MicroRNAs (miRNAs) are post-transcriptional regulators of gene expression that play critical roles in animal development and physiology, though functions for most miRNAs remain unknown. Worms with reduced miRNA biogenesis due to loss of Drosha or Pasha/DGCR8 activity are sterile and fail to ovulate, indicating that miRNAs are required for the process of oocyte maturation and ovulation. Starting with this penetrant sterile phenotype and using new strains created to perform tissue specific RNAi, we characterize the roles of the C. elegans Pasha, pash-1, and two miRNA-specific Argonautes, alg-1 and alg-2, in somatic gonad cells and in germ cells in the regulation of ovulation. Conditional loss of pash-1 activity resulted in a reduced rate of ovulation and in basal and ovulatory sheath contractions. Similarly, knockdown of miRNA-specific Argonautes in the cells of the somatic gonad by tissue-specific RNAi results in a reduction of the ovulation rate and in basal and ovulatory sheath contractions. Reduced miRNA pathway gene activity resulted in a range of defects, including oocytes that were pinched upon entry of the oocyte into the distal end of the spermatheca in about 42% of the ovulation events observed following alg-1 RNAi. This phenotype was not observed on worms exposed to control RNAi. In contrast, knockdown of alg-1 and alg-2 in germ cells results in few defects in oocyte maturation and ovulation. These data identify specific steps in the process of ovulation that require miRNA-specific Argonaute activity in the somatic gonad cells.