The cycle spectrum of a graph (the collection of all cycle lengths) has received extensive study. Since graphic matroids are based on the cycles of graphs, results in this field apply immediately to matroids. Motivated by the study of bicircular matroids, we consider the sizes of graph bicycles. That is, connected sets of edges containing exactly two cycles and no leaves. The graphs with bicycles of very few sizes have been well characterized. Here we examine graphs with bicycles of many sizes. In particular, we show that any graph of minimum degree $k$ has bicycles of at least $k$ consecutive sizes. We further explore graph properties which guarantee bicycles of nearly all sizes possible, analogous to pancyclic graphs. (Received January 27, 2014)