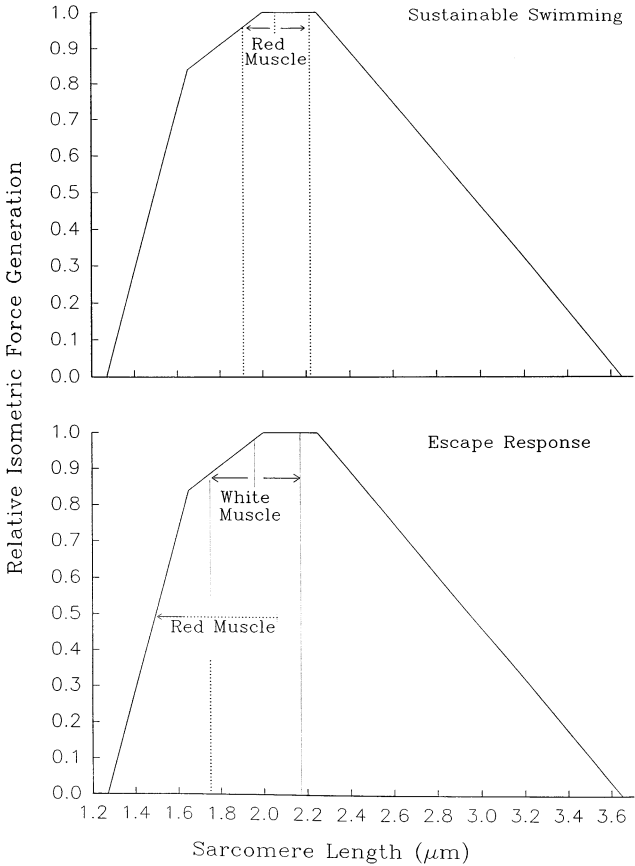


Fig. 4. Design constraint 1-Myofilament overlap. During all movements, muscle is used at nearly optimal myofilament overlap. During steady swimming (A), carp use red muscle over a SL of 1.91–2.23 $\mu$m, where no less than 96% maximal tension is generated. If the red muscle had to power the more extreme escape response (B), it would have to shorten to 1.4 $\mu$m where it generates little tension and can be damaged. Instead the white muscle which has a 4 × greater gear ratio is used. In the posterior region of the fish, the white muscle shortens to only 1.75 $\mu$m, where at least 85% maximal tension is generated. In the rest of the fish the excursion is smaller (average 1.82 $\mu$m) and the force higher (average 92%). Reproduced from [26].