

## Numerical prediction (low propagule, low synchrony, weak propagule)

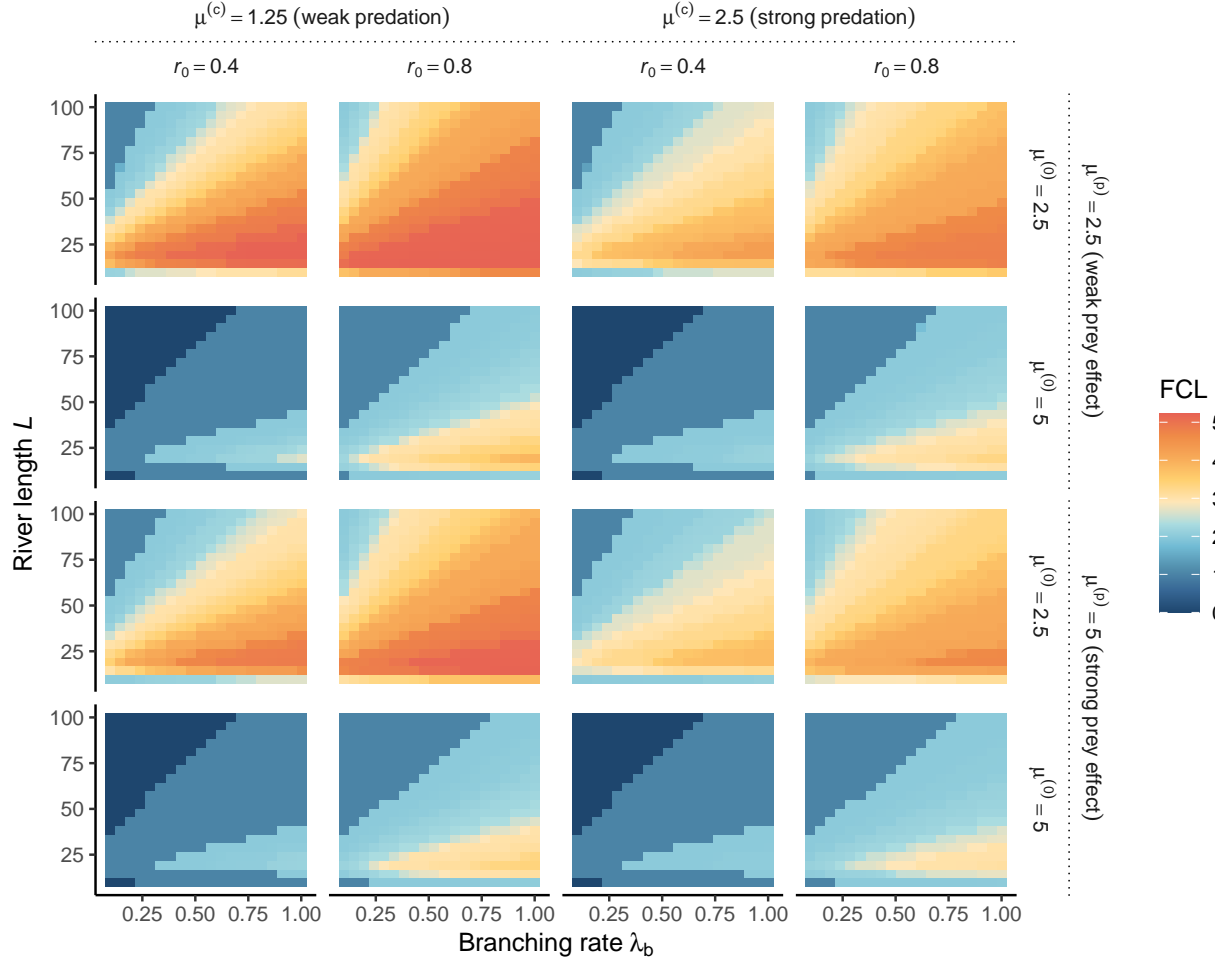


Figure 1: Heatmap of FCL as a function of ecosystem size (river length,  $L$ ) and complexity (branching rate,  $\lambda_b$ ), with rows and columns displaying different combinations of resource supply ( $r_0$ ), disturbance regime ( $\mu^{(0)}$ ), predation effect ( $\mu^{(c)}$ ), and prey effect ( $\mu^{(p)}$ ). Each cell represents the average FCL of five food webs. Additional parameter values are: number of gross propagules  $g_0 = 75$ , synchrony probability  $\rho = 0.25$ , omnivory  $\theta = 0.25$ , habitat density  $h = 2.5$ , dispersal capability  $\delta_0 = 0.5$ , and scaling exponent  $\psi = 0.5$ .

