Let S be a K3 surface and C a genus g curve lying on it. The Donagi-Morrison conjecture concerns complete linear series A of type grd on C such that $d \leq g - 1$ and the Brill–Noether number is negative. It predicts that such an A is contained in another linear series which is cut out from a line bundle on S and satisfies some numerical conditions, meaningful from a Brill–Noether theory viewpoint. We provide counterexamples to the conjecture already for r = 2. We then study a slight modification of the conjecture, which is known to hold for r = 1, 2. By using coherent systems and generalized Lazarsfeld–Mukai bundles, we prove the modified conjecture under some hypotheses on secant divisors to the curve C and its deformations. We show that these hypotheses cannot be avoided by exhibiting counterexamples obtained jointly with A.L.Knutsen.