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Corrigendum: Microbial control during the incubation of rainbow trout (*Oncorhynchus mykiss*) eggs exposed to humic acid

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KEYWORDS

rainbow trout, microbial community, fungus, eggs, aquaculture, 16s rDNA sequencing

A corrigendum on

Microbial control during the incubation of rainbow trout (*Oncorhynchus mykiss*) eggs exposed to humic acid

by Chiasson M, Kirk M and Huyben D (2023) *Front. Aquac.* 2:1088072. doi: 10.3389/faquc.2023.1088072

In the published article, there was an error. In the text, the dosage of the humic acid product was recorded as 0.005 mg/L. This was a calculation error, the correct dosage was 0.005 mL of humic acid in 1 L of water (5 mg/L).

A correction has been made to the **Abstract**. This sentence previously stated:

“Humic acid, an aqueous extract of oxidized lignite was added to water entering both stacked tray and jar type incubators at a dosage rate of 0.005 mg/L from fertilization until hatching.”

The corrected sentence appears below:

“Humic acid, an aqueous extract of oxidized lignite was added to water entering both stacked tray and jar type incubators at a dosage rate of 5 mg/L from fertilization until hatching.”

A correction has been made to the **Materials and Methods, 2.1 Fish Facilities**. This sentence previously stated:

“The treatment incubator trays received groundwater continuously dosed with 0.005 mg/L humic acid (trade name: AC Aqua, MTS Environmental Inc., Exeter, ON, Canada) using a peristaltic pump according to the manufacturer’s recommendation.

Eggs were maintained in the dark and the flow to each incubator tray was calibrated to 10 L/min. Similarly, during each of three consecutive weeks, fertilized eggs placed in the incubator jars were divided into two replicate groups of control (groundwater) and two replicate groups of treatment (groundwater continuously dosed with humic acid at 0.005 mg/L).”

The corrected sentence appears below:

“The treatment incubator trays received groundwater continuously dosed with 5 mg/L humic acid (trade name: AC Aqua, MTS Environmental Inc., Exeter, ON, Canada) using a peristaltic pump according to the manufacturer’s recommendation.

Eggs were maintained in the dark and the flow to each incubator tray was calibrated to 10 L/min. Similarly, during each of three consecutive weeks, fertilized eggs placed in the incubator jars were divided into two replicate groups of control (groundwater) and two replicate groups of treatment (groundwater continuously dosed with humic acid at 5 mg/L)."

A correction has been made to [Table 1](#). This sentence previously stated:

"[Table 1](#). Percent survival (\pm standard deviation) of rainbow trout eggs collected weekly for three weeks at the eyed stage (24 days post fertilization) and hatch (42 days post fertilization) incubated at 9°C in stacked incubator trays and incubating jars exposed to groundwater (control) and humic acid at 0.005 mg/L (treatment)."

The corrected sentence appears below:

A correction has been made to [Figure 1](#). This sentence previously stated:

"[Figure 1](#). Alpha diversity (Shannon Diversity Index) of operational taxonomic units of all treatment groups using water filtered from rainbow trout eggs exposed to no topical agent (Control) or 0.005 mg/L humic acid (Treatment) and sampled over 0, 10, 20, 30 and 40 days using incubator trays or jars. (n = 9)"

The corrected sentence appears below:

A correction has been made to [Figure 2](#). This sentence previously stated:

"[Figure 2](#). Alpha diversity (Shannon Diversity Index) of operational taxonomic units over time using water filtered from rainbow trout eggs exposed to no topical agent (Control) or 0.005 mg/L humic acid (Treatment) and sampled over 0, 10, 20, 30 and 40 days. (n = 9)"

The corrected sentence appears below:

A correction has been made to [Figure 4](#). This sentence previously stated:

"[Figure 4](#). Alpha diversity (Shannon Diversity Index) of operational taxonomic units between incubator trays and jars as well as exposure to no topical agent (Control) or 0.005 mg/L humic acid (Treatment) using water filtered from rainbow trout eggs. In this case, time points were pooled, except 0, 10 and 20 day samples were removed to compare final effects. (n = 9)"

The corrected sentence appears below:

A correction has been made to [Figure 6](#). This sentence previously stated:

"[Figure 6](#). Beta diversity of operational taxonomic units between incubator trays and jars as well as exposure to no topical agent (Control) or 0.005 mg/L humic acid (Treatment) using water filtered from rainbow trout eggs. Time points were pooled, except 0, 10 and 20 day samples were removed to compare final effects. NMDS; non-metric multidimensional scaling. (n = 9)"

The corrected sentence appears below:

A correction has been made to [Figure 7](#). This sentence previously stated:

"[Figure 7](#). Relative abundance of operational taxonomic units (OTU) on the phyla level from water filtered from rainbow trout eggs exposed to no topical agent (Control) or 0.005 mg/L humic acid (Treatment) and sampled over 0, 10, 20, 30 and 40 days using incubator trays (t) or jars (j). (n = 9)"

The corrected sentence appears below:

A correction has been made to [Figure 8](#). This sentence previously stated:

TABLE 1 Percent survival (\pm standard deviation) of rainbow trout eggs collected weekly for three weeks at the eyed stage (24 days post fertilization) and hatch (42 days post fertilization) incubated at 9°C in stacked incubator trays and incubating jars exposed to groundwater (control) and humic acid at 5 mg/L (treatment).

Collection	Incubator Type	Group	Mean Survival to Eyed Stage (%)	Mean Survival to Hatch (%)
Week 1	Tray	Control	84.0 \pm 5.3	68.8 \pm 11.8
		Treatment	90.7 \pm 1.1	80.9 \pm 1.7
	Jar	Control	-	54.1 \pm 23.8
		Treatment	-	33.4 \pm 19.8
Week 2	Tray	Control	82.8 \pm 2.5	59.4 \pm 5.6
		Treatment	97.7 \pm 0.5	74.7 \pm 16.5
	Jar	Control	-	68.8 \pm 16.5
		Treatment	-	91.5 \pm 4.7
Week 3	Tray	Control	78.5 \pm 4.6	38.5 \pm 11.8
		Treatment	98.0 \pm 0.5	75.9 \pm 9.7
	Jar	Control	-	89.9 \pm 0.7
		Treatment	-	62.7 \pm 3.1
Overall Mean	Tray	Control	81.9 \pm 4.6 ^a	55.5 \pm 16.1 ^a
		Treatment	95.5 \pm 3.6 ^b	77.2 \pm 10.4 ^b
	Jar	Control	-	70.9 \pm 20.6
		Treatment	-	62.5 \pm 27.6

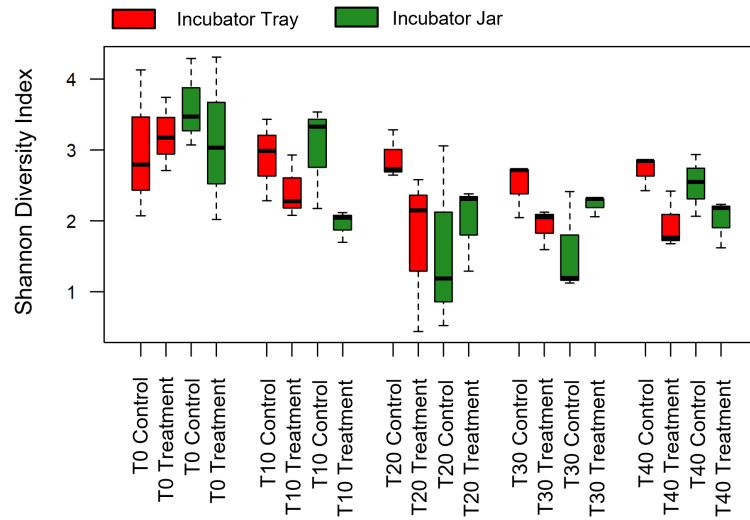


FIGURE 1 Alpha diversity (Shannon Diversity Index) of operational taxonomic units of all treatment groups using water filtered from rainbow trout eggs exposed to no topical agent (Control) or 5 mg/L humic acid (Treatment) and sampled over 0, 10, 20, 30 and 40 days using incubator trays or jars. (n = 9).