## Numerical prediction (high propagule, low synchrony, weak propagule)

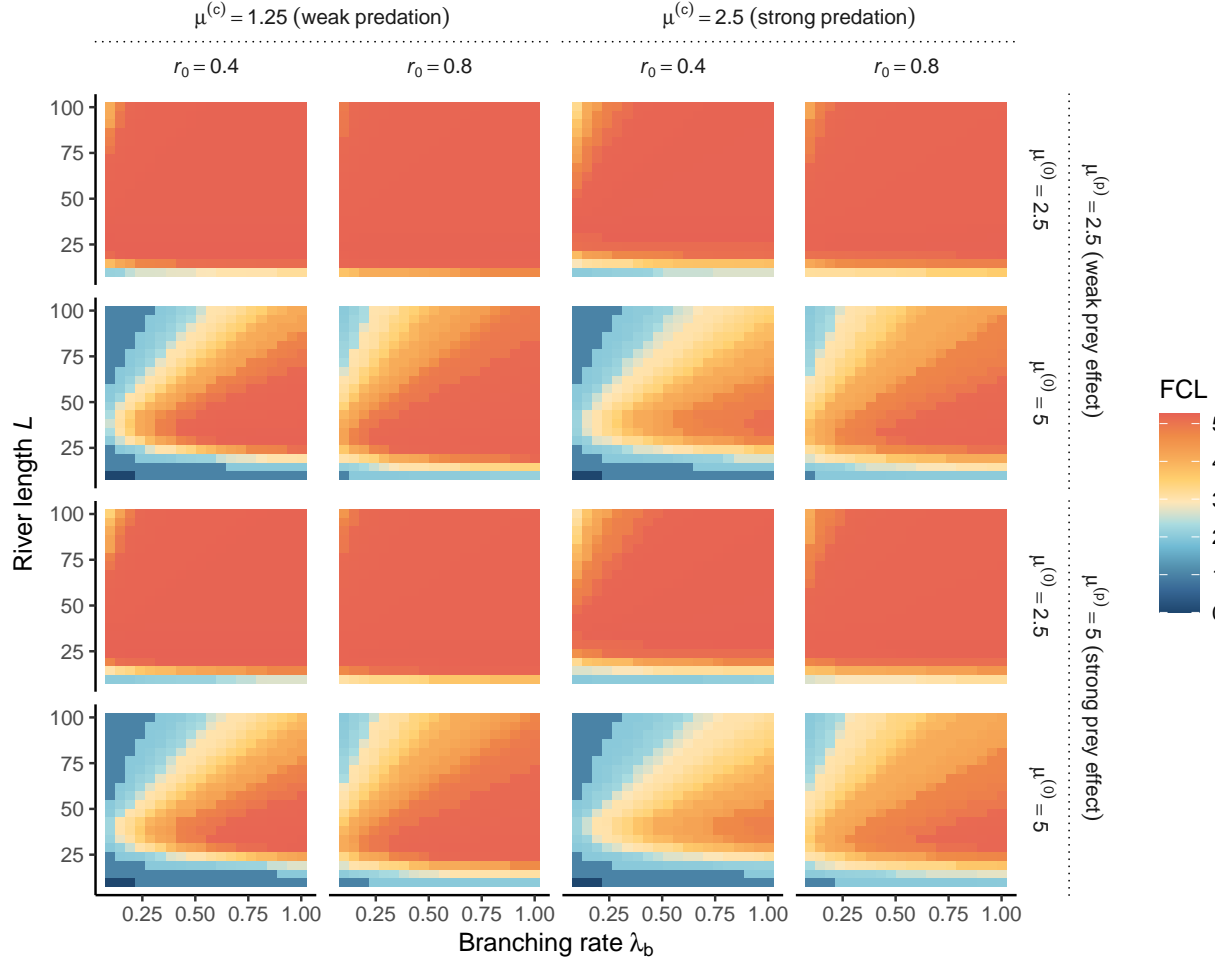


Figure 2: Heatmap of FCL as a function of ecosystem size (river length,  $L$ ) and complexity (branching rate,  $\lambda_b$ ), with rows and columns displaying different combinations of resource supply ( $r_0$ ), disturbance regime ( $\mu^{(0)}$ ), predation effect ( $\mu^{(c)}$ ), and prey effect ( $\mu^{(p)}$ ). Each cell represents the average FCL of five food webs. Additional parameter values are: number of gross propagules  $g_0 = 150$ , synchrony probability  $\rho = 0.25$ , omnivory  $\theta = 0.25$ , habitat density  $h = 2.5$ , dispersal capability  $\delta_0 = 0.5$ , and scaling exponent  $\psi = 0.5$ .

