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Humpback whales have a continually evolving vocal sexual display, or “song,” that appears to undergo both evolutionary and “revolutionary” change. All males within a population adhere to the current content and arrangement of the song. Populations within an ocean basin share similarities in their songs; this sharing is complex as multiple variations of the song (song types) may be present within a region at any one time. To quantitatively investigate the similarity of song types, songs were compared at both the individual singer and population level using the Levenshtein distance technique and cluster analysis. The highly stereotyped sequences of themes from the songs of 211 individuals from populations within the western and central South Pacific region from 1998 through 2008 were grouped together based on the percentage of song similarity, and compared to qualitatively assigned song types. The analysis produced clusters of highly similar songs that agreed with previous qualitative assignments. Each cluster contained songs from multiple populations and years, confirming the eastward spread of song types and their progressive evolution through the study region. Quantifying song similarity and exchange will assist in understanding broader song dynamics and contribute to the use of vocal displays as population identifiers.