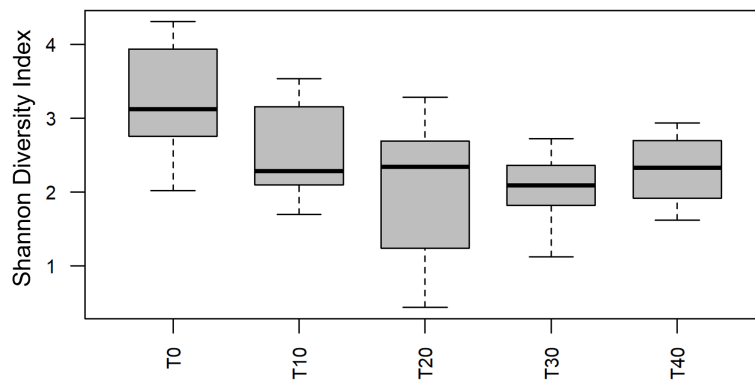


FIGURE 2 Alpha diversity (Shannon Diversity Index) of operational taxonomic units over time using water filtered from rainbow trout eggs exposed to no topical agent (Control) or 5 mg/L humic acid (Treatment) and sampled over 0, 10, 20, 30 and 40 days. (n = 9).

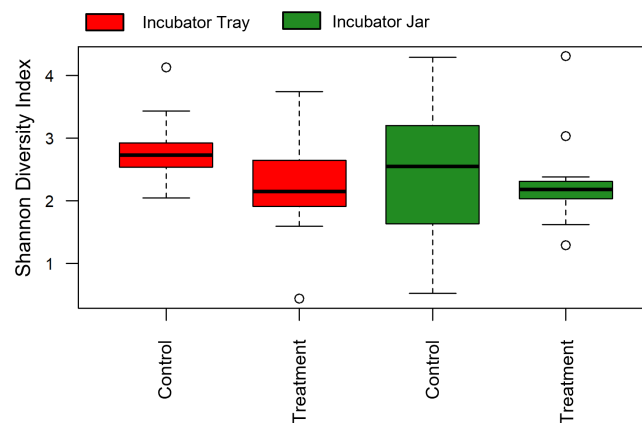


FIGURE 4 Alpha diversity (Shannon Diversity Index) of operational taxonomic units between incubator trays and jars as well as exposure to no topical agent (Control) or 5 mg/L humic acid (Treatment) using water filtered from rainbow trout eggs. In this case, time points were pooled, except 0, 10 and 20 day samples were removed to compare final effects. (n = 9).