## Numerical prediction (low propagule, high synchrony, weak propagule)

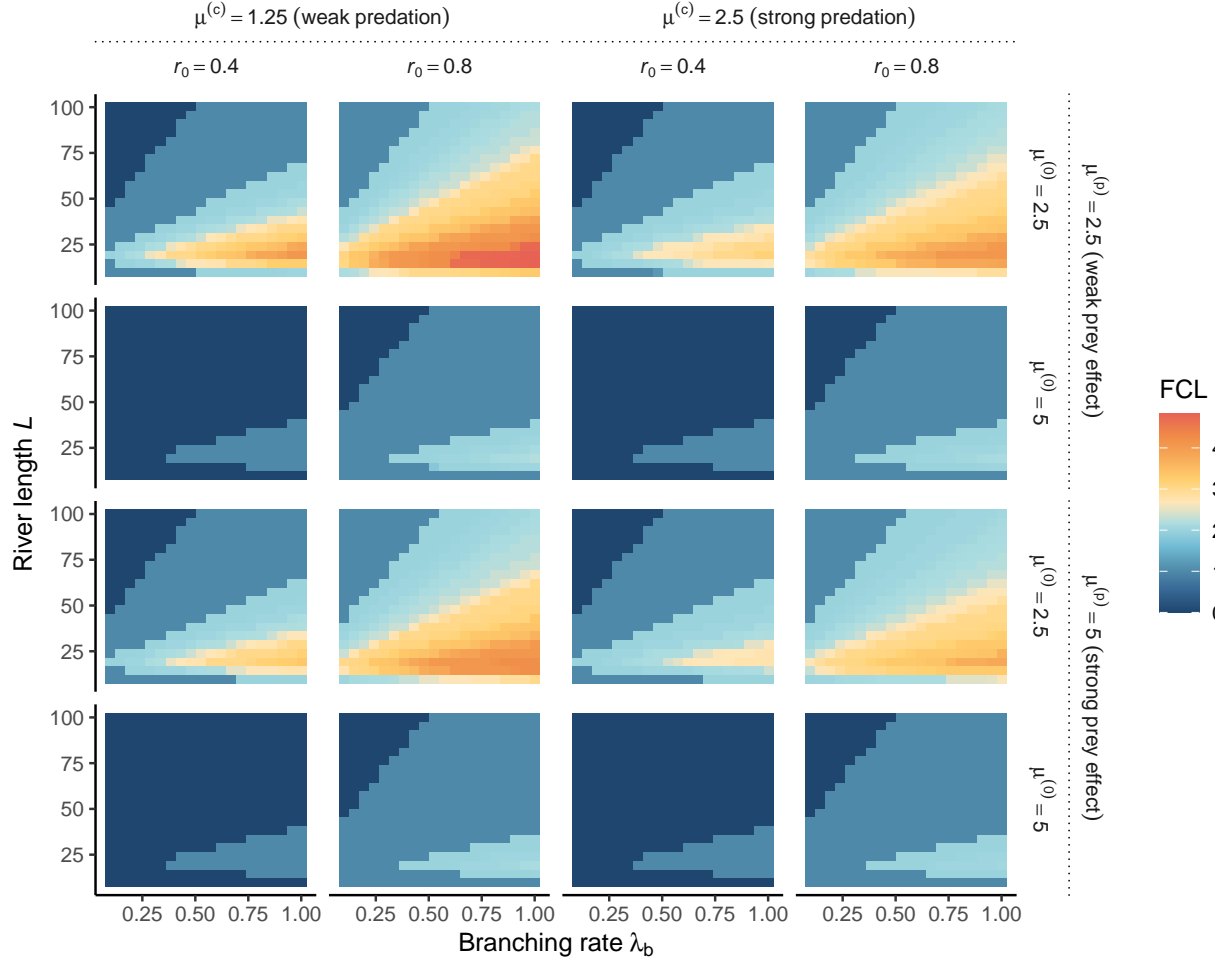


Figure 3: Heatmap of FCL as a function of ecosystem size (river length,  $L$ ) and complexity (branching rate,  $\lambda_b$ ), with rows and columns displaying different combinations of resource supply ( $r_0$ ), disturbance regime ( $\mu^{(0)}$ ), predation effect ( $\mu^{(c)}$ ), and prey effect ( $\mu^{(p)}$ ). Each cell represents the average FCL of five food webs. Additional parameter values are: number of gross propagules  $g_0 = 75$ , synchrony probability  $\rho = 0.5$ , omnivory  $\theta = 0.25$ , habitat density  $h = 2.5$ , dispersal capability  $\delta_0 = 0.5$ , and scaling exponent  $\psi = 0.5$ .

