Tan, Luis Carlos B.
2015-04318

Number 1

1. Running kmeans multiple times, each time with 2 random centroids, what would the segmentation look like?

The segmentation heavily depends on the centroids that were randomly generated so there are times that the segmentations from different cases differ from the other even after having the same 2 images trained and same image to process. It also depends on the 2 images usd for training since there are large discrepancies between the same image but trained with different images. Nevertheless, the segmentation always follows the right clustering to some extent and thus looked like the image itself but with less precision and accuracy.

Specimen : Filaria

Figure 1.1 : Processed Filaria1 image with 3 random centroids

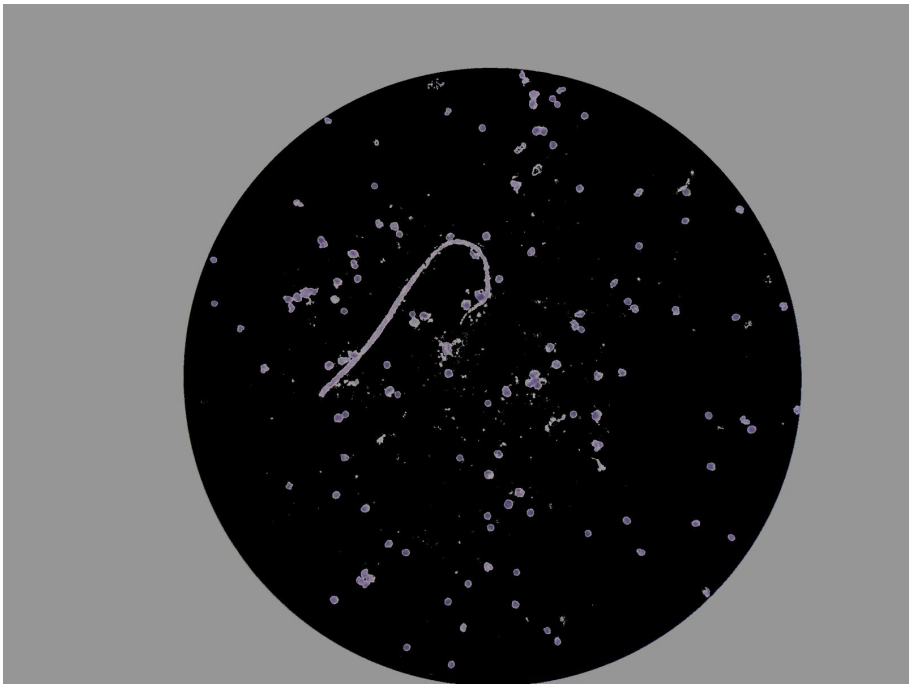

Figure 1.2 : Processed Filaria2 image with 3 random centroids

Figure 1.3 : Processed Filaria3 image with 3 random centroids

Figure 1.4 : Processed Filaria4 image with 3 random centroids

Figure 1.5 : Processed Filaria5 image with 3 random centroids

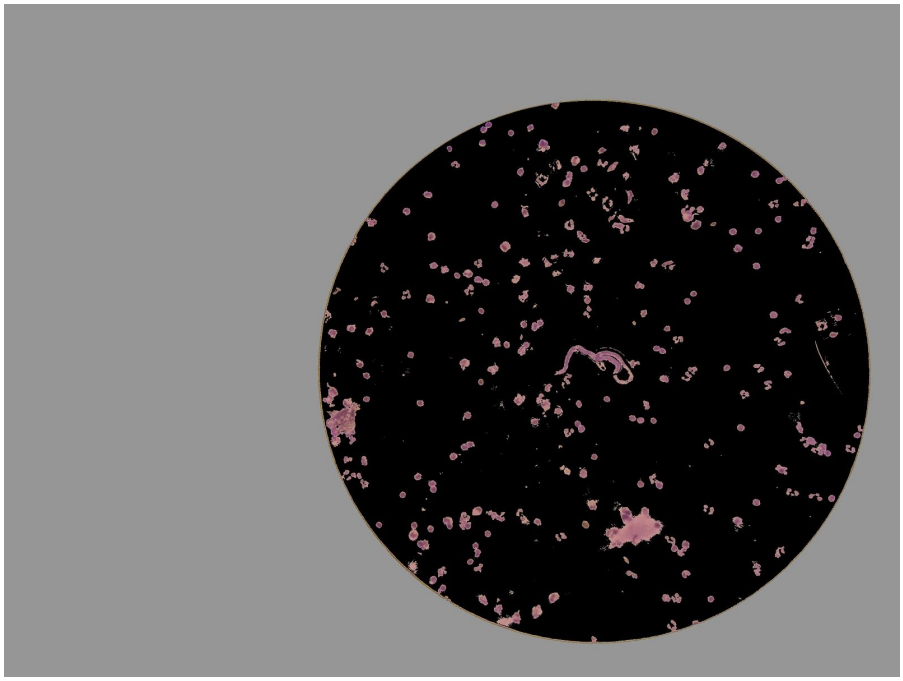

Figure 1.6 : Processed Filaria6 image with 3 random centroids

