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Dietary Habits of the Introduced Cane Toad, *Bufo marinus*, and Several Native Anurans on Ishigakijima Island, Southern Ryukyus: a Comparative Study

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The Cane toad, *Bufo marinus*, is a large bufonid toad originally distributed from southern North America (southern Texas and western Mexico) to central South America (southern Brazil). Since the early period of the 19th Century, this toad has been artificially introduced to various nonnative areas as a biological agent to control sugar cane pests. As a result, we now can see a number of feral populations, occasionally showing extremely high individual density, of *B. marinus* in the Caribbean Islands, and tropical and subtropical regions of Oceania (including northeastern Australia) and eastern Asia. In Japan, this toad was first introduced to a few oceanic islands (the Daito and Ogasawara Islands) before and immediately after the World War II, and finally to Ishigakijima Island in the southern part of the Ryukyu Archipelago in 1978. This species currently occurs in relatively high density almost all over this old continental island.

Artificially introduced species are of great concern from a viewpoint of conservation biology, because such species, once established as breeding populations, often deliver considerable impacts to native biodiversity through various types of interactions with indigenous species, such as predation, competition, and introgression. This is particularly true on such long isolated islands as the Ryukyus, because they have many endemic species that have long evolved with the absence of strong predators and powerful competitors. In this regard, elucidation of the pattern and extent of influences of the introduced *B. marinus* on the native biota of Ishigakijima Island obviously deserves a high conservation priority. To the present, however, very little is actually known of relevant aspects of this toad population.

We examined observation frequencies, and potential and actual prey items of *B. marinus* and native anuran species at three sites with different habitat conditions (pond, forest, and rice paddy field) on Ishigakijima Island. Our purposes were: (1) to clarify the diversity, variation, and selectivity of prey animals in each of these species; (2) to elucidate the extent of dietary overlap between *Bufo marinus* and native anurans; and (3) to estimate the extent of influences of the former on the latter accordingly.

At all three sites, *B. marinus* was found in substantial densities together with a few species of native frogs, confirming their broad sympatric occurrences within Ishigakijima Island. Stomach contents of *B. marinus* largely consisted of insects and other invertebrates. Comparisons in relative abundance of animal taxa from *B. marinus* stomachs and those from random sampling at same sites indicated significant prey selectivity in this toad. This suggests that the predation of this toad affects some particular invertebrates over the others. Stomach contents exhibited much greater values in mass and diversity in *B. marinus* than in any of the native anurans. Moreover, dietary overlap was greater between

B. marinus and the native anurans than between any pair of the latter at each site. These results predict negative impact of *B. marinus* on the native anurans through dietary competition.