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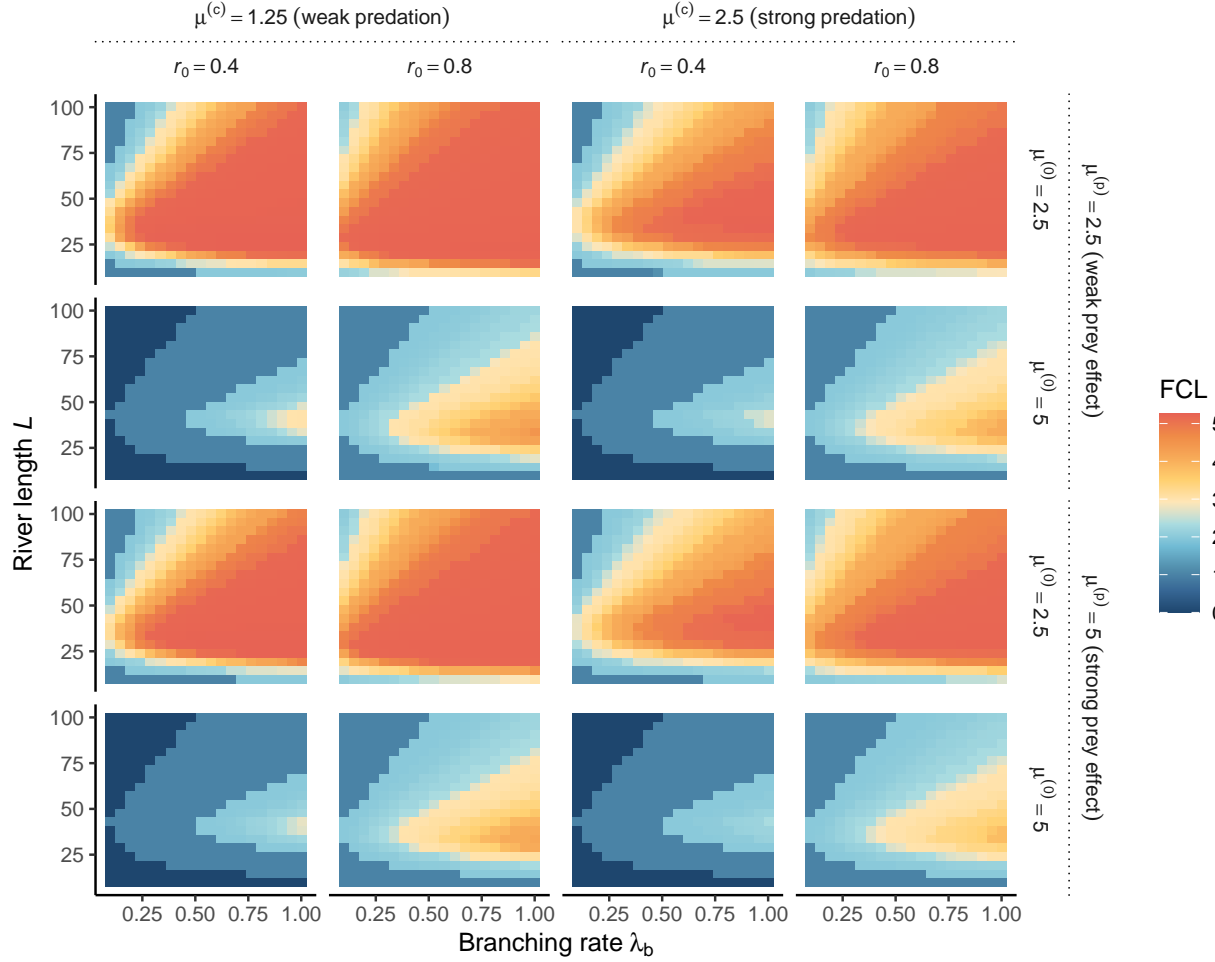


Figure 4: Heatmap of FCL as a function of ecosystem size (river length,  $L$ ) and complexity (branching rate,  $\lambda_b$ ), with rows and columns displaying different combinations of resource supply ( $r_0$ ), disturbance regime ( $\mu^{(0)}$ ), predation effect ( $\mu^{(c)}$ ), and prey effect ( $\mu^{(p)}$ ). Each cell represents the average FCL of five food webs. Additional parameter values are: number of gross propagules  $g_0 = 150$ , synchrony probability  $\rho = 0.5$ , omnivory  $\theta = 0.25$ , habitat density  $h = 2.5$ , dispersal capability  $\delta_0 = 0.5$ , and scaling exponent  $\psi = 0.5$ .