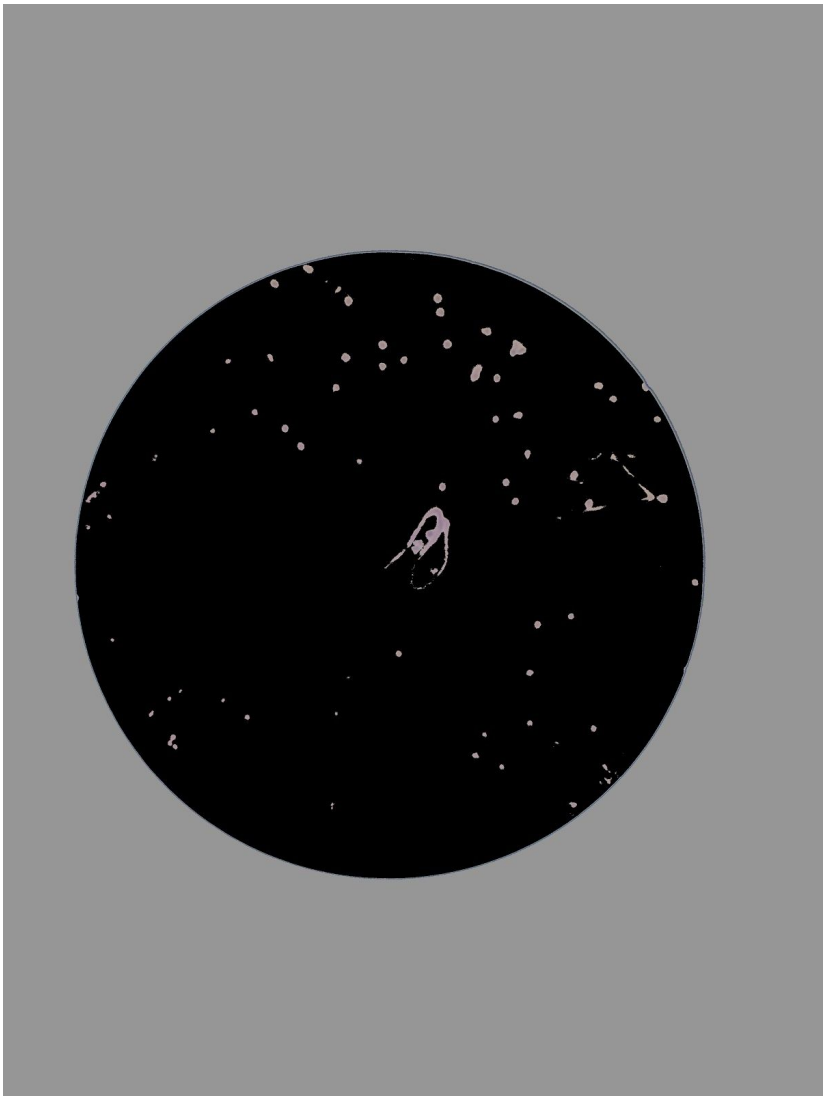

Figure 1.7 : Processed Filaria7 image with 3 random centroids

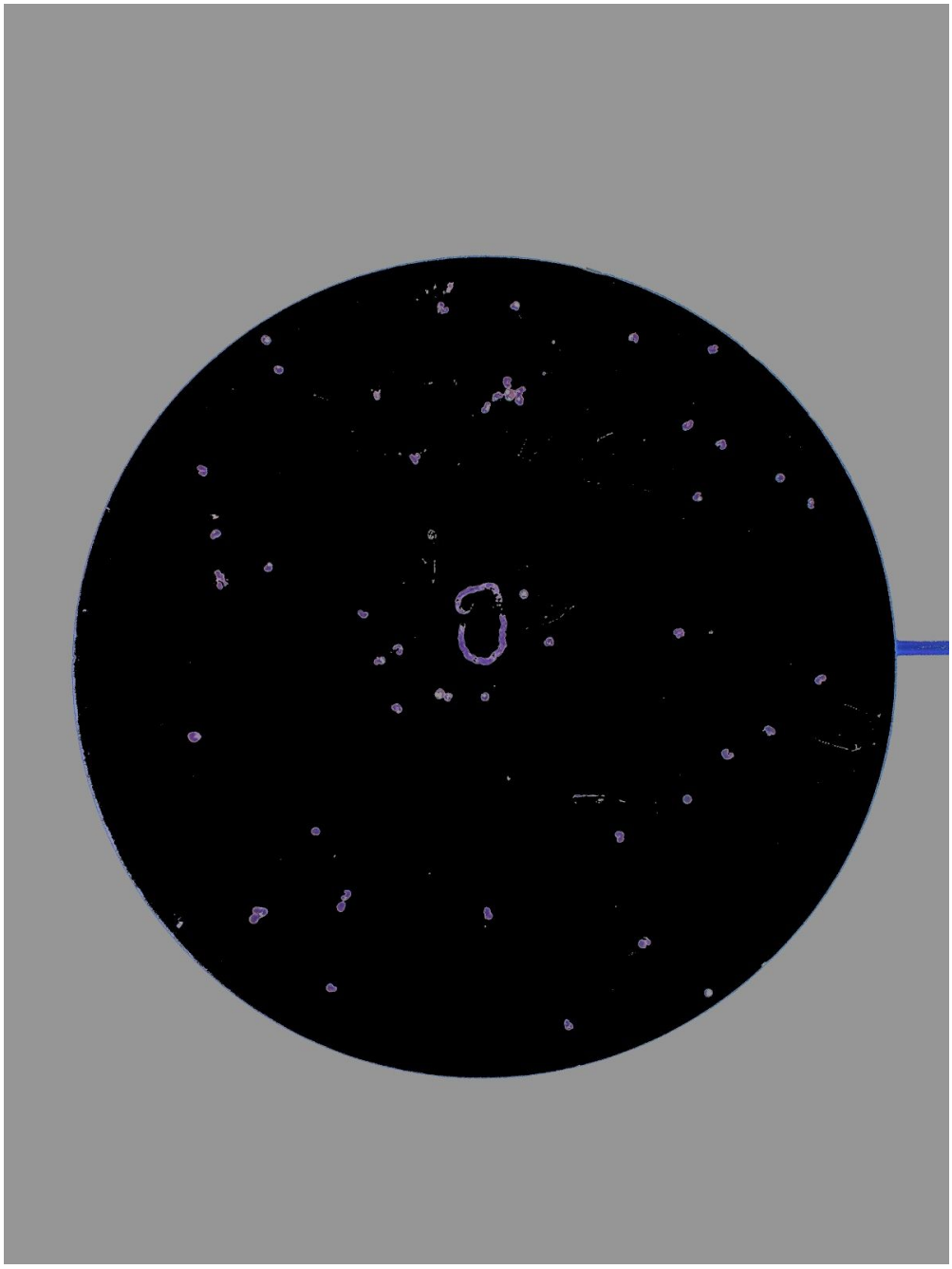

Figure 1.8 : Processed Filaria8 image with 3 random centroids

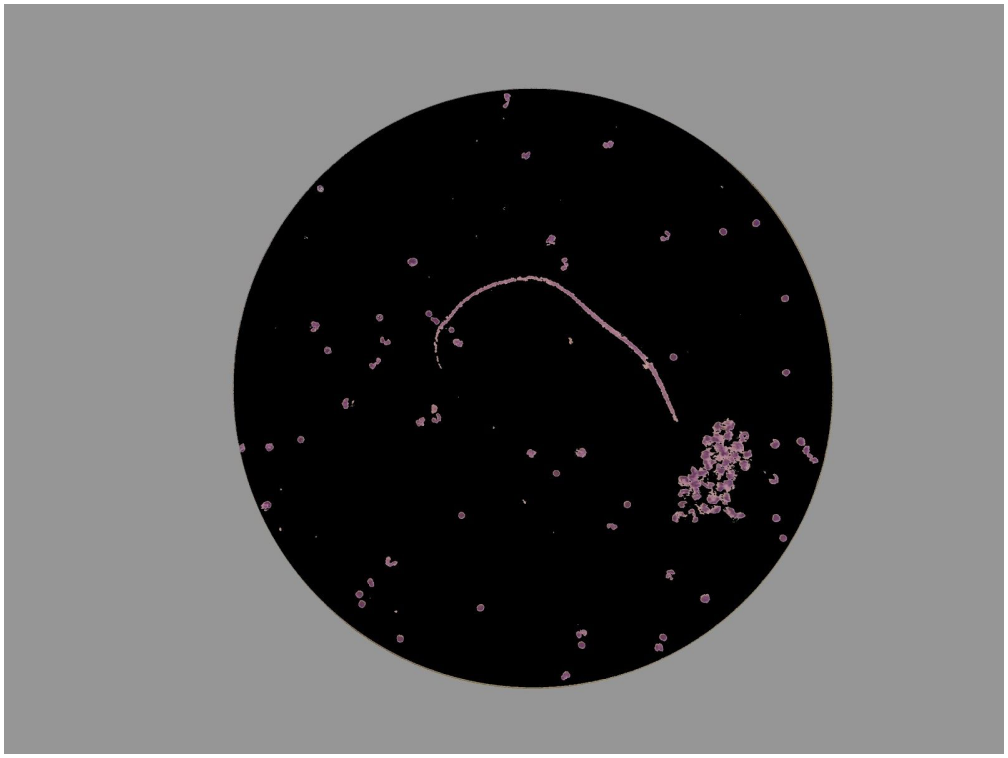

Figure 1.9 : Processed Filaria9 image with 3 random centroids

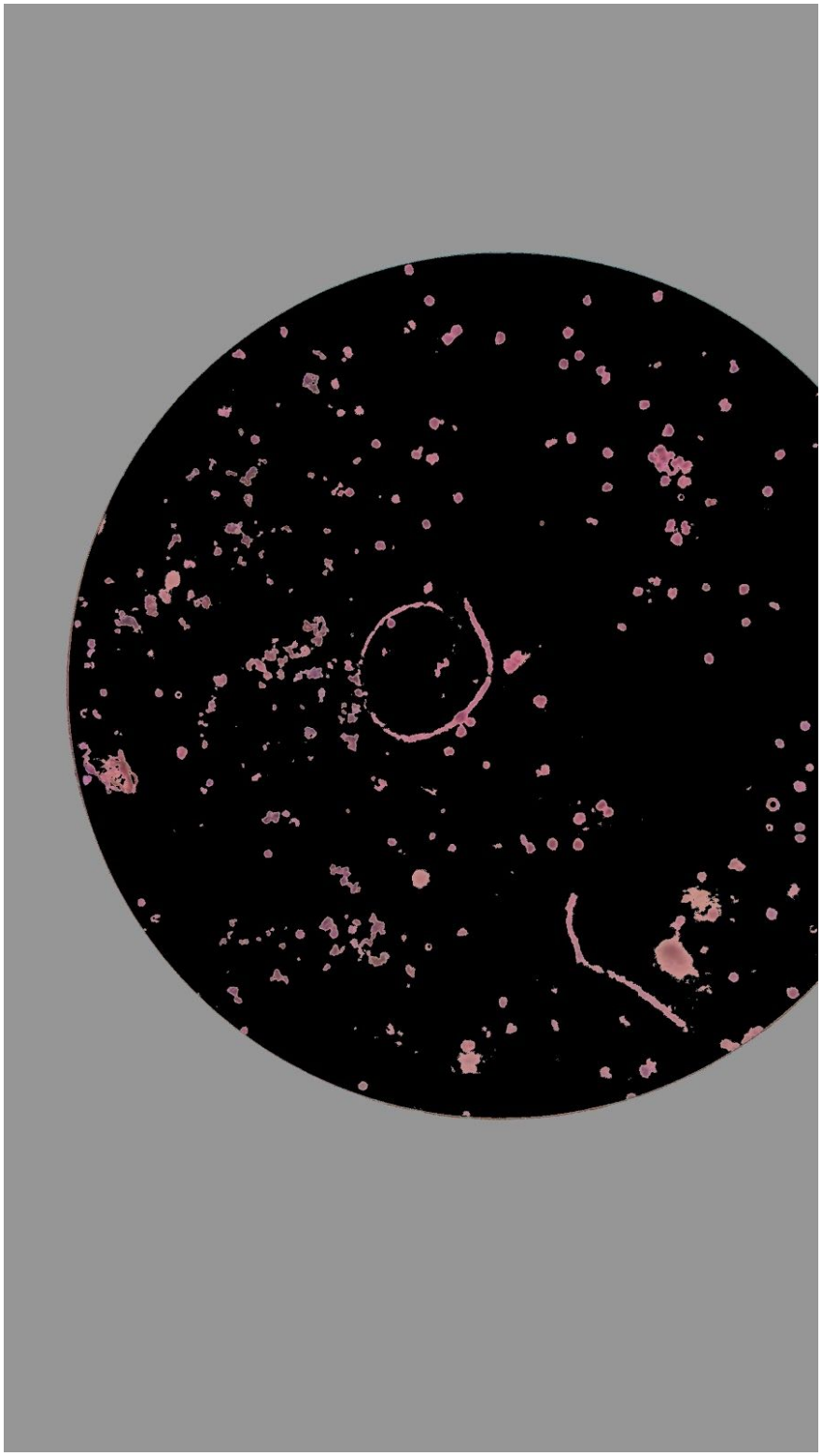

Figure 1.10 : Processed Filaria10 image with 3 random centrfoids

Specimen : Plasmodium

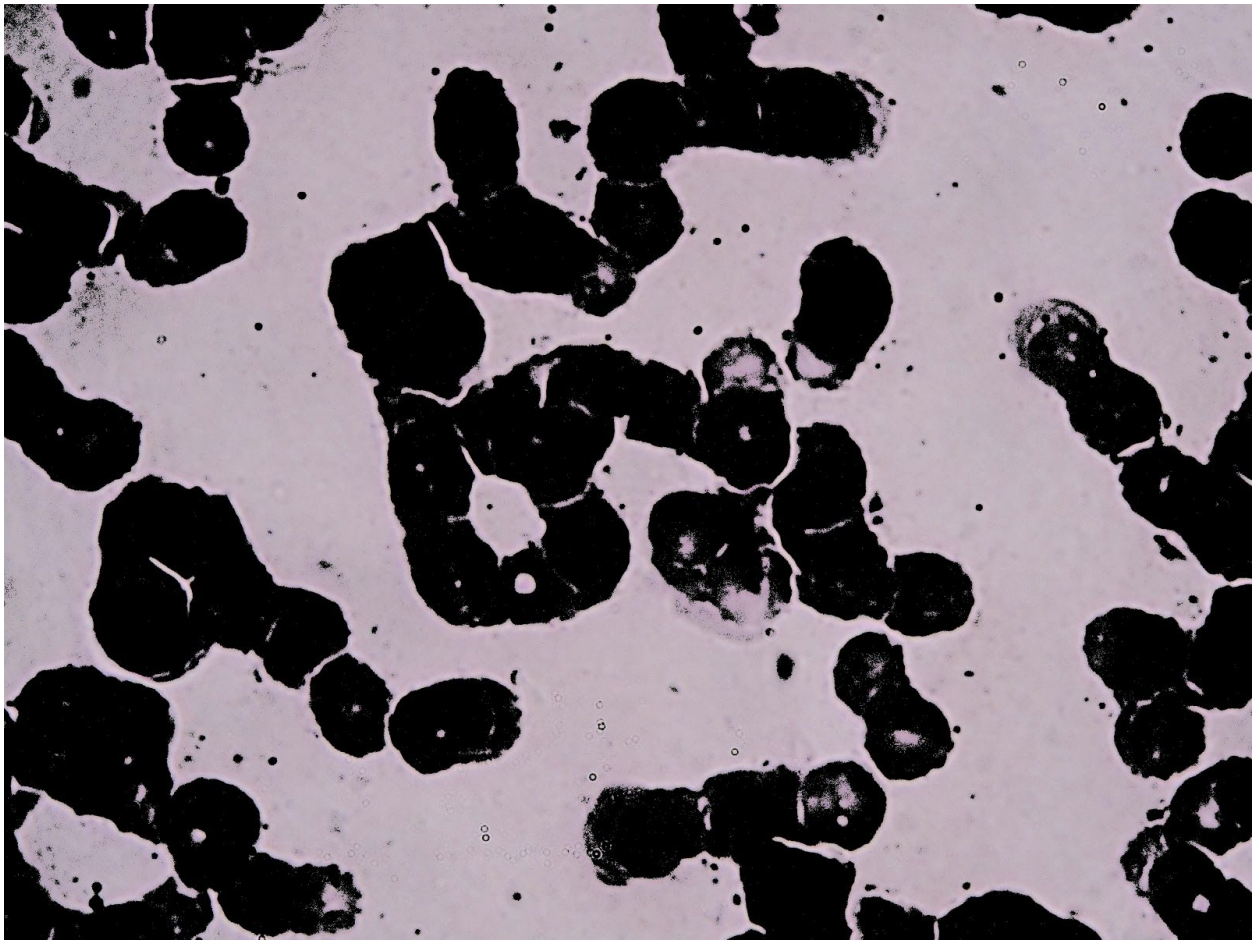

Figure 1.11: Processed Plasmodium1 image with 3 random centrfoids

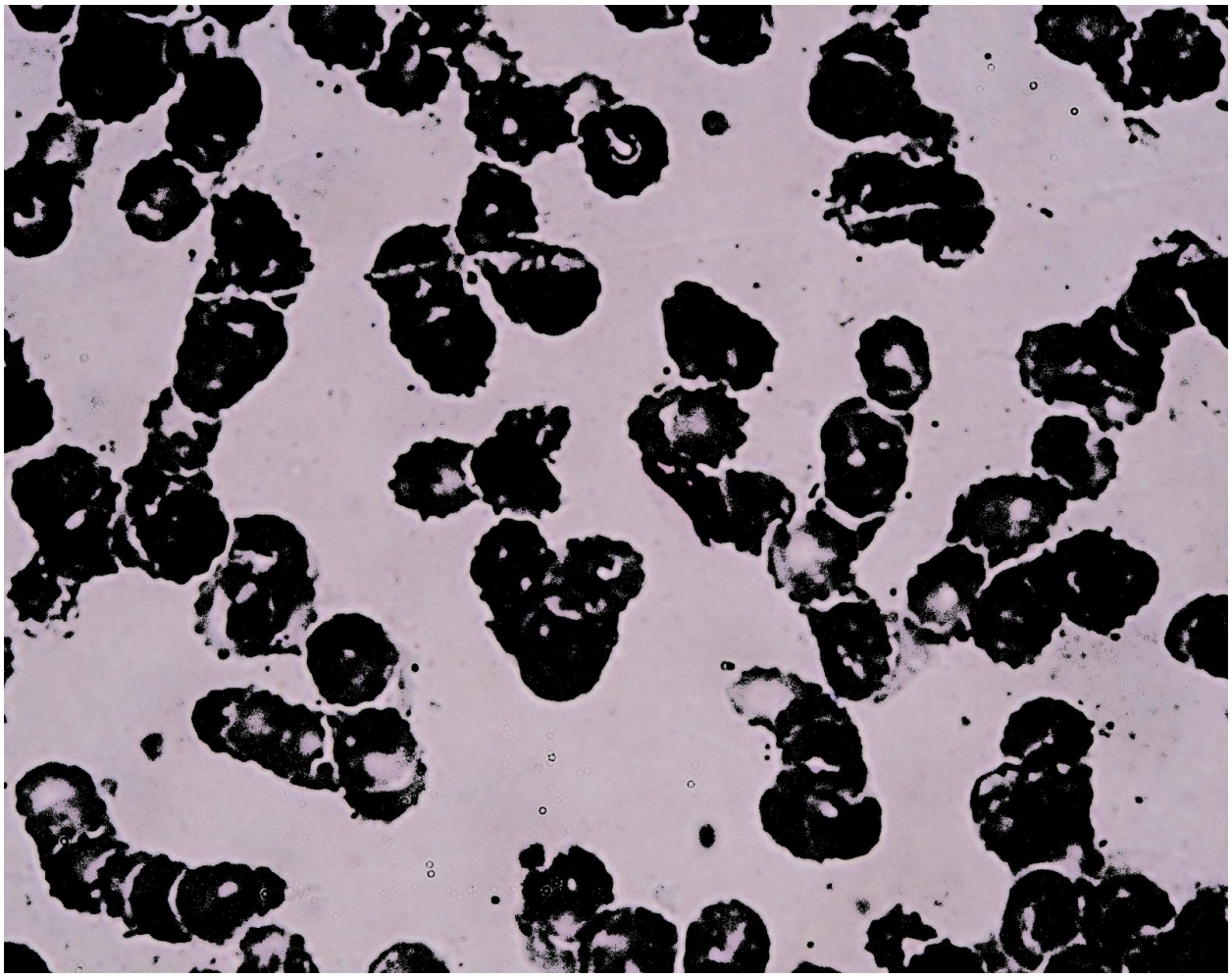

