A proud deep-sea fisherman hangs a 65.0-kg fish from an ideal spring having negligible mass. The fish stretches the spring 0.120 m. (a) Find the force constant of the spring. The fish is now pulled down 5.00 cm and released. (b) What is the period of oscillation of the fish? (c) What is the maximum speed it will reach?

**Identify:** Use the amount the spring is stretched by the weight of the fish to calculate the force constant \( k \) of the spring. \( T = 2\pi\sqrt{\frac{m}{k}} \). \( v_{\text{max}} = \omega A = 2\pi f A \).

**Set Up:** When the fish hangs at rest the upward spring force \( F_s = kx \) equals the weight \( mg \) of the fish. \( f = \frac{1}{T} \). The amplitude of the SHM is 0.0500 m.

**Execute:**

(a) \( mg = kx \) so
\[
\frac{mg}{x} = \frac{(65.0 \text{ kg})(9.80 \text{ m/s}^2)}{0.120 \text{ m}} = 5.31 \times 10^3 \text{ N/m}
\]

(b) \( T = 2\pi \sqrt{\frac{m}{k}} = 2\pi \sqrt{\frac{65.0 \text{ kg}}{5.31 \times 10^3 \text{ N/m}}} = 0.695 \text{ s} \)

(c) \( v_{\text{max}} = 2\pi f A = \frac{2\pi A}{T} = \frac{2\pi (0.0500 \text{ m})}{0.695 \text{ s}} = 0.452 \text{ m/s} \)

**Evaluate:** Note that \( T \) depends only on \( m \) and \( k \) and is independent of the distance the fish is pulled down. But \( v_{\text{max}} \) does depend on this distance.