## Numerical prediction (low propagule, low synchrony, strong omnivory)

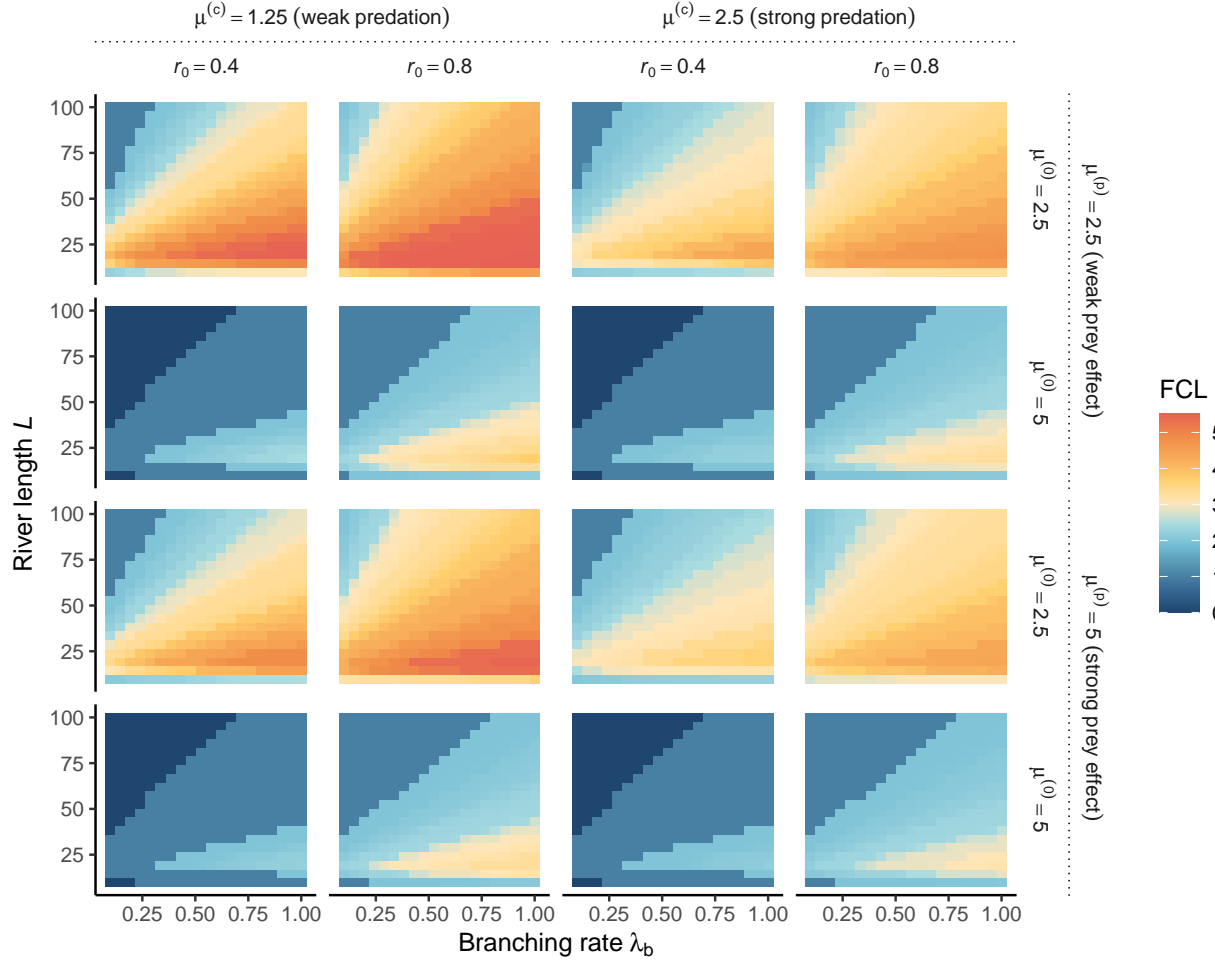


Figure 5: Heatmap of FCL as a function of ecosystem size (river length,  $L$ ) and complexity (branching rate,  $\lambda_b$ ), with rows and columns displaying different combinations of resource supply ( $r_0$ ), disturbance regime ( $\mu^{(0)}$ ), predation effect ( $\mu^{(c)}$ ), and prey effect ( $\mu^{(p)}$ ). Each cell represents the average FCL of five food webs. Additional parameter values are: number of gross propagules  $g_0 = 75$ , synchrony probability  $\rho = 0.25$ , omnivory  $\theta = 0.5$ , habitat density  $h = 2.5$ , dispersal capability  $\delta_0 = 0.5$ , and scaling exponent  $\psi = 0.5$ .