Figure 1.12: Processed Plasmodium2 image with 3 random centrfoids

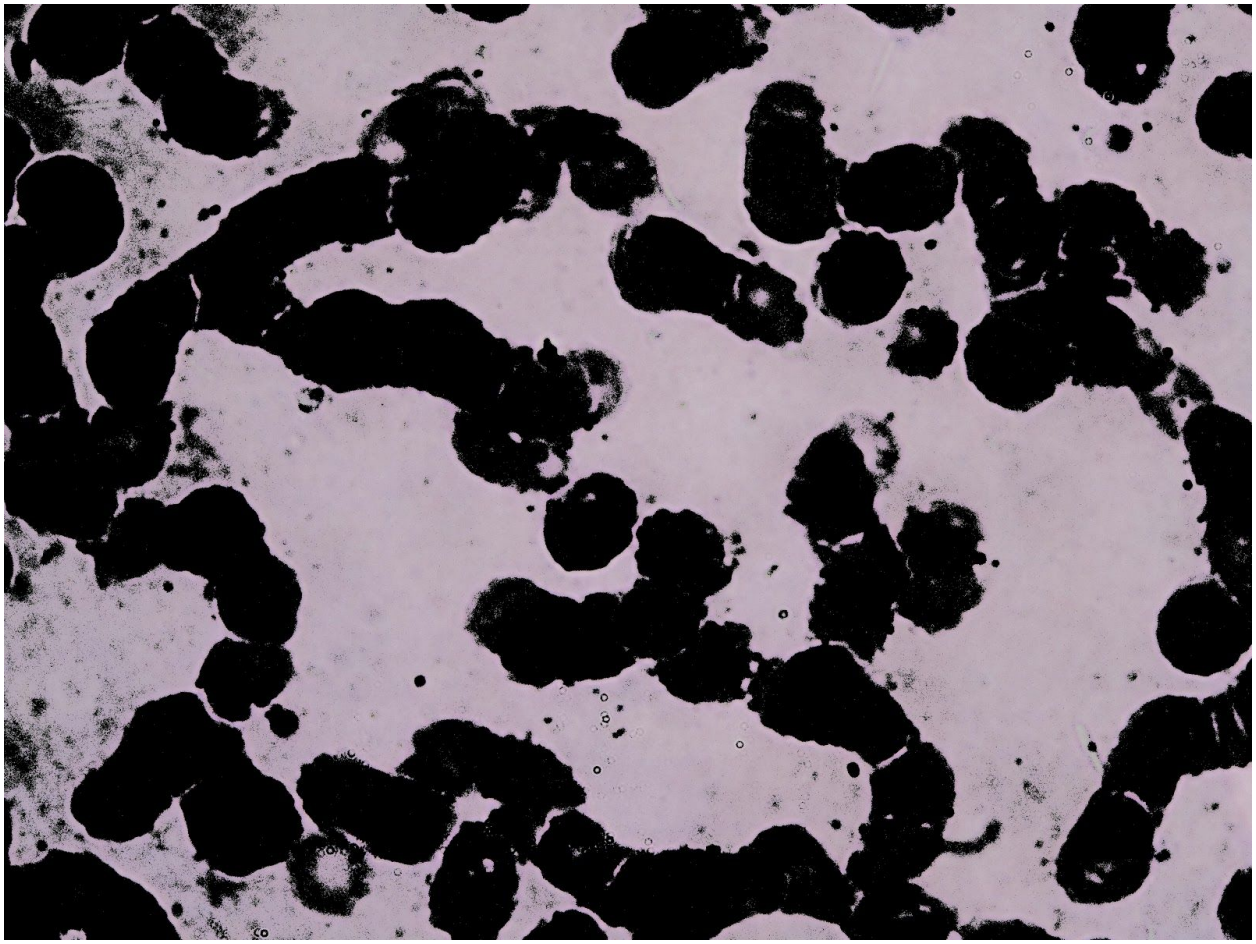

Figure 1.13: Processed Plasmodium3 image with 3 random centrfoids

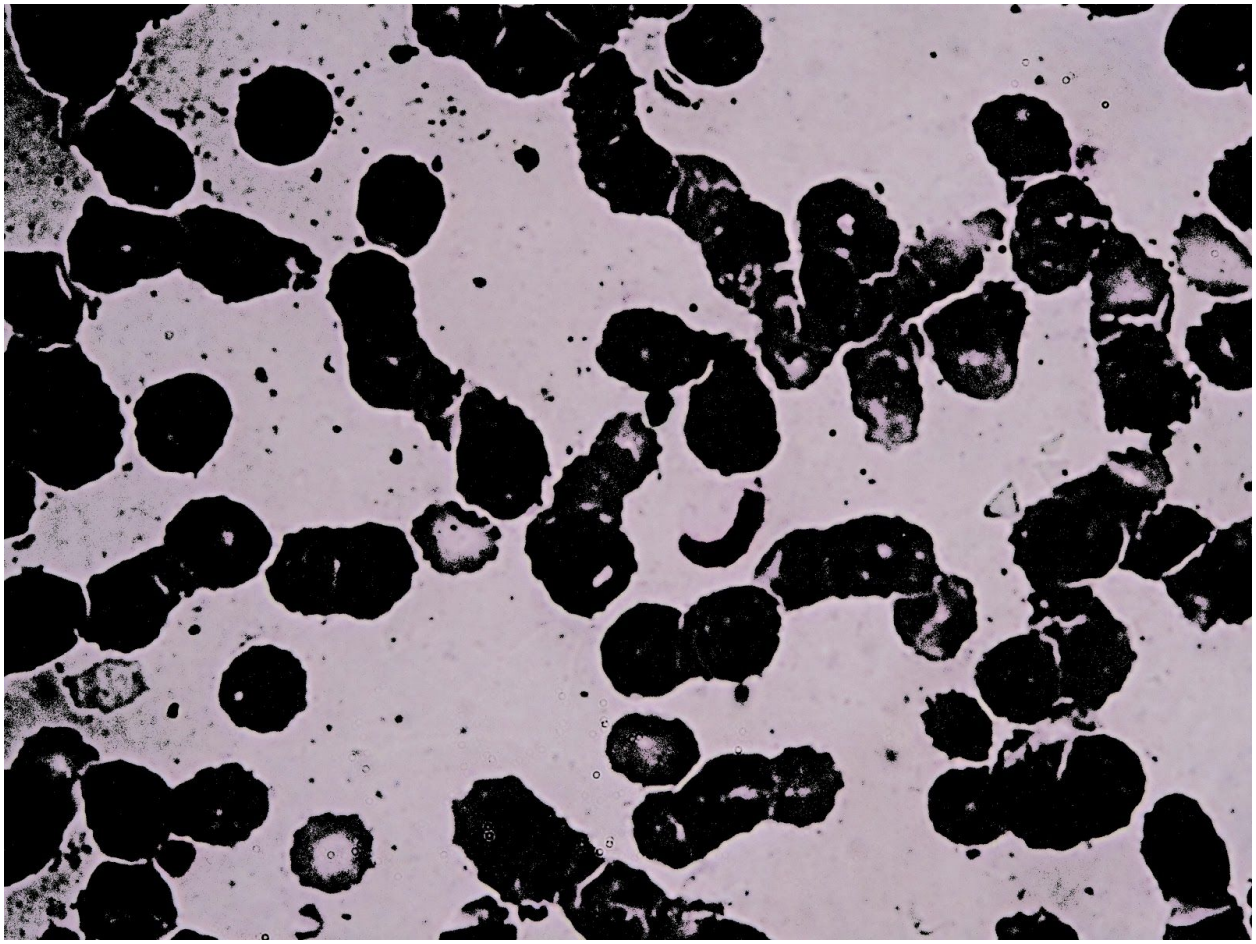

Figure 1.14: Processed Plasmodium4 image with 3 random centrfoids

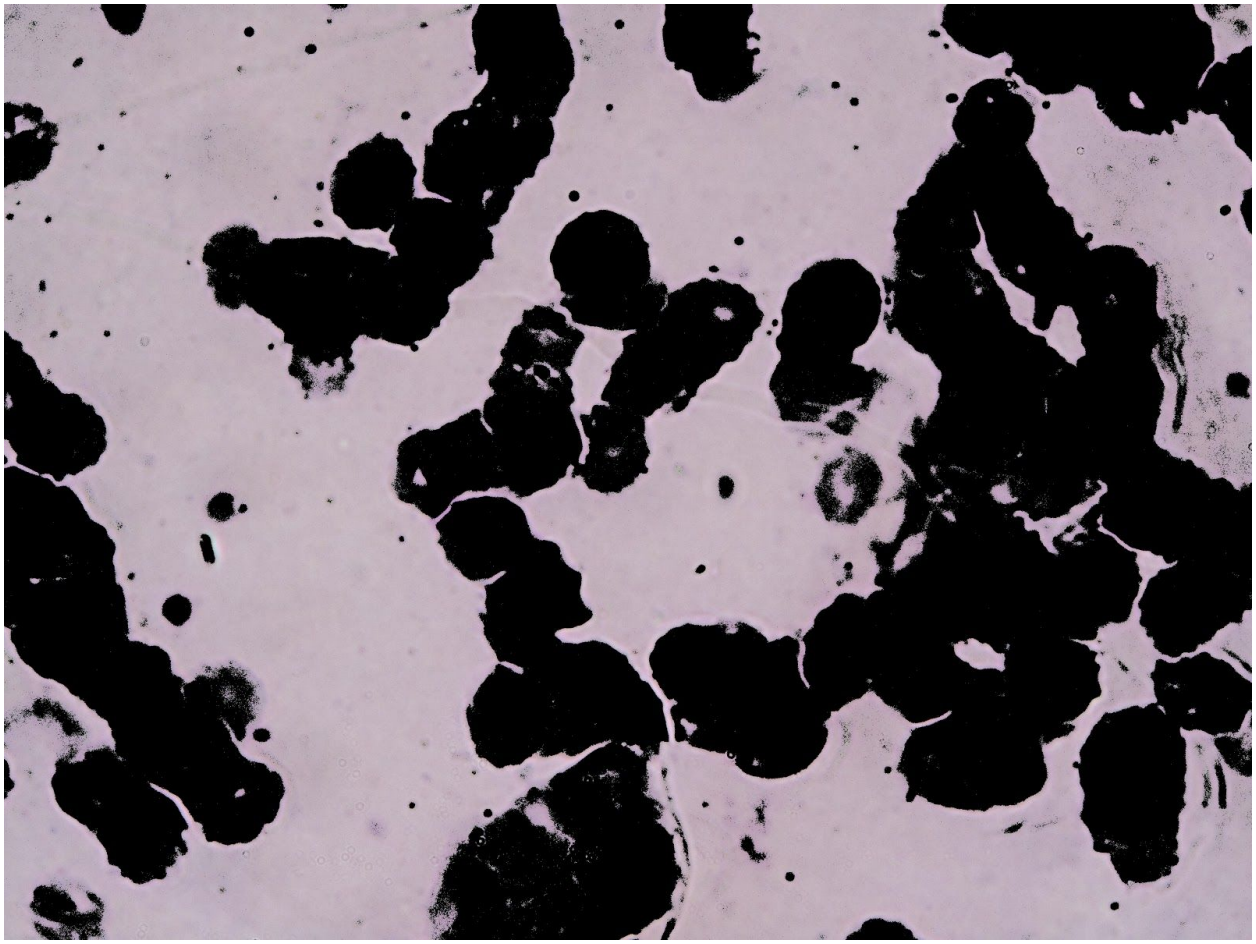

Figure 1.15: Processed Plasmodium5 image with 3 random centrfoids

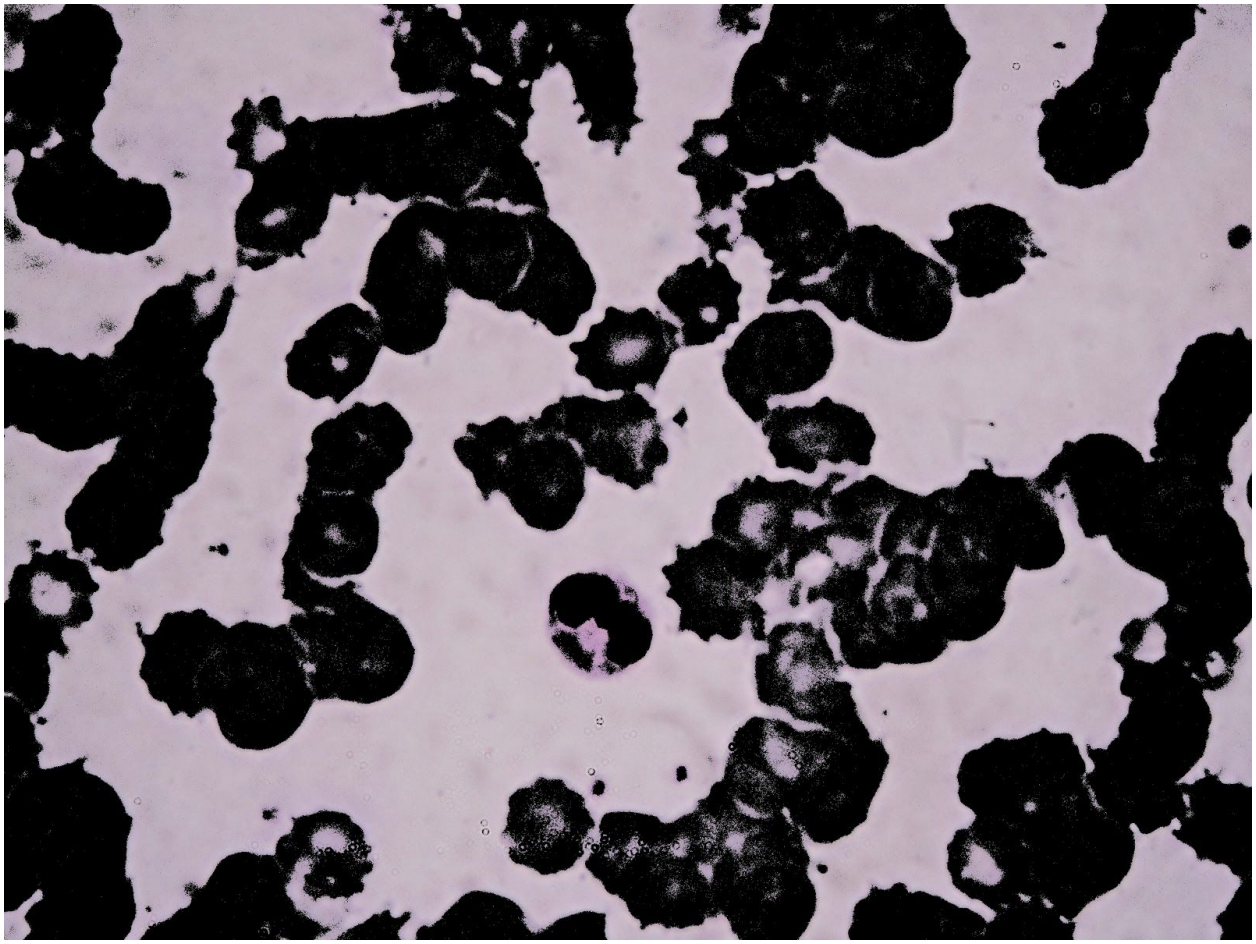

Figure 1.16: Processed Plasmodium6 image with 3 random centrfoids

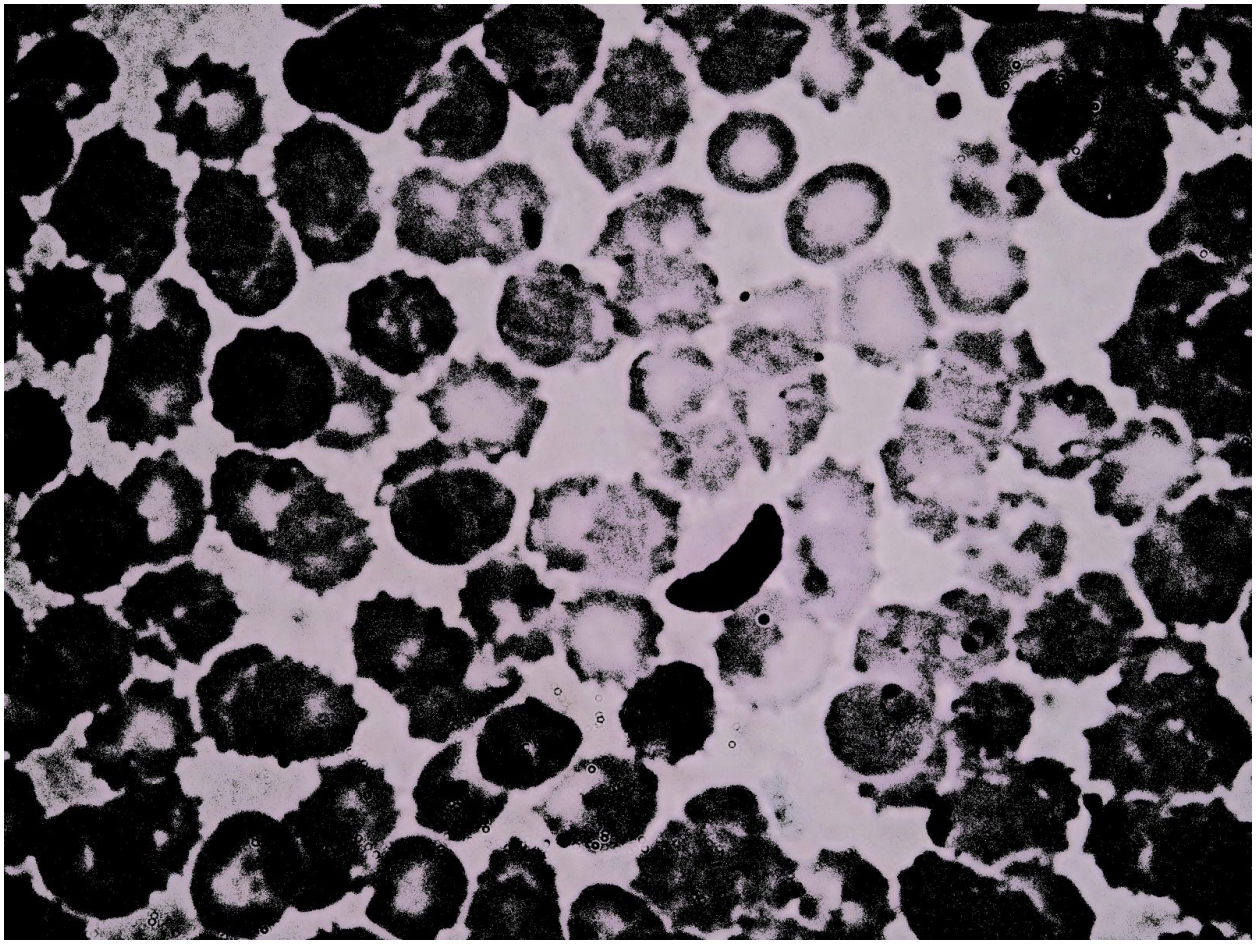

Figure 1.17: Processed Plasmodium7 image with 3 random centrfoids

