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 the detected local features to match the human saliency perception, thus adding more complexity to the task. Ecologists use photo-identification methods in their population studies and conservational efforts. In addition to the task of identifying an individual plant or animal or classifying species, precise phenotypic measurements are needed. Generic detectors, such as the renowned Maximally Stable Extremal Regions (MSER) perform very well on structured images, but have difficulties with blur, lighting and increased resolution. The detected regional features do not always correspond to semantically meaningful 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. The binary image is analyzed for saliency using morphology. DMSR shows transformation invariance and comparable repeatability to MSER on several benchmarks while achieves better invariance to lighting, blur and on images with increasing resolution. This is achieved via significantly fewer detected regions, leading to better scalability. Some preliminary results on animal and plant images, indicate that DMSR could be a suitable approach for such application as it matches the semantic salient regions well. The paper also introduces OxFrei - a dataset for transformation-independent detection evaluation. For repeatability of the research reported in the paper, all experimental results, well-documented dataset and the open-source software are available online.