Marine arch collapse at Santa Cruz, California

On the California coast, not far south of San Francisco, the small town of Santa Cruz was very proud of its Natural Bridges State Beach. This had a splendid sandy beach right beside a narrow rock headland that was broken by two perfect marine arches. They are best labelled as sea arches or marine arches, as natural bridges are the comparable features formed by river erosion through meander necks. Each arch had formed where selective wave erosion had picked out weaknesses, probably along joint/bedding intersections, in the almost horizontal fine-grained sandstones. The two sea caves were easily formed and then rapidly extended as the hammer blows of waves were concentrated onto their inside walls, so that both caves soon broke through the narrow rock promontory to form the arches. With continuing erosion, all marine arches are destined to become ever larger, until they inevitably collapse, leaving the offshore remnant as a sea stack or small island. The whole process generally takes thousands of years, but the collapses are almost instant events, usually unseen during a powerful winter storm. Thus Santa Cruz lost the larger of its two bridges during a storm in January 1980. The second of this pair of photographs was taken some months after the collapse, when the old arch abutments had weathered back a bit more and wave action had already removed the fallen debris. The surviving arch had not become smaller – the view is from a slightly different angle – and its roof is thick enough to suggest that Santa Cruz will at least have one Natural Bridge for many years to come. It had already lost a third arch, further out to sea, that collapsed in the early 1900s. Though the site is a fine example of geology in action, the end result is less dramatic, as is so often the case when landform development matures from the spectacularly youthful and degrades into unexciting old age: landforms and people seem to go the same way!   © *Photograph and text by Tony Waltham Geophotos*