Superconducting properties and the Fermi surface in noncentrosymmetric CeRhSi$_3$ T. TERASHIMA, T. YAMAGUCHI, T. MATSUMOTO, S. UJI, National Institute for Materials Science, N. KIMURA, T. KOMATSUBARA, H. AOKI, Tohoku University, H. HARIMA, Kobe University — CeRhSi$_3$ is a recently-discovered noncentrosymmetric superconductor [Kimura et al., PRL 95, 247004 (2005)]. At ambient pressure $P$, it orders antiferromagnetically below $T_N$ = 1.6 K. $T_N$ decreases with $P$ above ~8 kbar, and disappears somewhere above 20 kbar. Superconductivity is observed above ~12 kbar. We have performed measurements of ac susceptibility and the de Haas-van Alphen effect (dHvA) with the field in the $c$ direction up to $P$ = 29.5 kbar. Remarkably high upper critical fields $B_{c2}$ are observed: e.g., $B_{c2}$ = 17.5 T at 0.46 K for $P$ =29.5 kbar, where the superconducting transition temperature is only 1.1 K. The Fermi surface continuously evolves from $P$ = 0 to 29.5 kbar, and the effective masses decrease with $P$. We argue that these are consistent with theoretical scenarios ascribing antiferromagnetism to spin-density-wave formation. Analyses of dHvA oscillations in the mixed state seem to suggest an anisotropic superconducting energy gap.