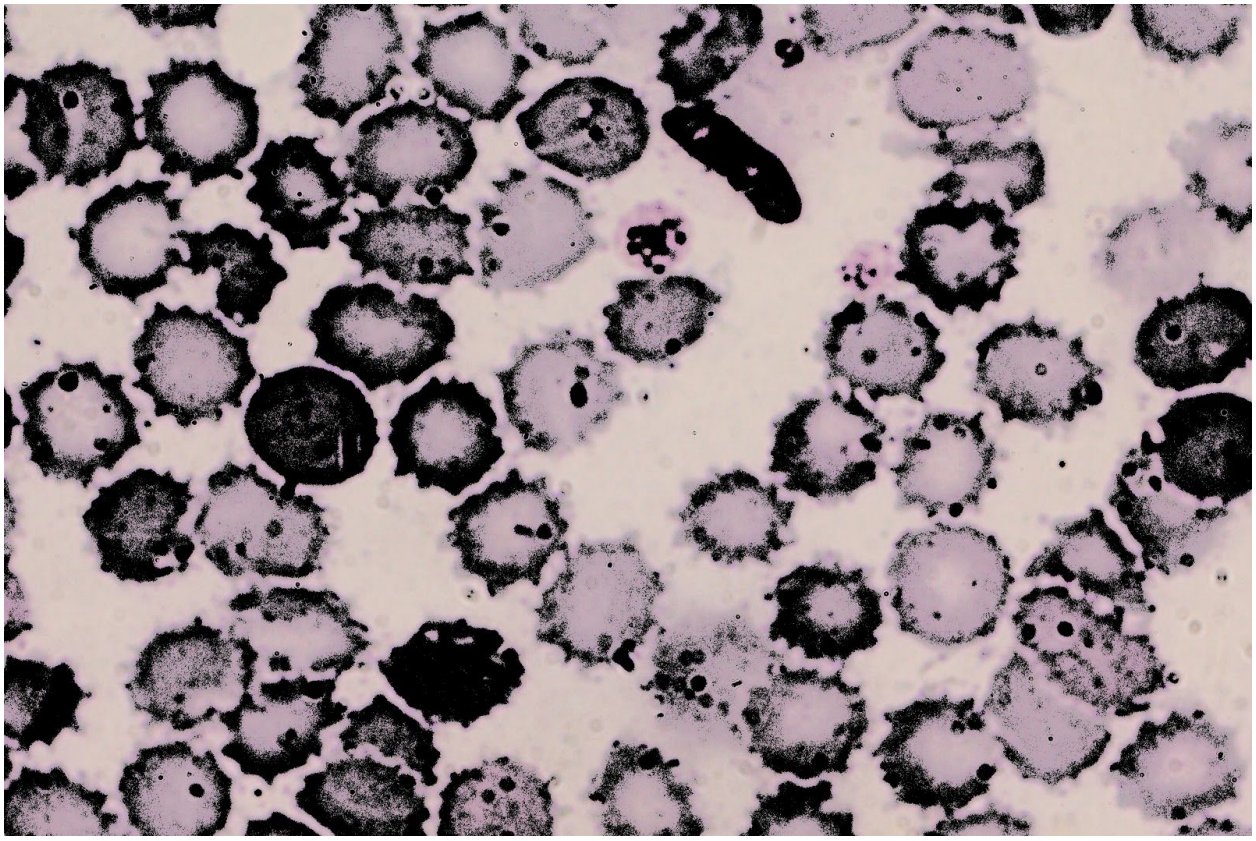

Figure 1.18: Processed Plasmodium8 image with 3 random centrfoids

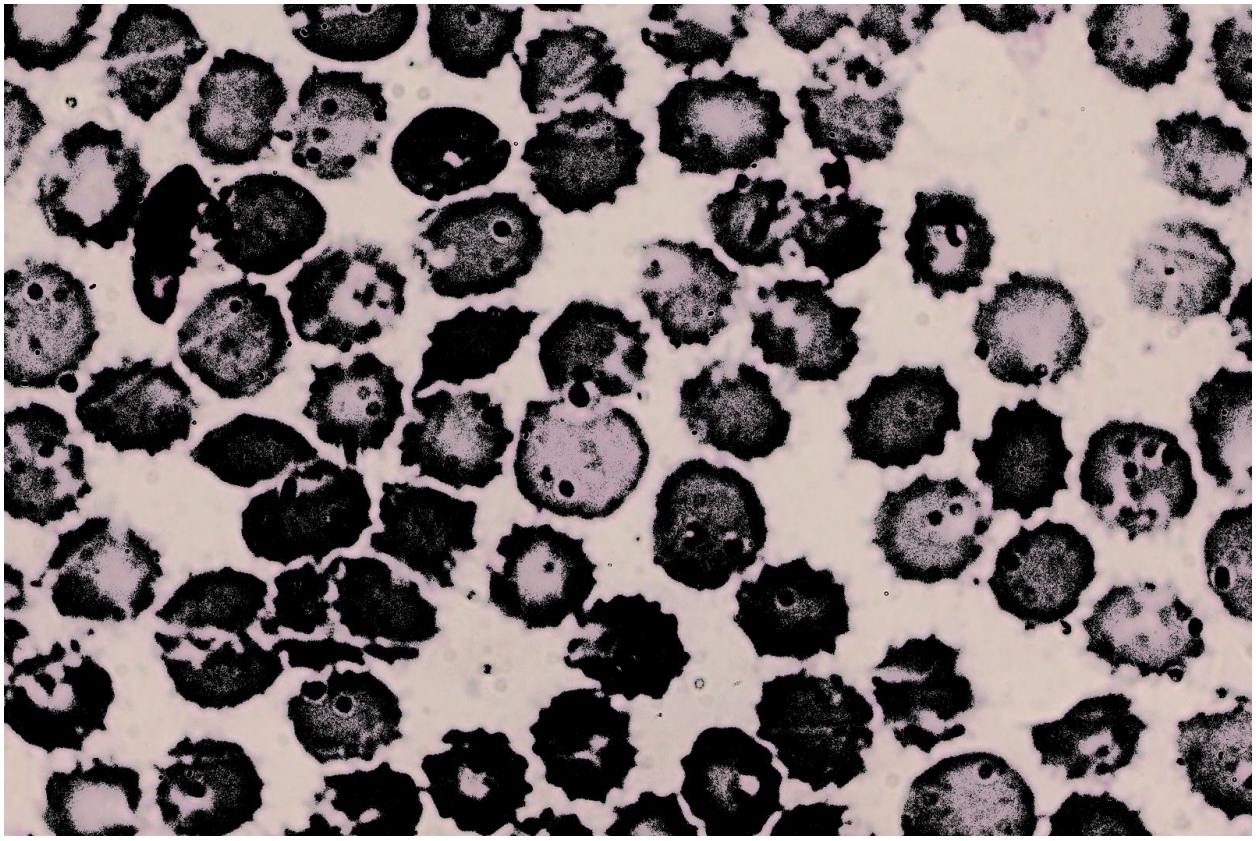

Figure 1.19: Processed Plasmodium9 image with 3 random centrfoids

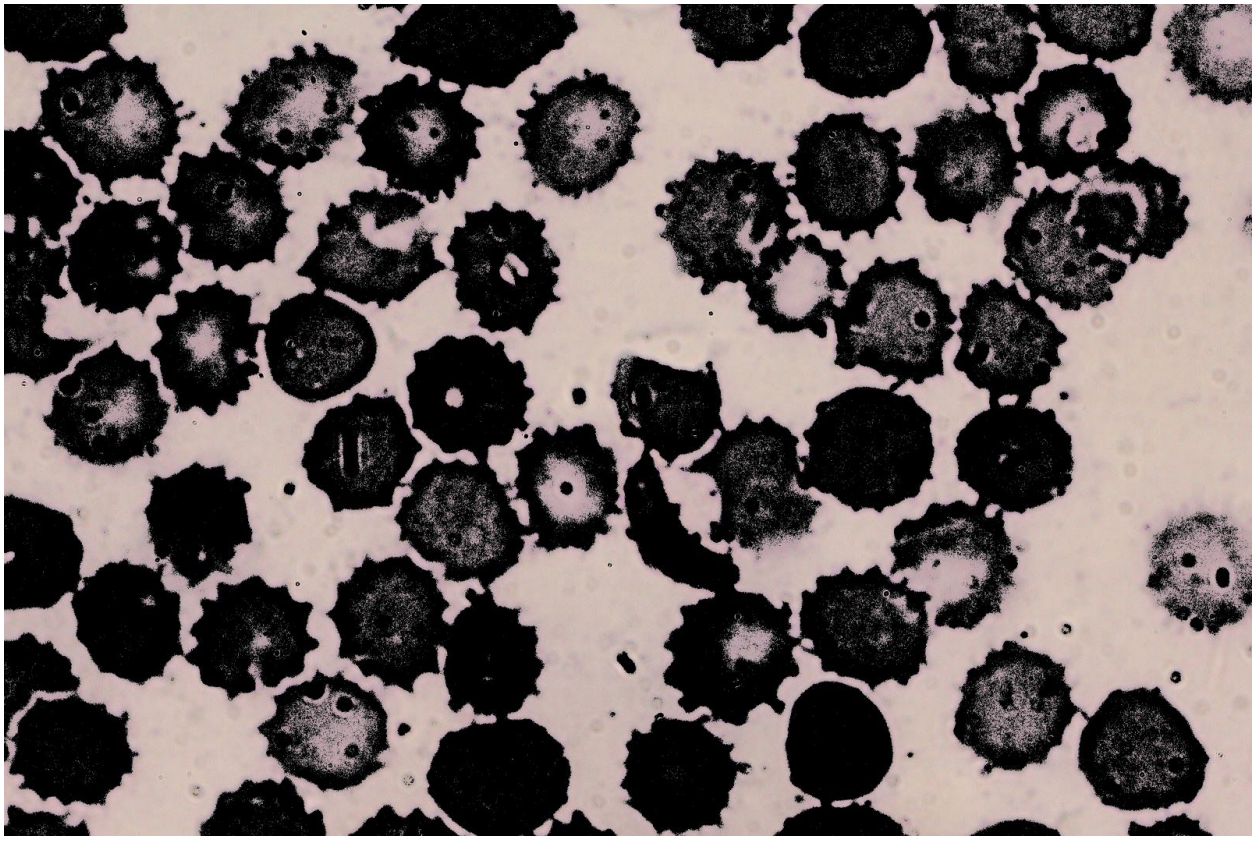

Figure 1.20: Processed Plasmodium20 image with 3 random centrfoids

Specimen : Schisostoma

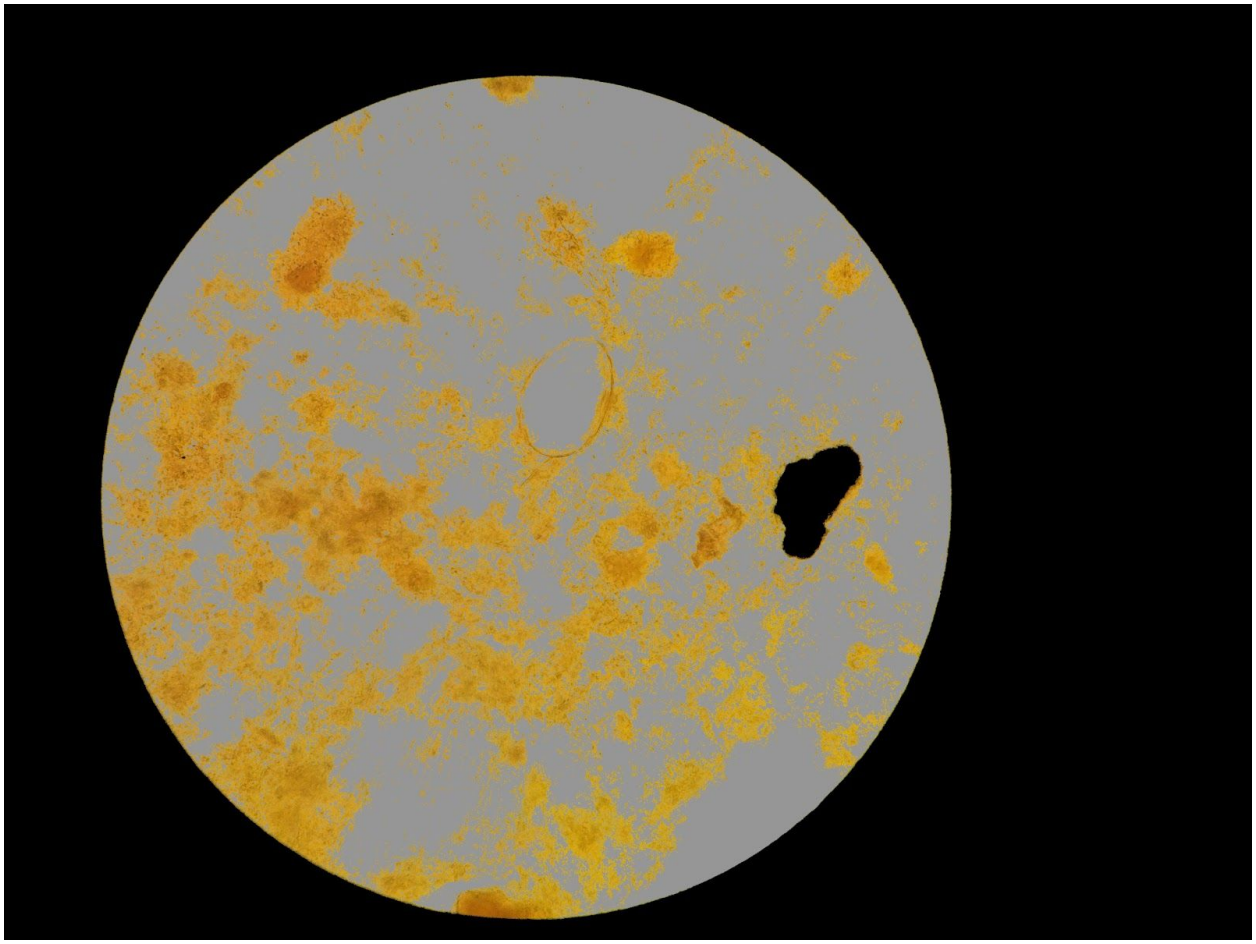

Figure 1.21: Processed Schisostoma1 image with 3 random centrfoids

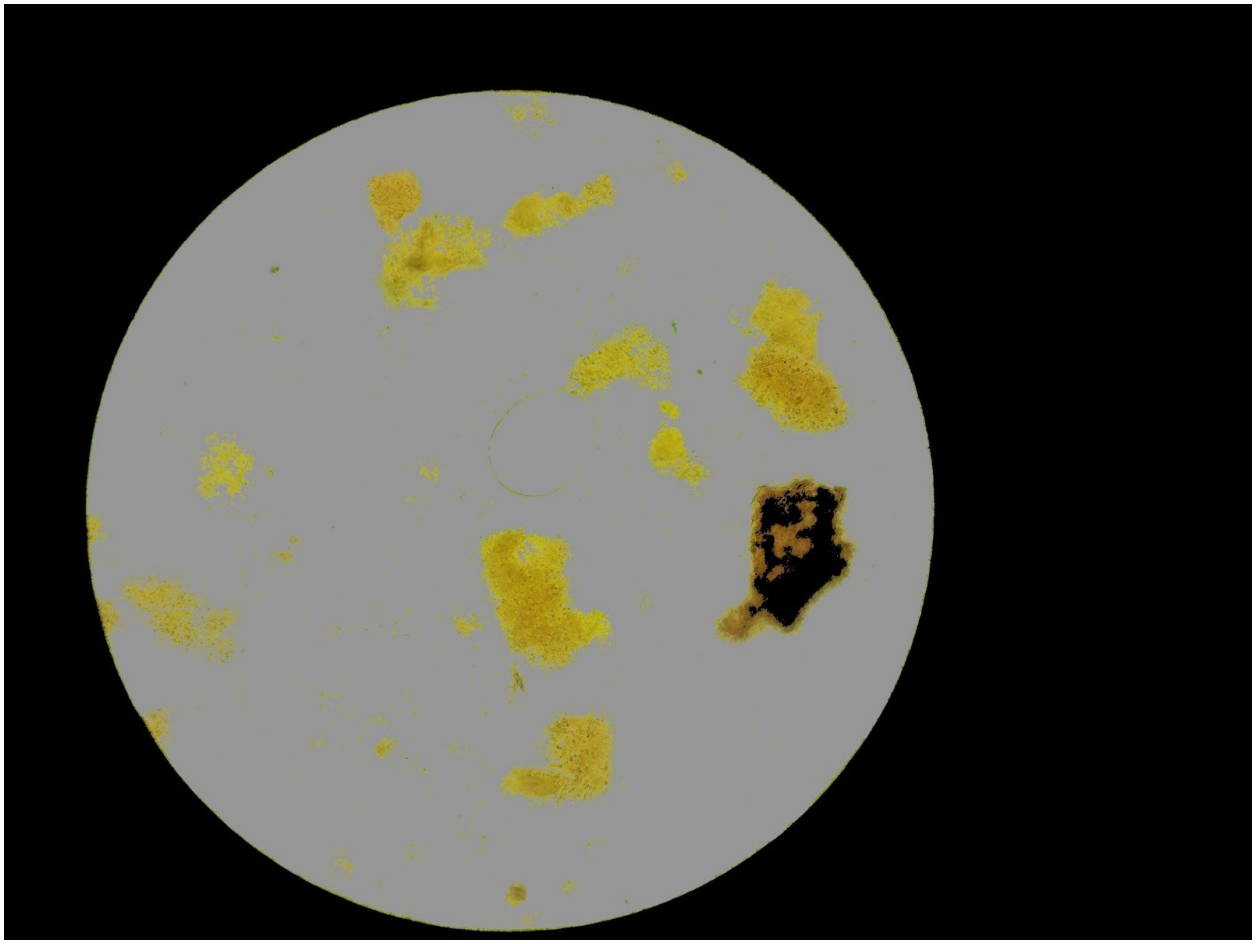

Figure 1.22: Processed Schisostoma2 image with 3 random centrfoids

