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## Frugivorous Bird Distribution in Relation to Fruit Abundance of Forests in The Japan Sea Coast Side of Central Japan

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Generally, fruiting events of bird-dispersed plants, of which seeds are dispersed by birds, concentrate during fall-winter in temperate regions. Corresponding to the fruiting season, so many fruit-eating birds (frugivorous birds) migrate from the high latitudes (cool-temperate regions) to the low latitudes (warm-temperate, sub-tropical or tropical regions). Pan-Japan Sea area is one of important routes for migratory frugivorous birds, and its forested area must play a role as fruit resource supply for them. Alternatively, frugivorous birds contribute to forest recruitment by consuming fruits followed by dispersing seeds. However, recent decreases of forested area and increases of fragmented forest area by artificial disturbance such as development, forestation and cultivation might cause the scarcity of fruit resources. This scarcity could have negative feedback since it would be followed by a decrease in the number of migratory birds which would, in turn, mean lower reproductive success of bird-dispersed plants to more severe deforestation. In this study, we evaluate the relationship between fruit abundance and occurrence of frugivorous birds at secondary forests or forests close to an artificial environment. Our investigation was carried out in 2003, 2004 and 2005 (in progress) at eleven sites located in the Hokuriku district, transit or overwintering areas for birds, in order to determine the effect of fruit resources on distribution of frugivorous birds.

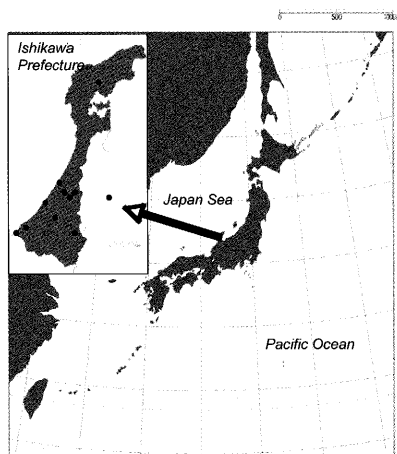


Figure 1 A location of 11 study sites

11 study sites (9 sites for both fruit and bird, and 2 sites only for bird) included one primary and ten secondary forests located in rural or urban areas of Ishikawa and Toyama prefecture, the Hokuriku district. The number of fruits of bird-dispersed plants was counted at the beginning of their ripening season, and fruit resource available for birds (*Food mass* below) was calculated by multiplying weight of edible part of fruit by the number of fruit. Bird-dispersed plants here are those bearing fleshy (berries and drupes) fruits of which seeds surrounded by or attached to edible parts. Bird censuses were conducted biweekly from September to January the next year, including a period of migration. These censuses were conducted in preconcerted census week simultaneously among all study sites by 8 co-observers in order to minimize time lag among sites. A point-count method was applied for the census. Five points for an observation were set in each study sites and record birds occurring within a radius of 25 m from the

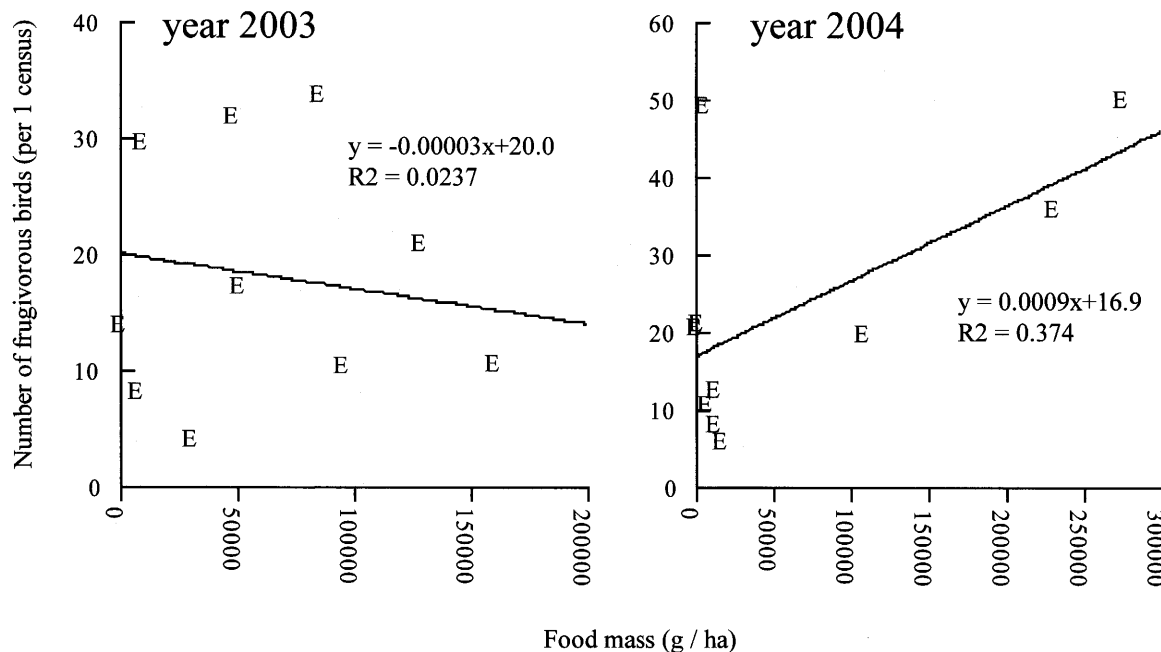
point for 5 minutes at each point.

Main results from investigations in 2003 and 2004 as follows;

1. There was no significant difference in the density of fruiting trees, available fruits, food mass and the observed number of frugivorous birds between 2003 and 2004 in the whole sites, but food mass was significantly lower in 2004 than 2004 in the whole sites of deciduous forest (t-test,  $t=2.418$ ,  $df=7$ ,  $p<0.05$ )
2. Only in 2004, there was a weak correlation between food mass and the observed number of

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frugivorous birds among all sites (a linear regression,  $R^2=0.374$ ,  $p=0.06$ , Fig. 2) and a strong correlation between food mass and the observed number of frugivorous birds among sites except one site where the overwhelming number of birds occurred (a linear regression,  $R^2=0.804$ ,  $p=0.001$ ).



**Figure 2** Number of frugivorous birds per 1 census as a function of density of mass of edible part of fruits at 9 study sites in 2003 (left) and in 2004 (right)

These suggested that frugivorous birds tend to move tracking fruit resources and hypothesized that the local pattern of occurrence of birds may be influenced by fruiting circumstances. We argue about this hypothesis introducing data analysis of the third year.