). The effect of stocking densities on growth performance and biochemical indices in new hybrid of *Leuciscus aspius* ♀ × *Rutilus frisii* ♂. Aquaculture Reports, 15: 100207.

Lundova K., Matousek J., Prokesova M., Sebesta R., Policar T., Stejskal V. (2019). The effect of timing of extended photoperiod on growth and maturity of brook trout (*Salvelinus fontinalis*). Aquaculture Research, 50: 1697-1704.

Badruzzaman M., Shahjahan M., Roy P.K., Islam M.T. (2020). Rotenone alters behavior and reproductive functions of freshwater catfish, *Mystus cavasius*, through deficits of dopaminergic neurons in the brain. Chemosphere, 263: 128355.

Haryanto L.N.F., Subekti S., Ardiyanti H.B., Amiin M.K., Akbar R.E.K., Achmadi I., Yudarana M.A. (2021). Molecular identification and prevalence of endoparasite worms in silver pompano (*Trachinotus blochii*) in floating net cages of Mari-culture Center, Lampung. IOP Conf. Series: Environmental Earth Sciences, 679: 012025.

Jayakumar R., Sakthivel M., Abdul Nazar A.K., Tamilmani G., Rameshkumar P., Samal A.K., Anikuttan K.K., Anbarasu M., Balamurugan V., Thiagu R., Sirajudeen S., Gopakumar G. (2018). Impact of increase in temperature and light intensity on development and metamorphosis of hatchery reared silver pompano *Trachinotus blochii* (Lacepede, 1801) larvae. Indian Journal of Fisheries, 65: 133-137.

Litvak M.K., Zadmajid, V., Butts, I.A.E. (2020). Growth and survival of winter flounder (*Pseudopleuronectes americanus*) larvae reared on different photoperiod regimes from hatch to metamorphosis. Aquaculture Research, 51: 2314-2321.

Ma H., Wei P., Li X., Liu S., Tian Y., Zhang Q., Liu Y. (2021). Effects of photoperiod on growth, digestive, metabolic and non-special immunity enzymes of *Takifugu rubripes* larvae. Aquaculture, 542: 736840.

Malambugi A., Yu Z., Zhu W., Wan, L., Song F., Limbu S.M., Dong Z. (2020). Effects of photoperiod on growth performance and melanogenesis pathway for skin pigmentation of Malaysian red tilapia. Aquaculture Research, 51: 1824-1833.

Mapunda J., Mtolera M.S.P., Yahya S.A.S., Ngo V.M., Golan M. (2021). Light colour affect the survival rate, growth performance, cortisol level, body composition, and digestive enzymes activities of different Snubnose pompano (*Trachinotus blochii* Lacépède, 1801) larval stages. Aquaculture Reports, 21: 100804.

Őnder M.Y., Basçınar N., Khan U., Sonay F.D. (2016). Effect of photoperiod on growth and efficiency of yolk-sac utilization in alevins of brook trout (*Salvelinus fontinalis*). Pakistan Journal of Zoology, 48: 533-537.

Ruchin A.B. (2020). Effect of illumination on fish and amphibian: Development, growth, physiological and biochemical processes. Reviews in Aquaculture, 13: 567-600.

Shahjahan M., Al-Emran M., Islam S.M., Baten S.A., Rashid H., Haque M.M. (2020). Prolonged photoperiod inhibits growth and reproductive functions of rohu *Labeo rohita*. Aquaculture Reports, 16: 100272.