Sphingolipids and sphingosine-type compounds are widely distributed in nature; they convey a diverse set of signal transduction and stress response pathways and have profound physiological impacts.[1] Despite their recognized importance fully characterized examples of structure-activity relations are still rare. Recently, we became interested in the rosette-inducing sulfonosphingolipids, named RIFs, which induce cell differentiation in the predatory eukaryote choanoflagellate Salpingoeca rosetta.[2] We became particularly intrigued by the 6-hydroxy-(4E)-sphingenine-containing sulfonolipid named RIF-2 and its inhibitor IOR-1, both produced by the same prey bacterium. To generate the different possible stereoisomers of the (2S,3S)-6-hydroxy-(4E)-sphingenine-containing lipids and to determine the absolute configuration and further analyze the structure-activity relationship of these highly bioactive molecules,[3] we make use of a hydrozirconation addition reaction to Garner’s aldehyde and derivatives. Here, we report about the synthesis of several unnatural (2S,3S)-6-hydroxy-(4E)-sphingenine-containing lipids including a fluorescence-labelled derivative for future biological studies.