Dung beetles are important detritivores in forests and grasslands. Their rapid consumption and burial of vertebrate feces represents an important ecosystem service, including secondary seed dispersal and enhanced soil quality. The beetles’ species-specific utilization of different types of dung can be characterized as a trophic network. Although the beetles’ choices are significantly non-random, dung-beetle networks are complex and highly generalized compared to other types of biotic interactions. The level of generalization is similar across the globe, despite a much higher diversity in the tropics. Variation in network properties across sites has important consequences for the magnitude, evenness and stability of dung removal. We thus demonstrate that a relevant ecosystem function depends on the complexity of trophic interactions.