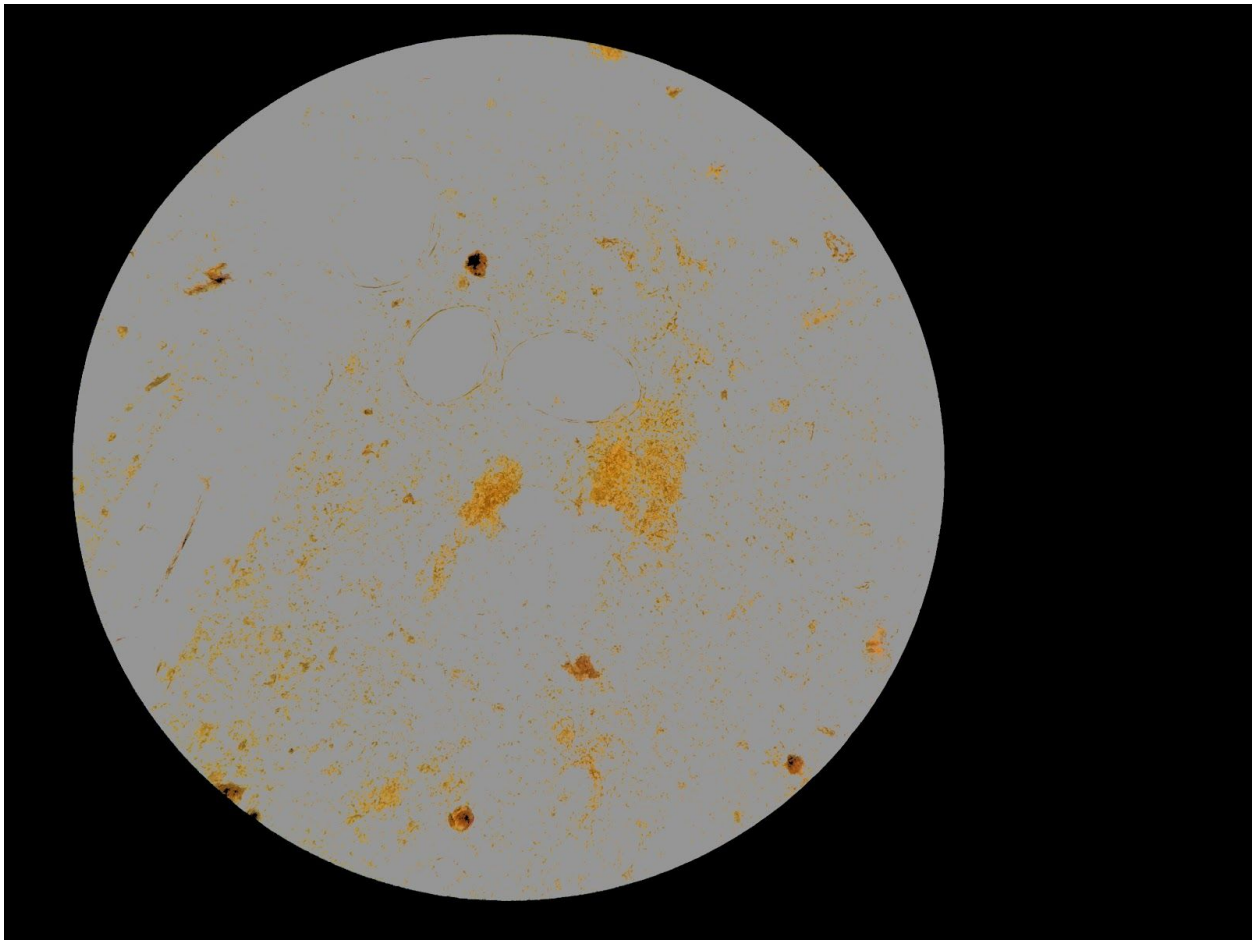

Figure 1.23: Processed Schisostoma3 image with 3 random centrfoids

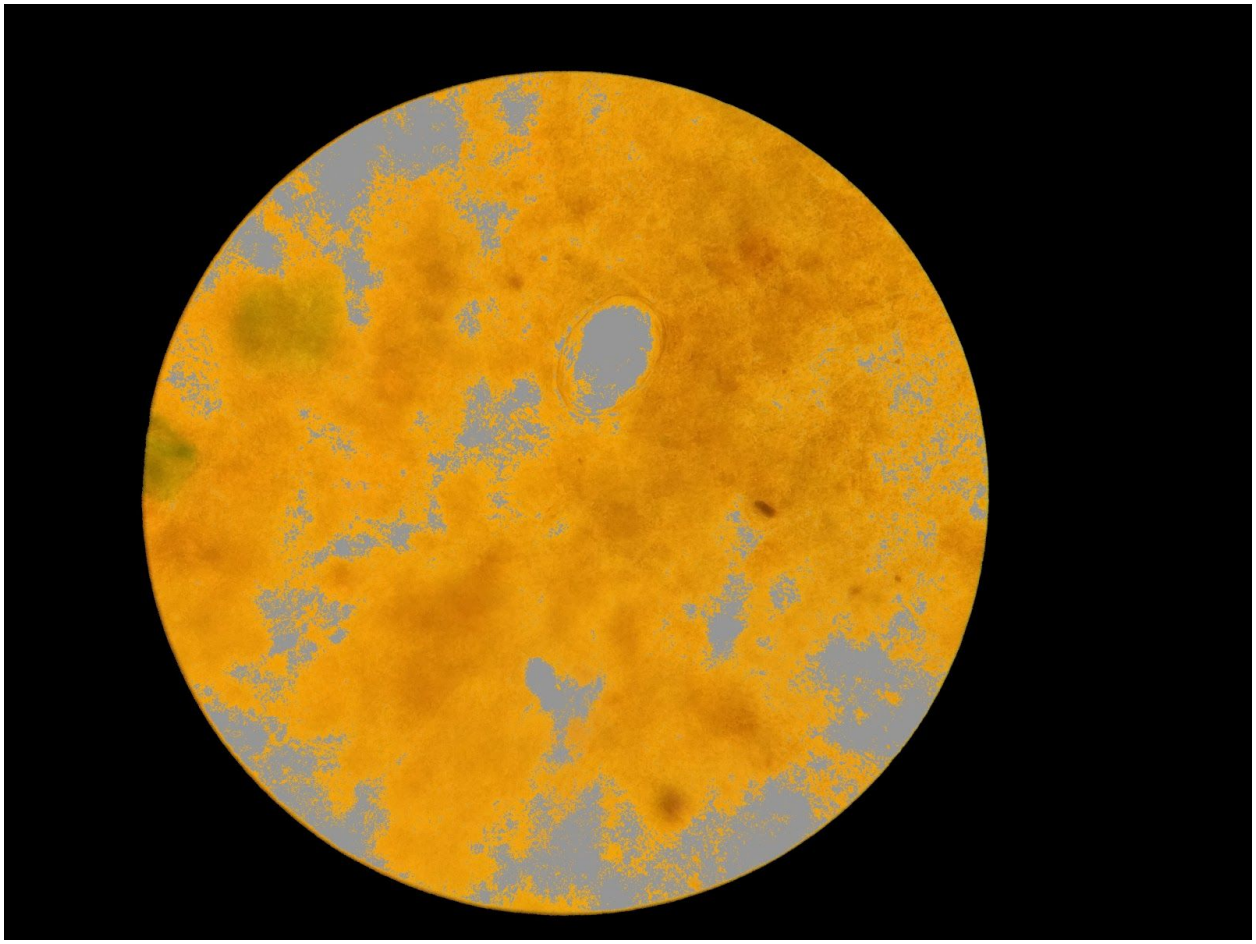

Figure 1.24: Processed Schisostoma4 image with 3 random centrfoids

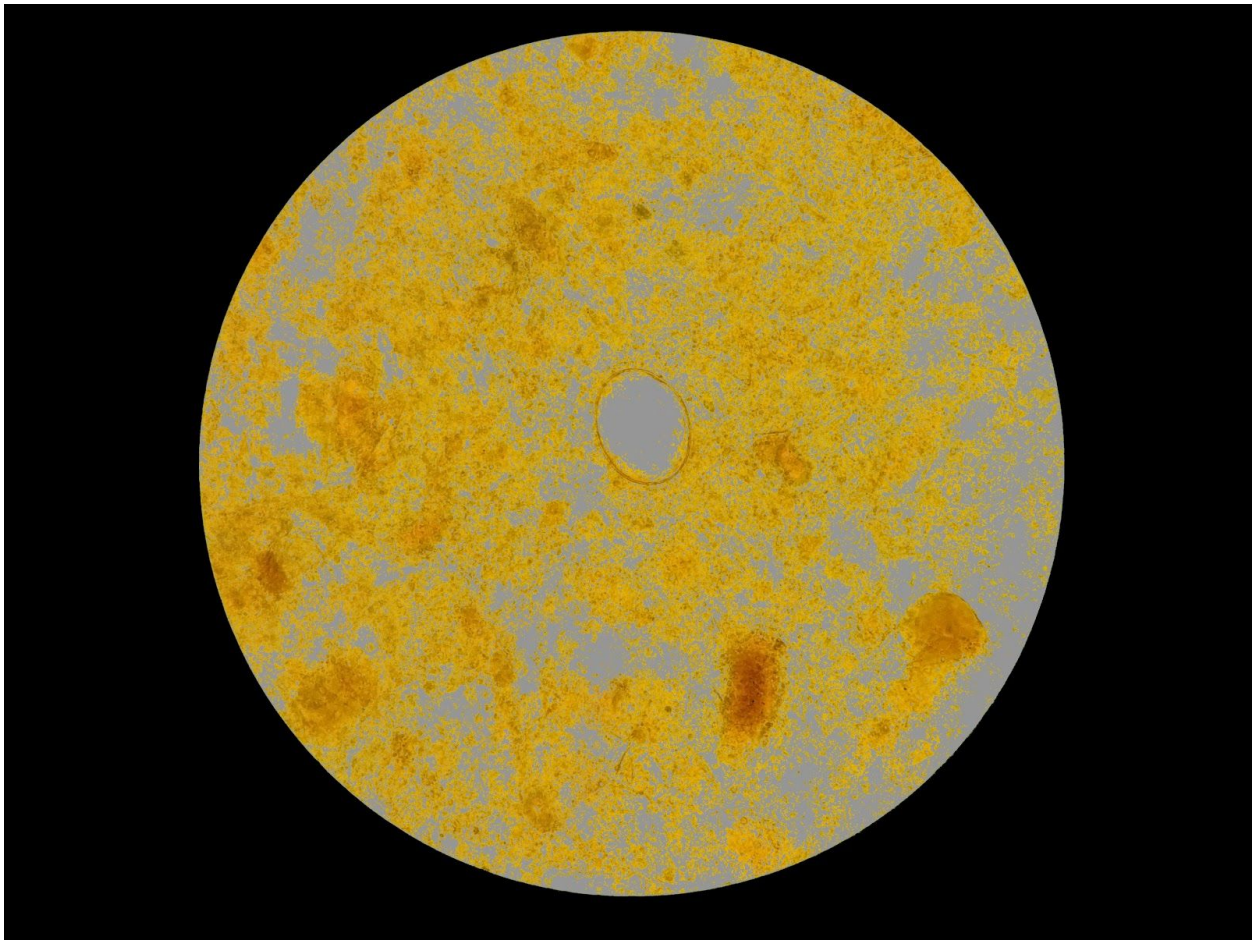

Figure 1.25: Processed Schisostoma5 image with 3 random centrfoids

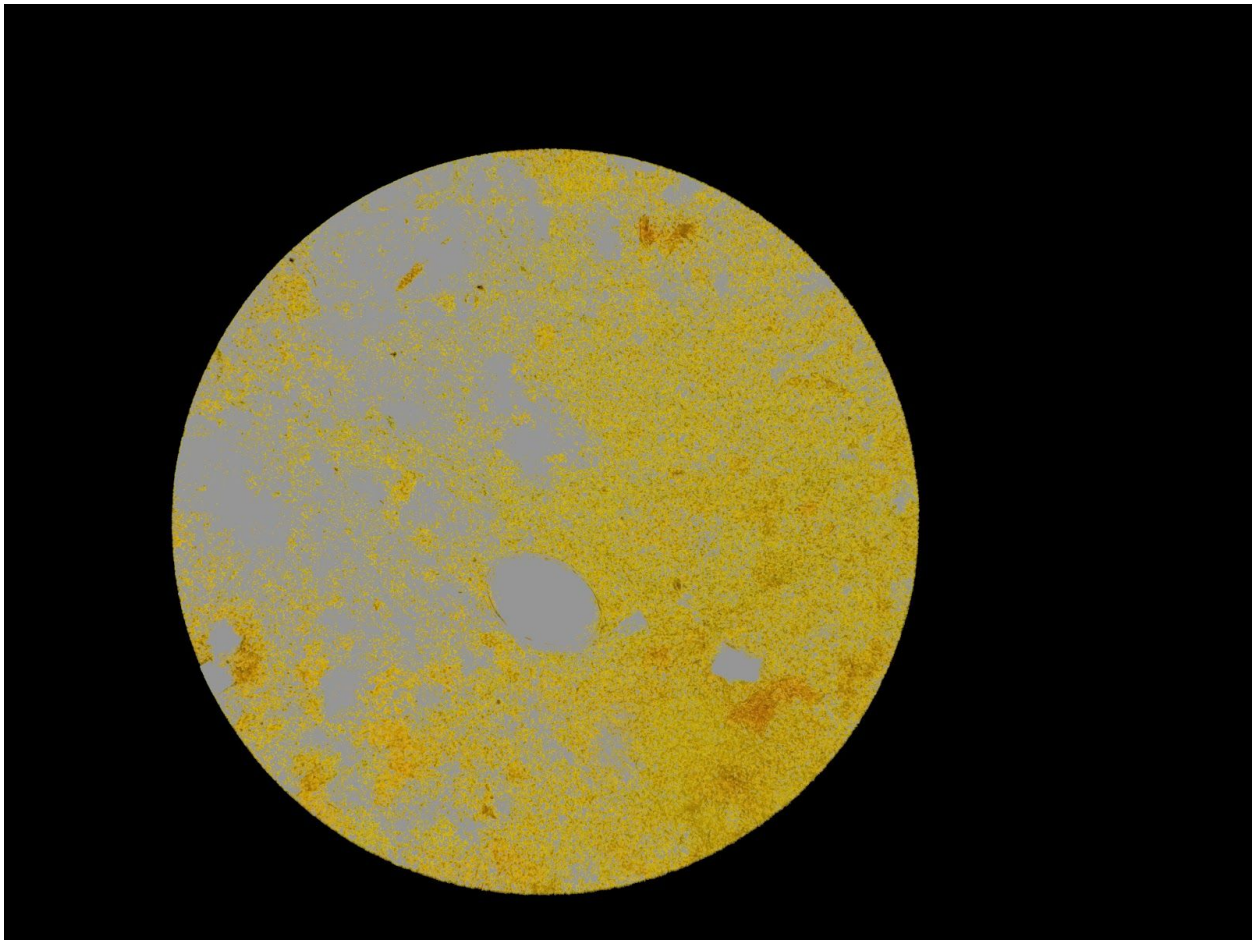

Figure 1.26: Processed Schisostoma6 image with 3 random centrfoids

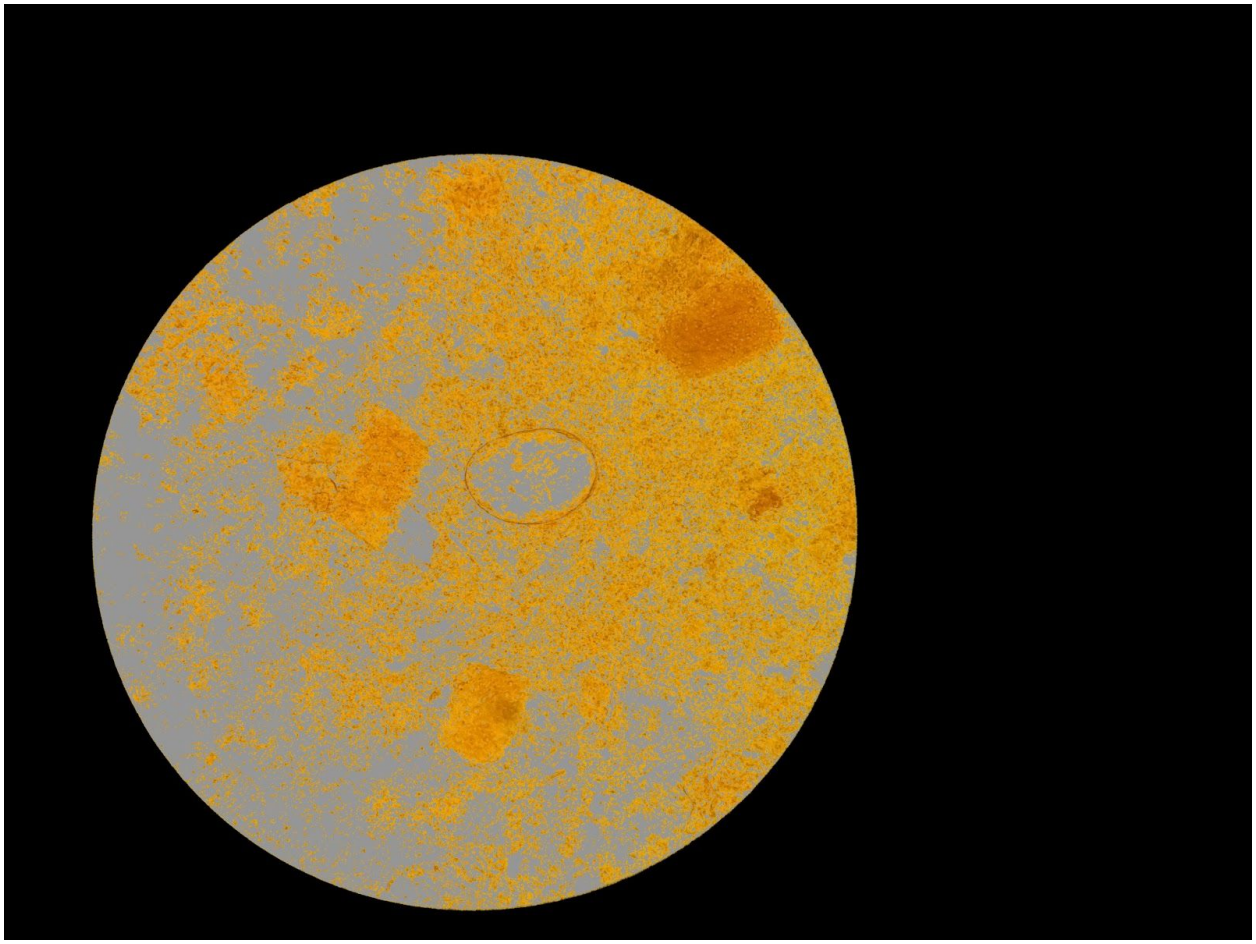

Figure 1.27: Processed Schisostoma7 image with 3 random centrfoids

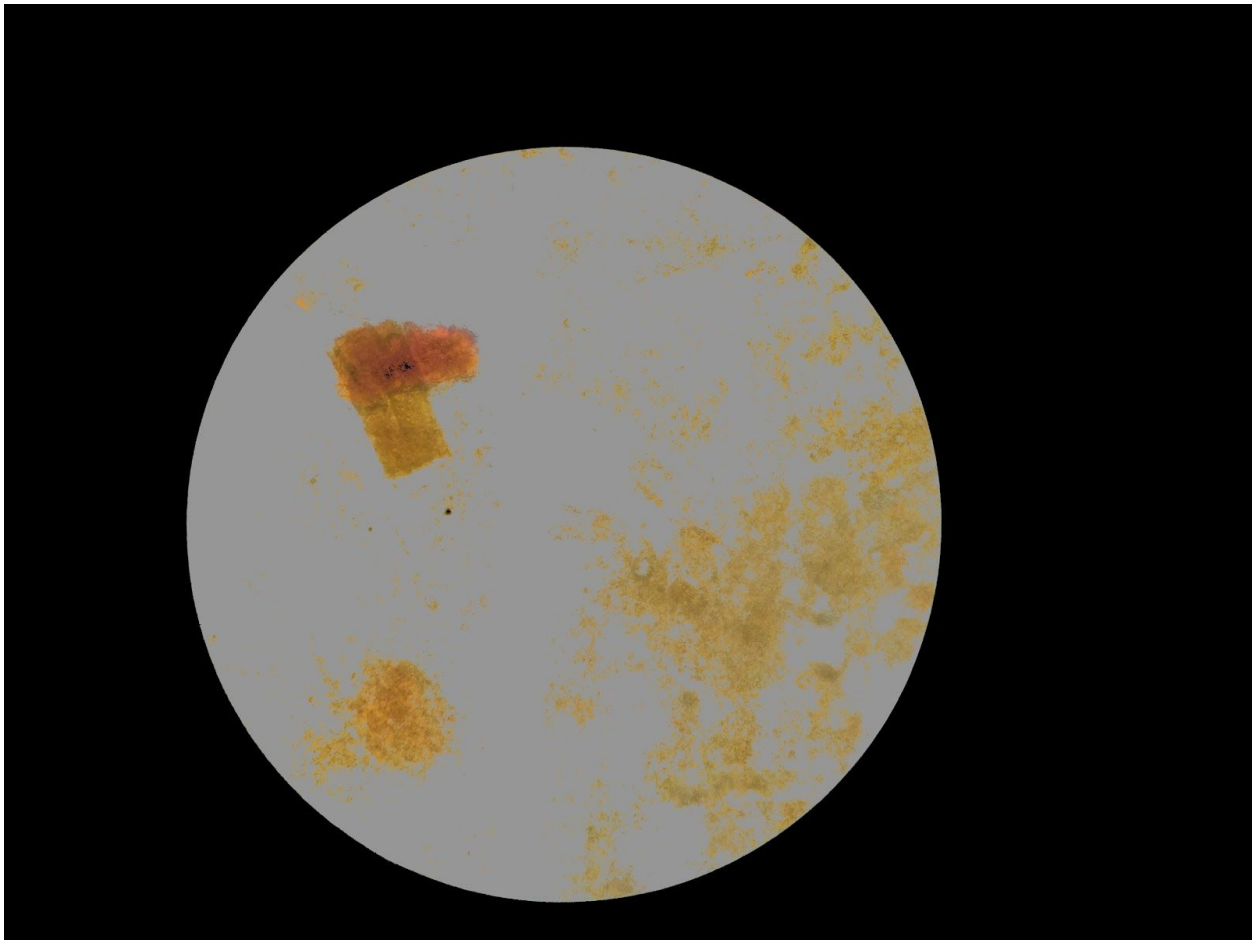

