Clearance, fragmentation, and degradation of tropical forests have resulted in declines of biodiversity. This loss of biodiversity is endangering important ecosystem processes such as seed dispersal. If anthropogenic disturbances affect seed dispersal of keystone plants, effects on tropical ecosystems might be especially pronounced. We studied frugivore assemblages and fruit removal from 25 Ficus thonningii trees in the heavily fragmented and disturbed Kakamega Forest, western Kenya. During 400 observation hours we recorded 36 frugivores visiting F. thonningii trees. We recorded significantly fewer frugivorous species in fragments compared to the main forest and in highly, compared to little, disturbed sites. Effects of fragmentation and local disturbance on the number of individuals were not significant but showed similar trends to those in the previous analyses. Furthermore, fruit removal from focal trees was slightly reduced in fragmented and significantly reduced in highly disturbed sites. These results suggest that mutualistic interactions of keystone species can be particularly sensitive to human forest disturbance with potential long-term effects on the biodiversity of tropical forests.