## Numerical prediction (high propagule, low synchrony, strong omnivory)

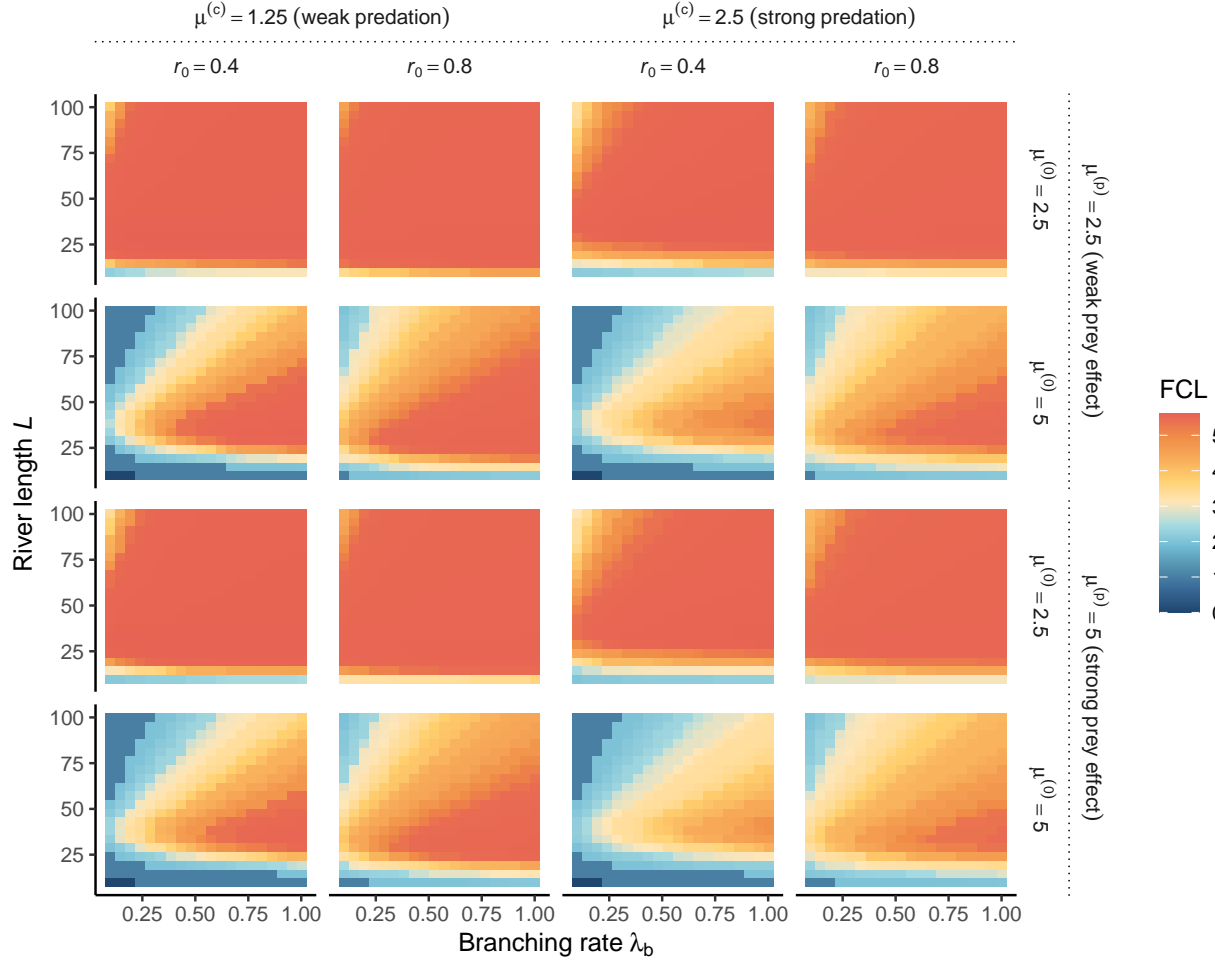


Figure 6: Heatmap of FCL as a function of ecosystem size (river length,  $L$ ) and complexity (branching rate,  $\lambda_b$ ), with rows and columns displaying different combinations of resource supply ( $r_0$ ), disturbance regime ( $\mu^{(0)}$ ), predation effect ( $\mu^{(c)}$ ), and prey effect ( $\mu^{(p)}$ ). Each cell represents the average FCL of five food webs. Additional parameter values are: number of gross propagules  $g_0 = 150$ , synchrony probability  $\rho = 0.25$ , omnivory  $\theta = 0.5$ , habitat density  $h = 2.5$ , dispersal capability  $\delta_0 = 0.5$ , and scaling exponent  $\psi = 0.5$ .