Figure 1.28: Processed Schisostoma8 image with 3 random centrfoids7

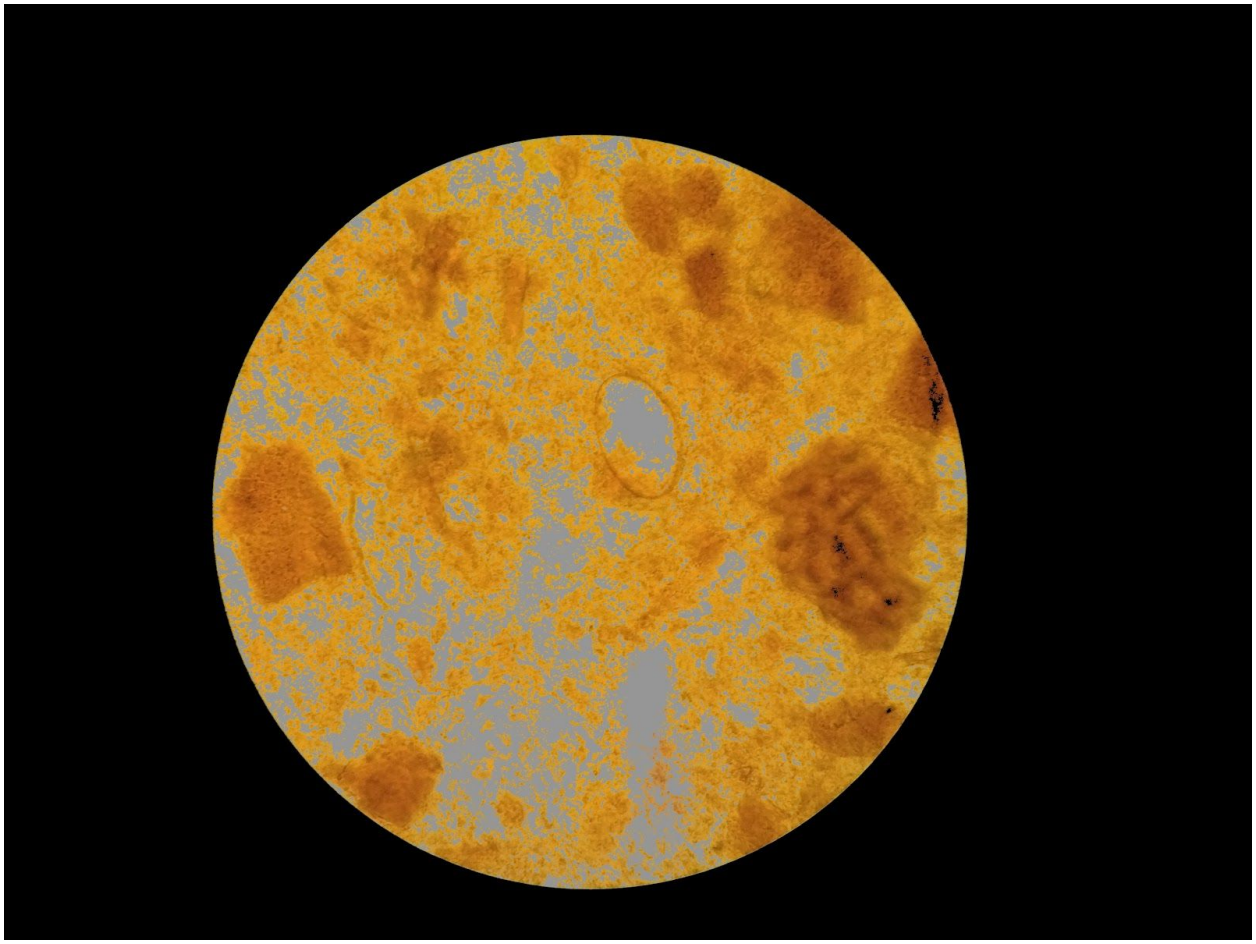

Figure 1.29: Processed Schisostoma9 image with 3 random centrfoids

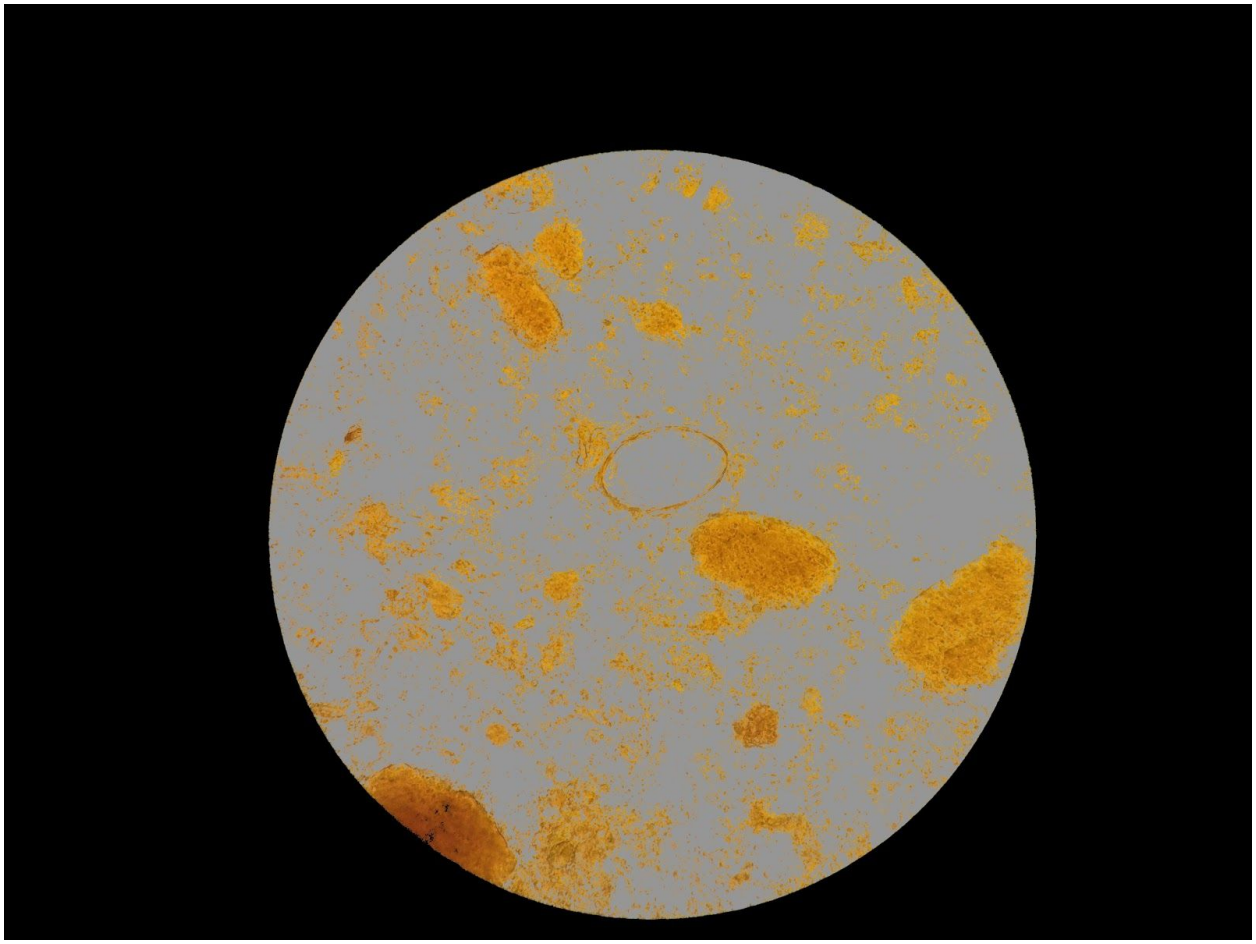

Figure 1.30: Processed Schisostoma10 image with 3 random centrfoids

Number 2

2. Manually selecting specific pixel locations, one for the parasite and one for the others, as centroids, how would the segmentation change?

The segmentation becomes more accurate and consistent since the segmentation doesn't depend heavily randomization of the centroids.

