



Identification and Characterization of *Sejorgia lycomia* sp. nov., a Unique Isolate from Loyalsock Creek

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Introduction:

- The aim of this study was to identify and characterize a potentially novel organism that was isolated from the Loyalsock Creek in Lycoming County, Pennsylvania.
- In lotic ecological systems (as is the case with Loyalsock Creek), bacteria fill a variety of roles, such as decomposing organic material, biofilm communities, nutrient cycling, and/or in commensal relationships with stream organisms.
- Identifying a novel bacteria species from the Loyalsock Creek can provide more insight into the microbial communities that exist within that ecosystem.
- If an undiscovered bacterium has a particularly important role to play, then this could impact the environmental system and how it is viewed.
- Our hypothesis is that *Sejorgia lycomia* JJC, one of the organisms that was isolated for Lycoming College's Microbiology course, is indeed a novel species based upon preliminary studies utilizing Bergey's Manual of Determinative Microbiology as well as comparison and alignment of the 16S rRNA sequence.

Results:

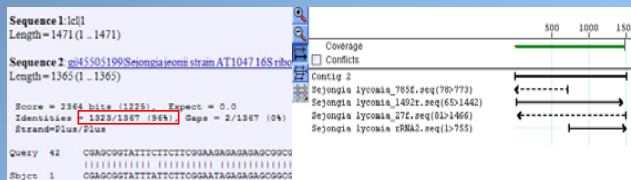


Figure 1: (L) BLAST Alignment of *Sejorgia lycomia* JJC and *Sejorgia jeonii*. (R) Strategy view of the assembled 16S rRNA sequence used in the RDP Search and BLAST2 Alignment.

	Percent Identity				
	1	2	3	4	
1		95.9	95.4	94.5	<i>Sejorgia marina</i>
2	4		97.6	95.6	<i>Sejorgia antarctica</i>
3	4.8	2.3		96.9	<i>Sejorgia jeonii</i>
4	5.7	4.4	3.1		<i>Sejorgia lycomia</i>

Figure 2: Sequence Distance Matrix between the different *Sejorgia* species. This figure was generated using MegAlign's Clustal W function.

Methods:

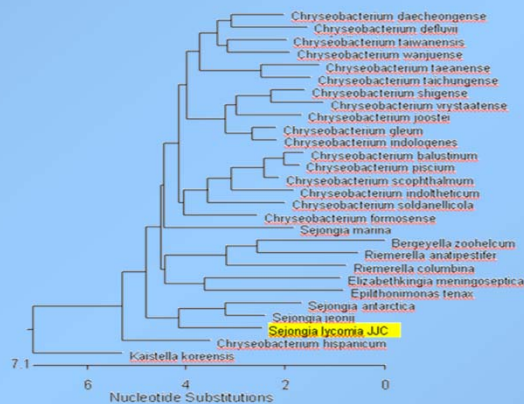
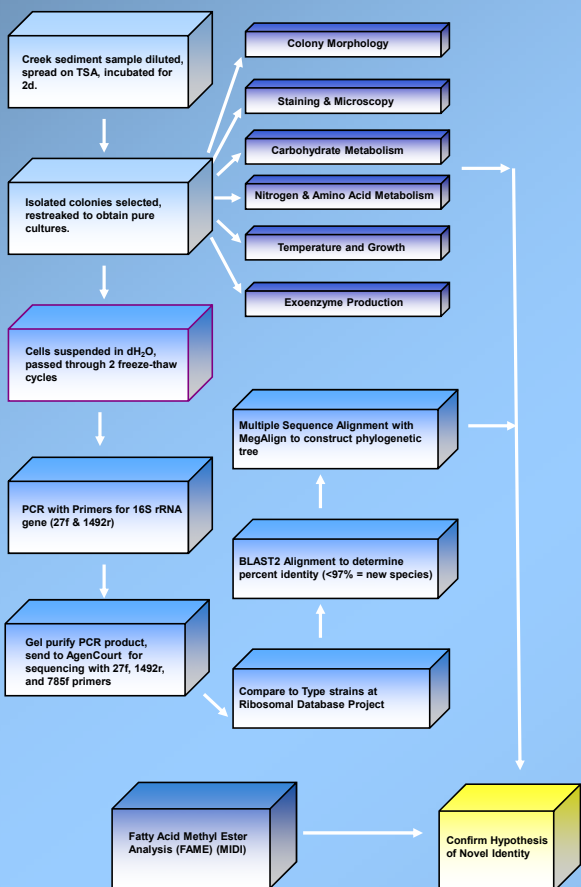


Figure 3: Phylogenetic cladogram of *Sejorgia lycomia* JJC and the most closely related species belonging to family Flavobacteriaceae. This figure was generated using the Clustal W method with MegAlign.

