Snapping shrimp produce a snapping sound by an extremely rapid closure of their snapper claw. They usually occur in large numbers providing a permanent crackling background noise, thereby severely limiting the use of underwater acoustics for active and passive sonar, both in scientific and naval applications. Source levels reported for *Alpheus heterochaelis* are as high as 220 dB (peak-to-peak) *re* 1 μPa at 1 m distance. Recent ultra-high-speed imaging of the snapper claw closure [Versluis *et al*., Science (in press)] revealed that the sound is generated by the collapse of a cavitation bubble formed in a fast flowing jet of water forced out from between the claws during claw closure. In this work, we develop a theoretical model for a bubble under such conditions. The dynamics of the bubble radius and the emitted sound can be described by the Rayleigh–Plesset equation. The calculated results are compared with the experimental data. The model fully reproduces the bubble dynamics and it quantitatively accounts for the time dependence of the bubble radius and for the emitted sound. [a)]Also at Dept. of Physics, Philipps-Univ. Marburg, Renthof 6, 35032 Marburg, Germany.