Transpacific biological invasions: the need to study the native habitats

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Effective management and prevention of invasives depend on a clear understanding the limiting factors that control their distribution and population growth. Because of the invasives' highly dynamic ranges and populations, it can be very difficult to draw meaningful conclusions from studies conducted solely in the invaded ranges. One way to overcome this problem is to compare the distribution patterns of the invasives in both native and introduced ranges with special attention to the range's internal structure and boundaries. At broad scales, species ranges can be compared with environmental variables from GIS datasets and remote sensing of various physical (temperature, soil) or even biological factors (natural enemies, pollinators, competitors, vegetation structure). This study uses GIS techniques to map 20 of the most dominant invasive plant species introduced to North America from Asia and 20 from Asia to North America. The purposes are (1) to map the whole species and its genetic (e.g., genotype, chromosome numbers) and morphological information (e.g., phenotype, seed size, reproductive modes) in both native and invaded ranges, (2) to compare the distribution patterns (range size, shape) and interannual dynamics between native and introduced ranges, (3) to identify the limiting factors that control the invasives' native local, regional, and continental distributions, and (4) to provide basic information for predictions of future direction and rate of invasions in introduced continents. Multiple years of distribution monitoring can tell us about the sensitivity of the invasives'native and introduced ranges to global climate and land use changes. Temporal changes in invasives' spatial distribution described on various scales from small patches to the whole species' range and the boundary dynamics can assist prediction of future invasions and be highly informative of the mechanisms responsible for invasion success. The findings would also be highly valuable in improving the effectiveness of management of invasives.

Key words: Comparative methods, native vs. exotic populations and habitats, transcontinental biological invasions