

## Forest decline and anomalies in recent years

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## Forest decline and anomalies in recent years

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In the fall 2004, black bears, *Ursus thibetanus*, appeared frequently in many human areas in Japan, especially in Ishikawa and Toyama Prefectures. A lack of food was the main factor causing frequent appearance of bears to human areas. According to Forestry Agency announcement, extraordinary numbers of typhoons that landed to Japan fell nuts at immature stage. However, our study proved that seed insects fed almost all nuts on trees before maturation. Japanese Oak Wilt (JOW), in addition, decreased the number of *Quercus crispula* trees, which depressed the number of acorns.

JOW has been prevalent since late 1980s. In Ishikawa Pref., JOW was first found Mt. Kariyasu in the west of the prefecture. It has continued to spread out to NE and reached Toyama Prefecture in 2002. JOW is caused by an ambrosia fungus, *Raffaelea quercivora*, carried by an ambrosia beetle, *Platypus quercivorus*. Necrosis spreads out in sapwood at any portions of the tree trunk, then water conductance stops, and finally tree will die. Tree mortality is 40-70% in *Q. crispula*. Pine wilt disease caused by pinewood nematode (PWDPWN) also causes a serious forest decline in Japan. The disease was caused by a pine wood nematode, *Bursaphelenchus xylophilus*, carried by a Japanese pine sawyer, *Monochamus alternatus*. *B. xylophilus* is an invasion species native of North America. Most of pine species in Japan are susceptible to the nematode because of a lack of coevolutionary process, which causes an epidemic of PWDPWN in Japan.

We must take care that these JOW and PWDPWN are in progress so that forest ecosystem in Japan will be altered greatly. However, there are no deeds to be afraid of typhoons or seed insects. The number of typhoons each year is a stochastic phenomenon. We must be careful if there is any increasing tendency in the number of typhoons relating to global warming. Most of beech nuts are demolished by seed insects before maturing except for mast years that happens once every 4-7 years. Non-mast years of beech and those of *Q. crispula* merely have occurred in the same year. Therefore, even in non-mast years of beech, bears did not appear in human areas so frequently because they could feed on acorns of *Q. crispula*. However, the number of acorns will decrease even in mast years of *Q. crispula* if the number of *Q. crispula* trees decrease by JOW. *Q. crispula* will not play an important role as a substitute food in non-mast years of beech.

In conclusion, it is important to distinguish stochastic factors from factors that are deteriorating. We should take care the latter indeed.