Parameter	<i>Sejorgia lycomia</i>	<i>Sejorgia antarctica</i>	<i>Sejorgia jeonii</i>	<i>Sejorgia marina</i>
Growth at 5°C	-	+	+	ND
Growth at 30°C	+	var	var	-
Presence of Lipase	+	+	+	+
Capable of Nitrate Reduction	-	-	-	+
Capable of Nitrite Reduction	-	-	-	ND
Hydrogen Sulfide Production	-	-	-	ND
Indole Production	-	+	+	-
Acid Produced from Maltose	+	+	+	ND
Acid Produced from D-Xylose	+	-	-	ND
Acid Produced from D-Glucose	+	+	+	-

Table 2: Biochemical and phenotypic test results. Var denotes a variable result as found by Yi, et al. (2005). ND stands for not determined, as it was not present in the literature. The significant differences between the species are highlighted in yellow.

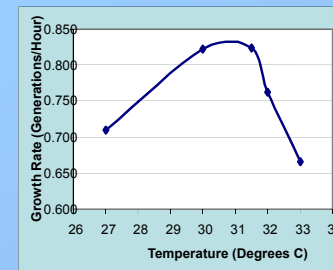
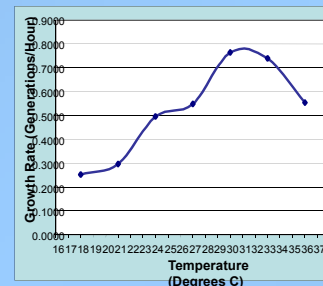


Figure 4 and 5: Graphs of the Growth Rates of *Sejorgia lycomia* at various temperatures. Growth Rate is the inverse of doubling time, which was measured using absorbance at 600 nm. Growth Rates were calculated using exponential trend line equations. Figure 5 is a more precise look at the growth rates near the optimal growth temperature. Based upon these data, the growth optimum most likely lies near 30°C, another key phenotypic difference from the psychrotolerant *Sejorgia* species.

Fatty Acid	<i>Sejorgia lycomia</i>	<i>Sejorgia antarctica</i>	<i>Sejorgia jeonii</i>	<i>Sejorgia marina</i>
13:0 iso	8.92	2.50	2.90	0.60
13:0 anteiso	0.76	3.20	3.60	0.50
15:0 iso	39.01	13.60	12.20	17.01
15:0 anteiso	8.42	15.20	24.20	33.80
15:0 iso 3OH	4.21	1.00	1.30	3.20
15:1 anteiso A	0.00	6.80	0.00	0.00
16:0 iso	0.36	2.80	5.70	0.60
16:0 10-Methyl	15.79	0.00	0.00	0.00
16:0 iso 3OH	0.00	5.10	5.70	2.90
16:1 ω7c/16:1 ω6c	6.57	2.70	2.60	0.00
16:1 iso H	0.00	3.60	9.10	2.30
17:0 iso 3OH	8.86	5.60	4.40	5.00
17:1 iso ω6c	0.00	21.30	8.60	8.80
17:1 anteiso ω6c	0.00	2.50	1.90	2.30

Table 1: Dominant Membrane Fatty Acids as detected using MIDI system. Each figure is a percentage of the total fatty acids found in the membrane. Differences between species are highlighted in yellow. Data from *Sejorgia antarctica* and *Sejorgia jeonii* is from Yi, et al. (2005). Data for *Sejorgia marina* is from Lee, et al. (2007). Profiling of *Sejorgia lycomia* was performed by Microbial ID, Inc. of Newark, Delaware.

Conclusions:

- Sejorgia lycomia* JJC is a novel organism belonging to genus *Sejorgia* in family Flavobacteriaceae based upon 16S sequence homology of less than 97%, unique membrane fatty acid composition, and distinct phenotypic characteristics.
- Description of Species:** *Sejorgia lycomia* (Se.jong.i.a. ly.com.i.a.) is an aerobic, gram-negative, mucoid, yellow-pigmented, rod-shaped organism. *Sejorgia lycomia* optimally grows at approximately 31°C. Metabolizes lecithin and starch. Produces acid aerobically from D-Xylose, D-Glucose, and Maltose. Does not reduce nitrate or produce indole. Predominant fatty acids include 13:0 iso, 15:0 iso, 15:0 anteiso, 10 Methyl 16:0, and 17:0 iso 3OH. The strain was initially isolated from Loyalsock Creek near Montoursville, Pa (41° 15'00.53" N, 76° 56'09.63" W)

References:

- Yi, H. H. I. Yoon, and J. Chun. "Sejorgia antarctica Gen. Nov., Sp. Nov. and Sejorgia Jeonii Sp. Nov., Isolated From the Antarctic." *International Journal of Systematic and Evolutionary Microbiology* 55 (2005): 409-416.
- Lee, K. et al. "Sejorgia marina sp. nov., isolated from Antarctic seawater." *International Journal of Systematic and Evolutionary Microbiology* 57 (2007): 2917-2921.