The following is the derivation of the amplitude -- bob mass function for a, driven, at resonance, simple plane pendulum

The usual simple plane pendulum assumptions apply, i.e. rigid support, linear dissipation only, small angle regime, etc. However, the massless rod and point mass bob are not necessary if the period is unchanged.

The starting point is the differential equation:

1, $I\ddot{\theta} = T$, or:

1a, $ml^2\ddot{\theta} = -kl\dot{\theta}l - mg\theta l + \Gamma\cos\omega$

where the last term is the harmonic torque drive.

This reduces to the more familiar:

$$\ddot{\theta} + \frac{k}{m}\dot{\theta} + \frac{g}{l}\dot{\theta} = \frac{\Gamma}{ml^2}\cos\omega t$$

Note: many texts use the more mathematically convenient 2γ for the dissipation constant.

However, this obscures the very important mass factor.

The well known solution (under damped) is:

3, $\theta(t) = Ce^{-\frac{k}{2m}t}[\cos(\omega_1 t + \alpha] + B\cos(\omega t - \phi)$

here $\omega_1^2 = \omega_0^2 - \left(\frac{k}{2m}\right)^2$ and $\omega_0^2 = {}^{g}\!/_{l}$

Ignoring the transient (The pendulum is at equilibrium.),

$$4,\quad B = \frac{\Gamma / ml^2}{\sqrt{(\omega_0^2 - \omega^2)^2 + (k/m)^2 \omega^2}}$$

B is maximum at the resonance frequency: $5,\ \omega_R = \sqrt{\omega_0^2 - \frac{k^2}{2m^2}}$

Substituting, letting $\frac{k}{m} = c$, and symplifying:

$$6,\quad B = \frac{\Gamma}{ml^2 c}[\omega_0^2 - \frac{c^2}{4}]^{-1/2} = \frac{\Gamma}{kl^2\omega_0\sqrt{1 - \frac{k^2}{4m^2\omega_0^2}}}$$ If the radical's second term is small, then:

$$6a,\quad B \cong \frac{\Gamma(1 + \frac{k^2}{8m^2\omega_0^2})}{kl^2\omega_0}$$

This approximation clearly shows a mass increase decreases the amplitude.