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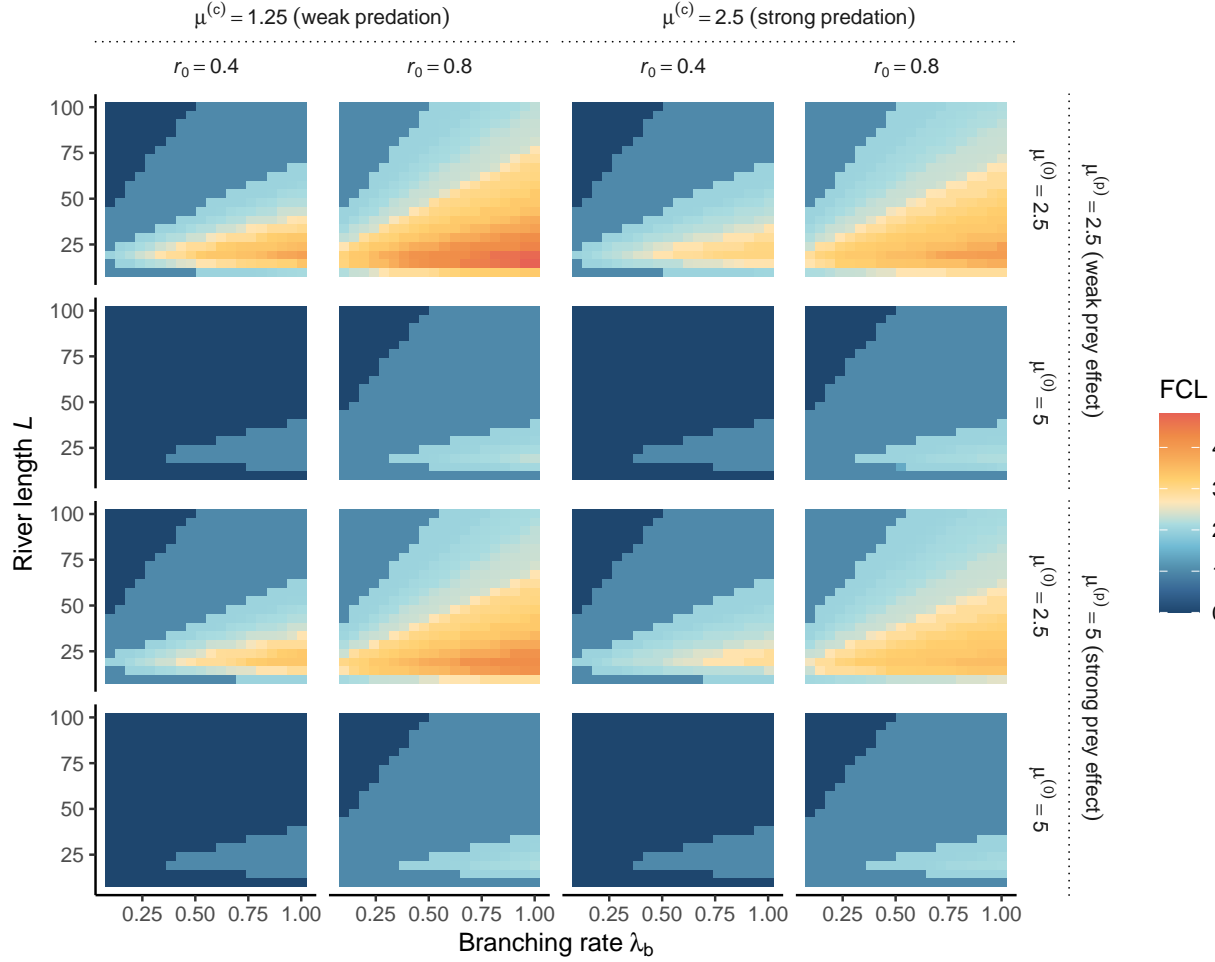


Figure 7: Heatmap of FCL as a function of ecosystem size (river length,  $L$ ) and complexity (branching rate,  $\lambda_b$ ), with rows and columns displaying different combinations of resource supply ( $r_0$ ), disturbance regime ( $\mu^{(0)}$ ), predation effect ( $\mu^{(c)}$ ), and prey effect ( $\mu^{(p)}$ ). Each cell represents the average FCL of five food webs. Additional parameter values are: number of gross propagules  $g_0 = 75$ , synchrony probability  $\rho = 0.5$ , omnivory  $\theta = 0.5$ , habitat density  $h = 2.5$ , dispersal capability  $\delta_0 = 0.5$ , and scaling exponent  $\psi = 0.5$ .