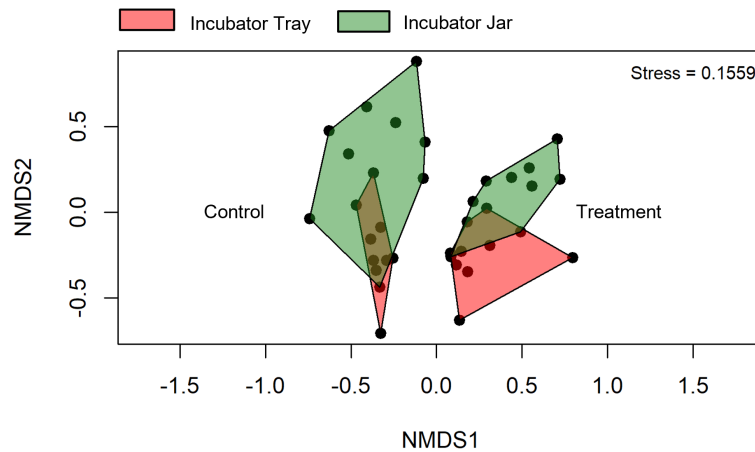


FIGURE 6 Beta diversity of operational taxonomic units between incubator trays and jars as well as exposure to no topical agent (Control) or 5 mg/L humic acid (Treatment) using water filtered from rainbow trout eggs. Time points were pooled, except 0, 10 and 20 day samples were removed to compare final effects. NMDS; non-metric multidimensional scaling. (n = 9).

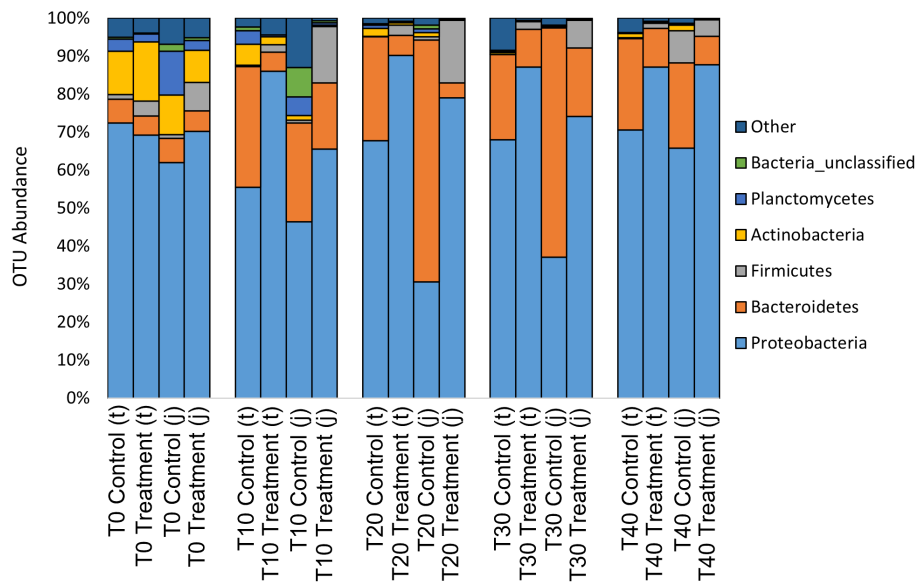


FIGURE 7 Relative abundance of operational taxonomic units (OTU) on the phyla level from water filtered from rainbow trout eggs exposed to no topical agent (Control) or 5 mg/L humic acid (Treatment) and sampled over 0, 10, 20, 30 and 40 days using incubator trays (t) or jars (j). (n = 9).

“Figure 8. Relative abundance of operational taxonomic units (OTU) on the genus level from water filtered from rainbow trout eggs exposed to no topical agent (Control) or 0.005 mg/L humic acid (Treatment) and sampled over 0, 10, 20, 30 and 40 days using incubator trays (t) or jars (j). (n = 9)”

The corrected sentence appears below:

A correction has been made to Figure 9. This sentence previously stated:

“Figure 9. Linear discriminant analysis effect size (LEfSe) of indicator operational taxonomic units from water filtered from rainbow trout eggs

exposed to no topical agent (Control) or 0.005 mg/L humic acid (Treatment). Samples over time and vessels were pooled and a Linear Discriminant Analysis (LDA) cutoff score of 3.0 was used. (n = 9)”

The corrected sentence appears below:

A correction has been made to Figure 10. This sentence previously stated:

“Figure 10. Relative abundance of operational taxonomic units of a) Comamonadaceae (Burkholderiales order), b) Flavobacterium, and c) Aeromonas from water filtered from rainbow trout eggs exposed to no topical agent (Control) or 0.005 mg/L humic acid (Treatment).

