Finding correspondences between two images of the same scene or object, taken from different viewpoints and in different conditions, is a challenging task. Furthermore, in the analysis of scientific imagery, it must be possible in terms of human perception to appreciate detected local features, thus making the task even more complex. One method, used by ecologists in their population studies and conservation efforts, is photo identification. In addition to identifying individual plants or animals or classifying species, precise phenotypic (appearance) measurements are needed. A renowned generic feature detector, Maximally Stable Extremal Regions (MSER), performs very well on structured images, but has difficulties with blur, lighting and increased resolution. The detected regions do not always correspond to semantically meaningful image structures, and the large number of regions hampers scalability. This paper proposes a Data-driven Morphology Salient Regions (DMSR) detector which overcomes these limitations. We present a new binarization algorithm which uses a threshold derived from the data; the resulting binary image is analyzed for saliency using morphology. DMSR shows transformation invariance and comparable repeatability to MSER on several evaluation benchmarks while obtaining better invariance to lighting, blur and resolution. This is achieved via significantly fewer regions, leading to better scalability. Preliminary results on animal and plant images indicate that DMSR could indeed be a suitable approach for wild-life biometric applications as the detected regions correspond well to the semantic salient image structures. We also introduce OxFrei - a dataset for transformation-independent detection evaluation.