## Numerical prediction (high propagule, high synchrony, strong omnivory)

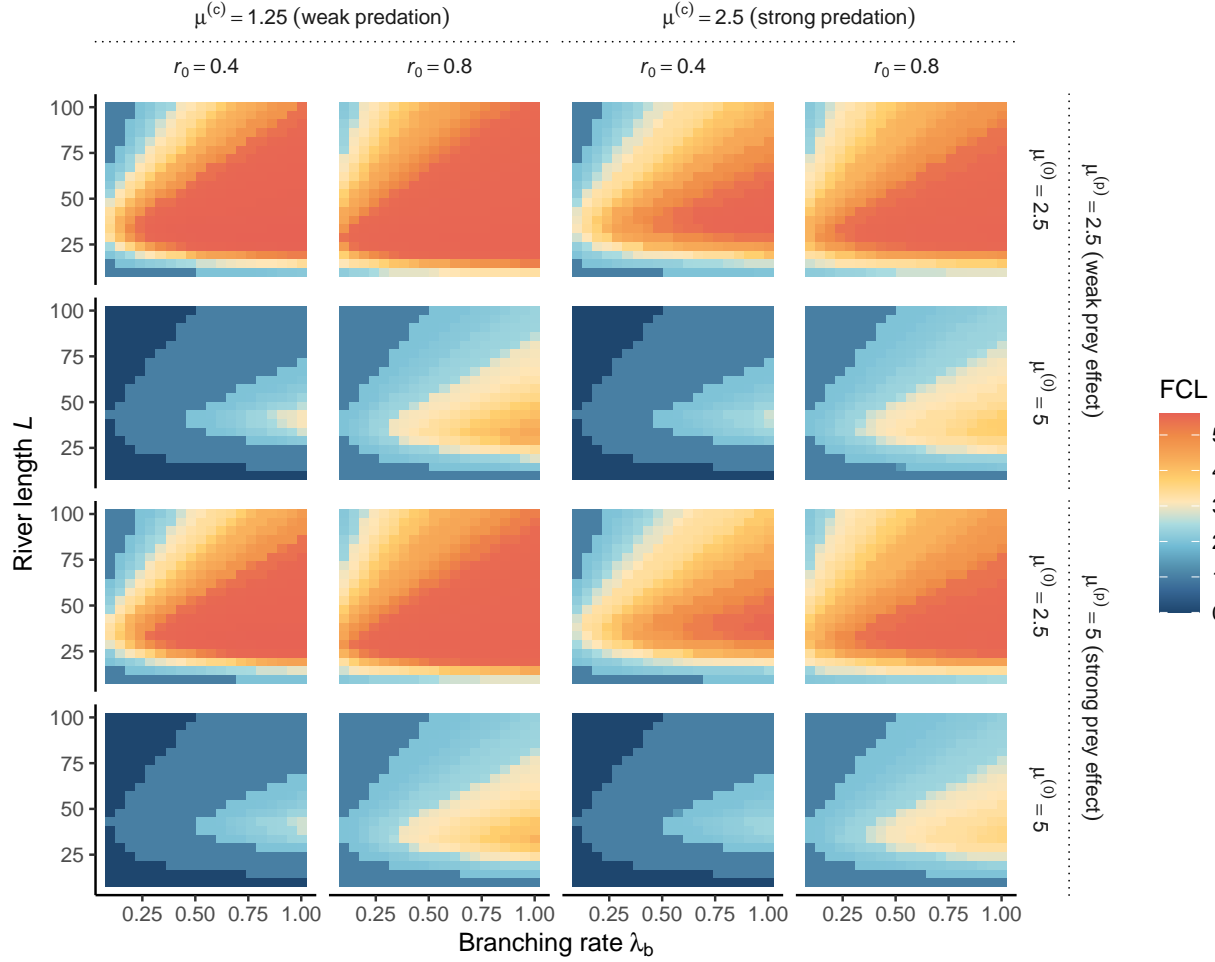


Figure 8: Heatmap of FCL as a function of ecosystem size (river length,  $L$ ) and complexity (branching rate,  $\lambda_b$ ), with rows and columns displaying different combinations of resource supply ( $r_0$ ), disturbance regime ( $\mu^{(0)}$ ), predation effect ( $\mu^{(c)}$ ), and prey effect ( $\mu^{(p)}$ ). Each cell represents the average FCL of five food webs. Additional parameter values are: number of gross propagules  $g_0 = 150$ , synchrony probability  $\rho = 0.5$ , omnivory  $\theta = 0.5$ , habitat density  $h = 2.5$ , dispersal capability  $\delta_0 = 0.5$ , and scaling exponent  $\psi = 0.5$ .