

# (1) A model for pattern formation and (2) population dynamics of the mimetic butterfly *Papilio polytes* in the Sakishima Islands, Japan: Mathematical analysis and Computer simulations

Toshio Sekimura

Chubu University, Japan



## (1) A model for pattern formation

Butterfly wing pigmentation patterns are one of the most spectacular and vivid examples of pattern formation in biology. They have attracted much attention from experimentalists and theoreticians, who have tried to understand the underlying genetic, chemical and physical processes that lead to patterning. In this paper, I present a brief review of this field by first considering the generation of the localised, eyespot, patterns and then the formation of more globally controlled patterns. We present some new results applied to pattern formation on the wing of the mimetic butterfly *Papilio dardanus* and *Papilio polytes*.



The African female limited mimetic butterfly *Papilio dardanus*

## (2) Population Dynamics of the mimetic Butterfly *Papilio polytes* in the Sakishima Islands, Japan

I next present a mathematical model for population dynamics of the mimetic swallow butterfly *Papilio polytes* in the Sakishima Islands, Japan.

**(Introduction)** *P. polytes* is a mimetic swallowtail butterfly species widely distributed across India and Southeast Asia, including Southeast of China, the Philippines, Taiwan, and the Ryukyu Islands of Japan (Clarke and Sheppard, 1972). *P. polytes* exhibits the female limited polymorphism, that is, the female is polymorphic, whereas the male is monomorphic and exhibits a white bar on the black hind wing. In the Ryukyu Islands located in the southwest of Japan, the female of *P. polytes* has two different forms, the mimetic form *f. polytes* and the non-mimetic form *f. cyrus* resembling the monomorphic male in appearance. The form *f. polytes* mimics the unpalatable butterfly *Pachiliopta aristolochiae* as a mimetic model, which has a large white area in the center, and a row of submarginal red spots on the black hind wing. Mimicry in the female of *P. polytes* is known to be Batesian mimicry. Batesian mimicry is one of the most interesting biological phenomena in nature.



*Papilio polytes* and the numerical simulation result of fore and hind wings