

## Research Report (April, 2020- March, 2021)

Enrollment from  
April 2020

Department of Pure and Applied Mathematics

Jumpei INOUE

### **I. List of Papers**

1. Jumpei Inoue, Kousuke Kuto, "On the unboundedness of the ratio of species and resources for the diffusive logistic equation", *Discrete & Continuous Dynamical Systems – B*, vol. 26 (5), 2021. doi:10.3934/dcdsb.2020186
2. Jumpei Inoue, "Limiting profile for stationary solutions maximizing the total population of a diffusive logistic equation", *Proceedings of the American Mathematical Society*, Accepted
3. Jumpei Inoue, Kousuke Kuto, "Impact of regional difference in recovery rate on the total population of infected for a diffusive SIS model", *Mathematics*, submitted

### **II. List of Talks**

1. Jumpei Inoue, Kousuke Kuto, "On the optimal distribution and the existence of an  $L^1$ -unbounded sequence of steady states for the diffusive logistic equation", 日本数学会 2020 年度 秋季総合分科会 関数方程式論分科会, Kumamoto Univ. (online), September
2. Jumpei Inoue, 「拡散ロジスティック方程式における  $N_i$  予想に対する反例の構成」, 数学・数理科学専攻若手研究者のための異分野・異業種研究交流会(研究交流会)2020, online, October
3. Jumpei Inoue, 「拡散ロジスティック方程式における  $N_i$  予想と  $L^1$  非有界な定常解列の存在について」, 明治非線型数理セミナー・秋の学校, online, November
4. Jumpei Inoue, Kousuke Kuto, "On the Unboundedness of the Ratio of the Total Population to the Total Resources in the Stationary Logistic Equation", *International Workshop on Multiphase Flows: Analysis, Modelling and Numerics*, online, December
5. Jumpei Inoue, Kousuke Kuto, "On an  $L^1$ -unbounded property in a class of diffusive logistic equations", 第 46 回発展方程式研究会, online, December
6. Jumpei Inoue, "On an  $L^1$ -unbounded property in an SIS reaction-diffusion model", 非線形 PDE 若手ワークショップ, online, March
7. Jumpei Inoue, Kousuke Kuto, "Impact of regional differences of recovery rates on the total population of infected in an SIS reaction diffusion model", 日本数学会 2021 年度年会 応用数学分科会, Keio Univ. (online), March
8. Jumpei Inoue, 「拡散ロジスティック方程式における  $N_i$  予想の解決と SIS モデルへの応用」, さいたま数理解析セミナー, online, March

### **III. Research Results in AY2020**

I focused on a problem to maximize the total population of species under the limited total resources. In particular, I resolved a mathematical problem asking for the supremum of a ratio of the total population to total resources, see Paper 1, 2. As an application of the above results to an SIS epidemic reaction-diffusion model, I derived that a spatially heterogeneous recovery rate of an infectious disease can make the total population of infected become large (Paper 3).

### **IV. Research Plan for AY2021**

I consider the maximizing problem in the settings of a nonlocal dispersal.