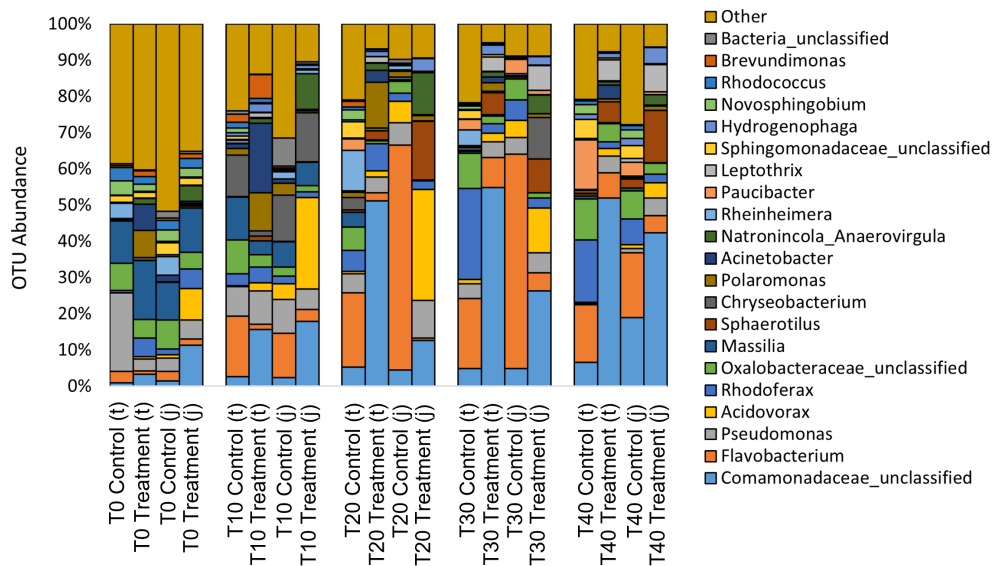


FIGURE 8
Relative abundance of operational taxonomic units (OTU) on the genus level from water filtered from rainbow trout eggs exposed to no topical agent (Control) or 5 mg/L humic acid (Treatment) and sampled over 0, 10, 20, 30 and 40 days using incubator trays (t) or jars (j). (n = 9).

Comparison of incubator trays and jars, while pooled over time. (n = 9)”

The corrected sentence appears below:

The authors apologize for these errors and state that this does not change the scientific conclusions of the article in any way. The original article has been updated.

