（学位第３号様式）

学 位 論 文 要 旨

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題　目	Evolutionary biology of the mimetic butterfly *Papilio polytes* in the Ryukyu Archipelago (琉球諸島におけるシロオビアゲハの進化生物学)

（メモ：500 ワード以内）Mimetic females of *P. polytes* in the Ryukyu Archipelago mimic the poisonous butterfly, *Pachliopta aristolochiae* (model). Interestingly, *P. aristolochiae* has established field populations on some islands of the Ryukyus since 1960s. I hypothesized that because of the changed predation pressure due to the immigration of *P. aristolochiae*, natural selection would have driven the wing colour patterns of mimetic females to more closely resemble the model from the former selectively neutral state in the absence of the model. The results of test the hypothesis showed that mean and variance of the white spot size increased after the model's arrival on Okinawa Island. Moreover, during the 1980s, the white spot size of the Yaeyama and Miyako island groups (the model arrived in 1968 and 1975, respectively) was larger than that of Okinawa Island group (the model arrived in 1993). These results are strongly evidence of natural selection caused by the arrival of the model. The white spot of mimetic females seems to be an important trait for avoiding predation, whereas ecological mechanisms causing the variation in the red spot size have been unknown. Hence, I tested the hypothesis that mimetic females develop a wider melanized (black) area under strong ultraviolet irradiation (UV), which results in smaller red spots because flying insects such as butterflies are likely to have strategies to protect their wings against UV damages. The red spot size of mimetic females varied seasonally and was significantly negatively correlated with the monthly cumulative intensity of solar UV-B radiation at the time of capture. UV exposure to larvae led to smaller red spots in the adulthood. Experimental UV exposure also suggested that the red spot size of offspring (mimetic females) whose mimetic female mothers were exposed to UV for a long time became smaller regardless of larval rearing conditions of the offspring. This putative "epigenetic" inheritance may be considered as an adaptive strategy that can optimize the wing color pattern of offspring (mimetic females) according to UV environment experienced by their mothers. Finally, I examined model-mimic relationships between *P. polytes* and the two poisonous butterflies (*P. aristolochiae* and *Byasa alcinous*) by applying the Convergent Cross Mapping (CCM) method to field observational time-series data, i.e. population density and the density of beak-marked individuals. CCM and S-map analyses revealed that increased density of *P. aristolochiae* led to decreased density of both beak-marked mimetic females and beak-marked *P. aristolochiae,* whereas increased density of mimetic female did not lead to increased density of beak-marked *P. aristolochiae.* These results suggest that mimetic females are commensalists that obtain benefit of mimicry through predation avoidance while posing no cost to *P. aristolochiae*. On the other hand, the hypothesis that *B. alcinous* is another model of mimetic females was not supported by the time-series data. The current study provides some strong insights to the evolutionary biology of Batesian mimicry.