Research Report（April, 2020 - March, 2023）

In the SGU course of Mathematical Physical Science: April 2020-March 2023

Conferring university	Degree name (by completing a course)	Date of conferment
Waseda Universityy	Doctor of science	3/15, 2023

Enrollment from April 2020 | Department of Pure and Applied Mathematics | Jumpei INOUE

I. List of Papers

1. Jumpei Inoue, On the ratio of total masses of species to resources for a logistic equation with Dirichlet boundary condition, Communications on Pure and Applied Analysis, online first, 2022, doi:10.3934/cpaa.2023009.
2. Jumpei Inoue and Kousuke Kuto, Impact of Regional Difference in Recovery Rate on the Total Population of Infected for a Diffusive SIS Model, Mathematics 2021, 9, 888.
3. Jumpei Inoue and Kousuke Kuto, On the unboundedness of the ratio of species and resources for the diffusive logistic equation, Discrete and Continuous Dynamical Systems - B, 2021, 26 (5), 2441-2450.
4. Jumpei Inoue, Limiting profile for stationary solutions maximizing the total population of a diffusive logistic equation, Proceedings of the American Mathematical Society, 149 (2021), no. 12, 5153-5168.

II. Record of Awards

Young Researcher Award of the Waseda-KIOXIA partnership, 2020

III. List of Talks

1. Jumpei Inoue, On the optimal habitai profile for the Dirichlet problem of a logistic equation, MSJ Autumn Meeting 2022, Hokkaido University, September, 2022.
2. Jumpei Inoue, 拡散ロジスティック方程式の最適棲息分布, JSIAM Annual Meeting 2022, Online, September, 2022.

（Other 17 talks）

IV. Research Results in AY 2022

This year, we continued our research on optimal habitat distribution in the stationary problem for diffusion logistic equations. In particular, we investigated the effects of boundary conditions and the shape of the boundary on the problem under consideration. Details are given in the summary below.

V. Summary (From April 2020 to May 2023)

We considered the problem to maximize the ratio of total population to total biomass. Such a problem for the Neumann boundary condition was proposed by Wei-Ming Ni around 2012, and the supremum of the ratio was expected to be a finite value. Indeed, it was shown by Bai-He-Li (2015) that the supremum is 3 in the one dimension. We first studied the asymptotic profiles of the one dimensional solutions. Next, we proved that the supremum of the ratio is infinity in the high dimensions. Furthermore, it was shown that the above results hold true independent of the geometry of the boundary and the boundary conditions.