Bilateral symmetry is widespread across animals, yet, among bilaterians, many cases of conspicuous asymmetries evolved. This means that bilaterally homologous structures on the left and right side display divergent phenotypes. Evolution of such divergent phenotypes between structures is often thought to be favoured by modularity, but this has rarely been studied in the context of left-right differences. Here, we provide an empirical example, using geometric morphometrics to assess patterns of asymmetry and variational modularity (i.e., covariation patterns between landmarks) in a grasshopper withconspicuously asymmetric mandibles. Our morphometric data confirms the presence of conspicuous directional asymmetry in the mandibles, and surrounding structures, but not in the dorsal half of the head, which carries sensory structures. The strongest modularity signal (i.e., the weakest covariation) is found between a single module, composed of both mandibles, and the rest of the head, which is best explained by a combination of functional (feeding vs. sensory) and developmental (different ontogenetic origins) modularity. Left and right mandibles also show significant, albeit weaker, variational modularity. This supports the idea that developmental modularity may allow asymmetric shapes of left and right mandibles to arise, while remaining integrated to achieve the key-and-lock morphology necessary to achieve their feeding function.