Finding correspondences between two images of the same scene or object, taken from different viewpoints and conditions, is a challenging task. Analyzing scientific imagery often requires detected local features to coincide with the human perception, thus making the task even more complex. Ecologists use photo-identification methods in their population studies and conservation efforts. In addition to the task of identifying an individual plant or animal or classifying species, precise phenotypic measurements are needed. A renowned generic region 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 their large number hampers scalability. This paper proposes a Data-driven Morphology Salient Regions (DMSR) detector which overcomes the above limitations. A new binarization algorithm uses a threshold derived from the data and 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. Some preliminary results on animal and plant images, indicate that DMSR could be a suitable approach for such wild-life biometric application as the detected regions correspond well to the semantic salient image structures. The paper also introduces OxFrei - a dataset for transformation-independent detection evaluation.