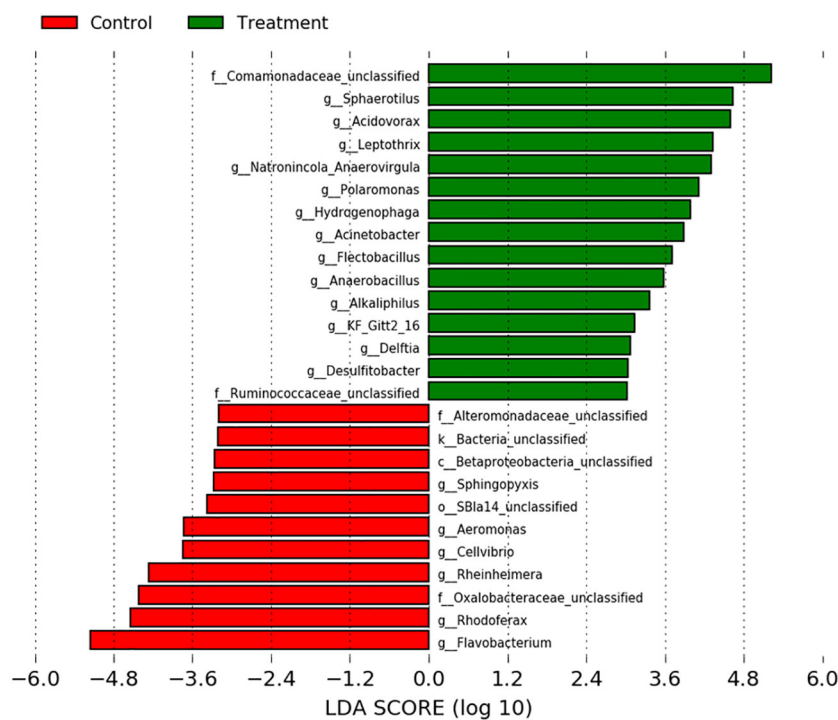


FIGURE 9
Linear discriminant analysis effect size (LEfSe) of indicator operational taxonomic units from water filtered from rainbow trout eggs exposed to no topical agent (Control) or 5 mg/L humic acid (Treatment). Samples over time and vessels were pooled and a Linear Discriminant Analysis (LDA) cutoff score of 3.0 was used. (n = 9).

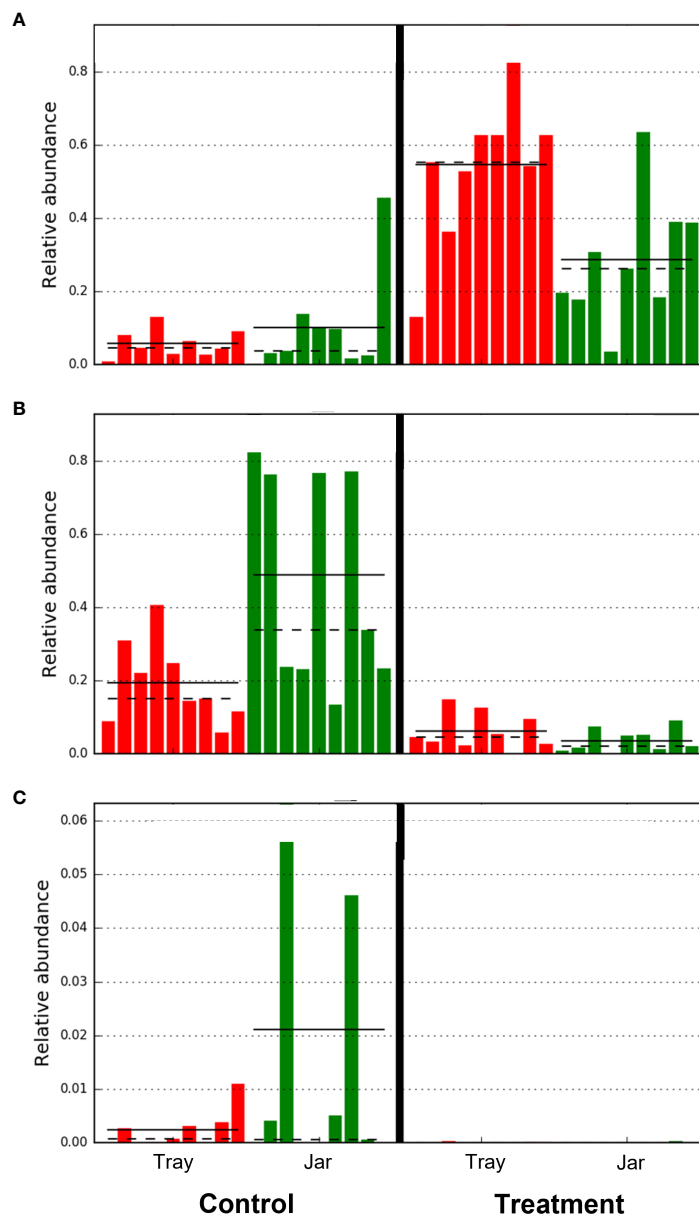


FIGURE 10

Relative abundance of operational taxonomic units of (A) Comamonadaceae (Burkholderiales order), (B) Flavobacterium, and (C) Aeromonas from water filtered from rainbow trout eggs exposed to no topical agent (Control) or 5 mg/L humic acid (Treatment). Comparison of incubator trays and jars, while pooled over time. (n = 9).

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