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Time series analysis of waterfowl species number change

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The objective of this study is to analyze the time series of waterfowl species numbers in Da-du estuary which was set up as Important Bird Areas (IBAs) from birdlife international in 2004. The multiplicative decomposition method has been adapted to determine the species variations, including long-term (T), seasonal (S), circular (C), and irregular (I). The results indicated: (1) The long-term trend decreased with time from 1989 to 2012; (2) There were two seasonal high peaks in April and November each year with the lowest peak in June. Moreover, since the winter visitors had the dominant numbers in total species numbers, the seasonal changes were mainly depended on the winter birds' migration. (3) The waterfowl was gradually restored back from lowest point in 1996, but the difference between 1989 and 2003 indicated the irreversible effect existed already. (4) The irregular variation was proved as a random distribution by several statistical tests including normality test, homogeneity of variance, independence test and variation probability method to portray the characteristics of the distributions and to demonstrate its randomness. Consequently, this study exhibited the time series analysis methods were reasonable well to present the waterfowl species changes numerically. And those results could be the precious data for the researches of ecosystem succession and anthropogenic impacts in the estuary.