Specimen : Filaria | centroids = [[229,189,164],[0,0,0],[176,128,142]]

Figure 2.1 : Filaria1 image segmented with Manual initialization of Centroids

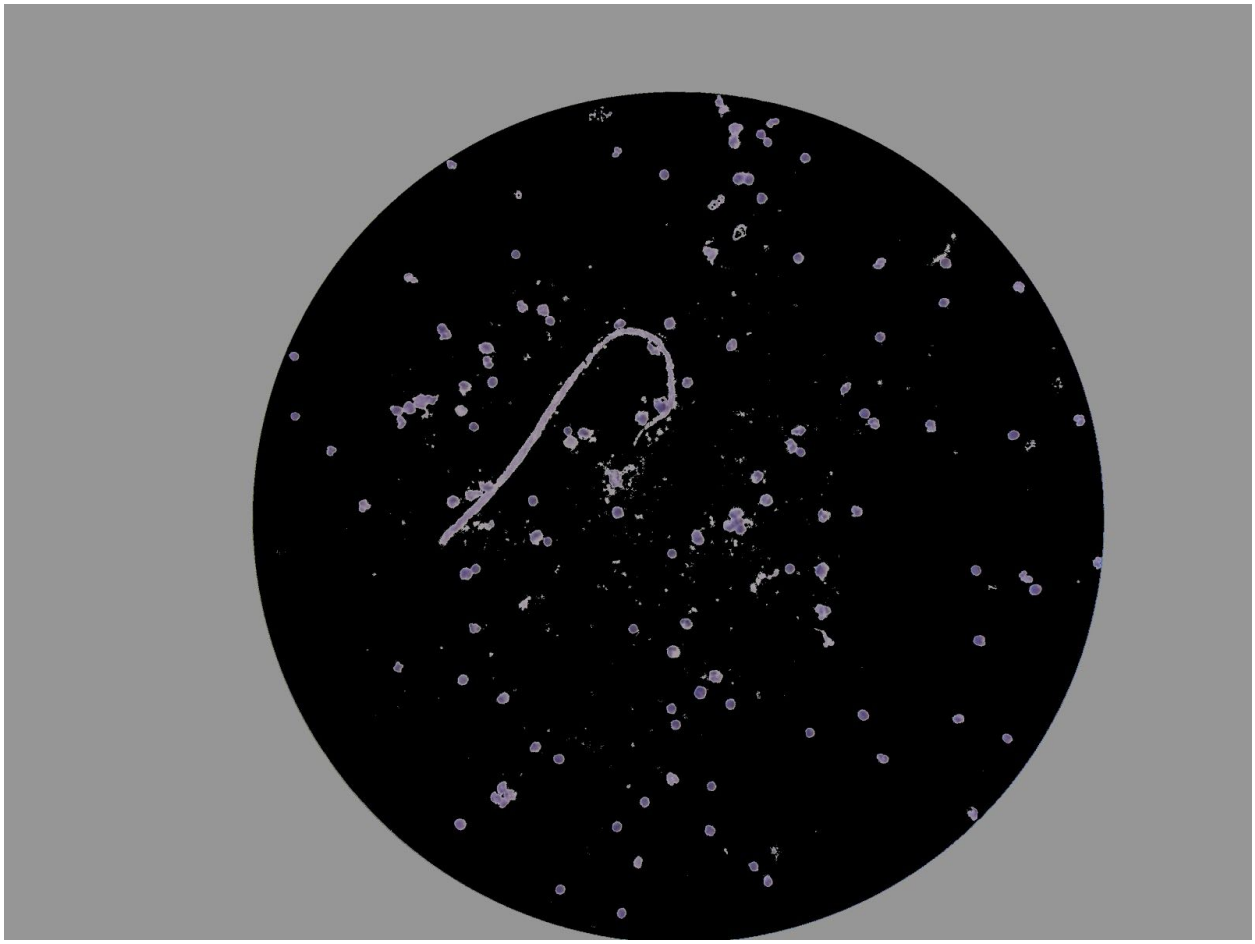

Figure 2.2 : Filaria2 image segmented with Manual initialization of Centroids

Figure 2.3: Filaria3 image segmented with Manual initialization of Centroids

Figure 2.4: Filaria4 image segmented with Manual initialization of Centroids

Figure 2.5: Filaria5 image segmented with Manual initialization of Centroids

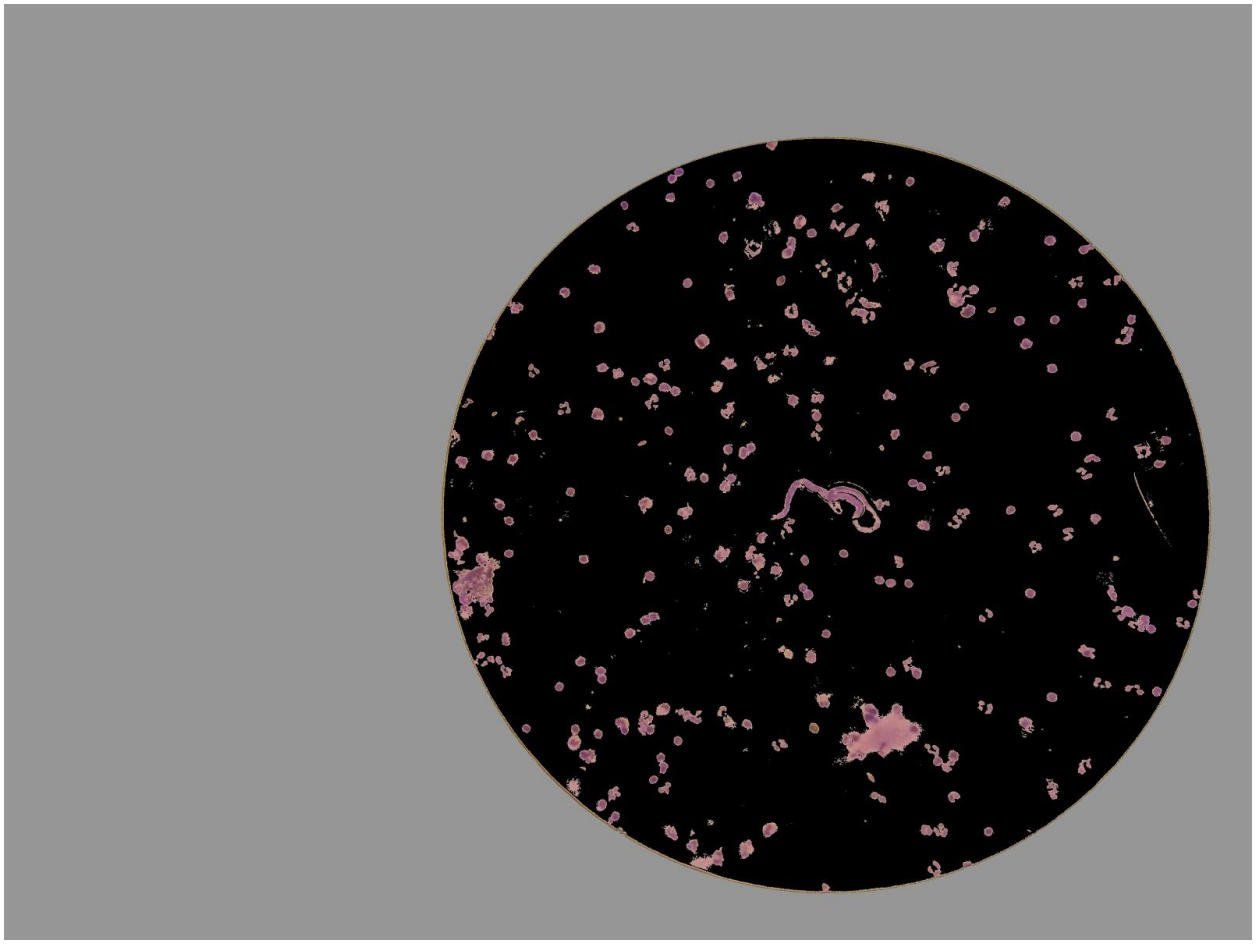

Figure 2.6: Filaria6 image segmented with Manual initialization of Centroids

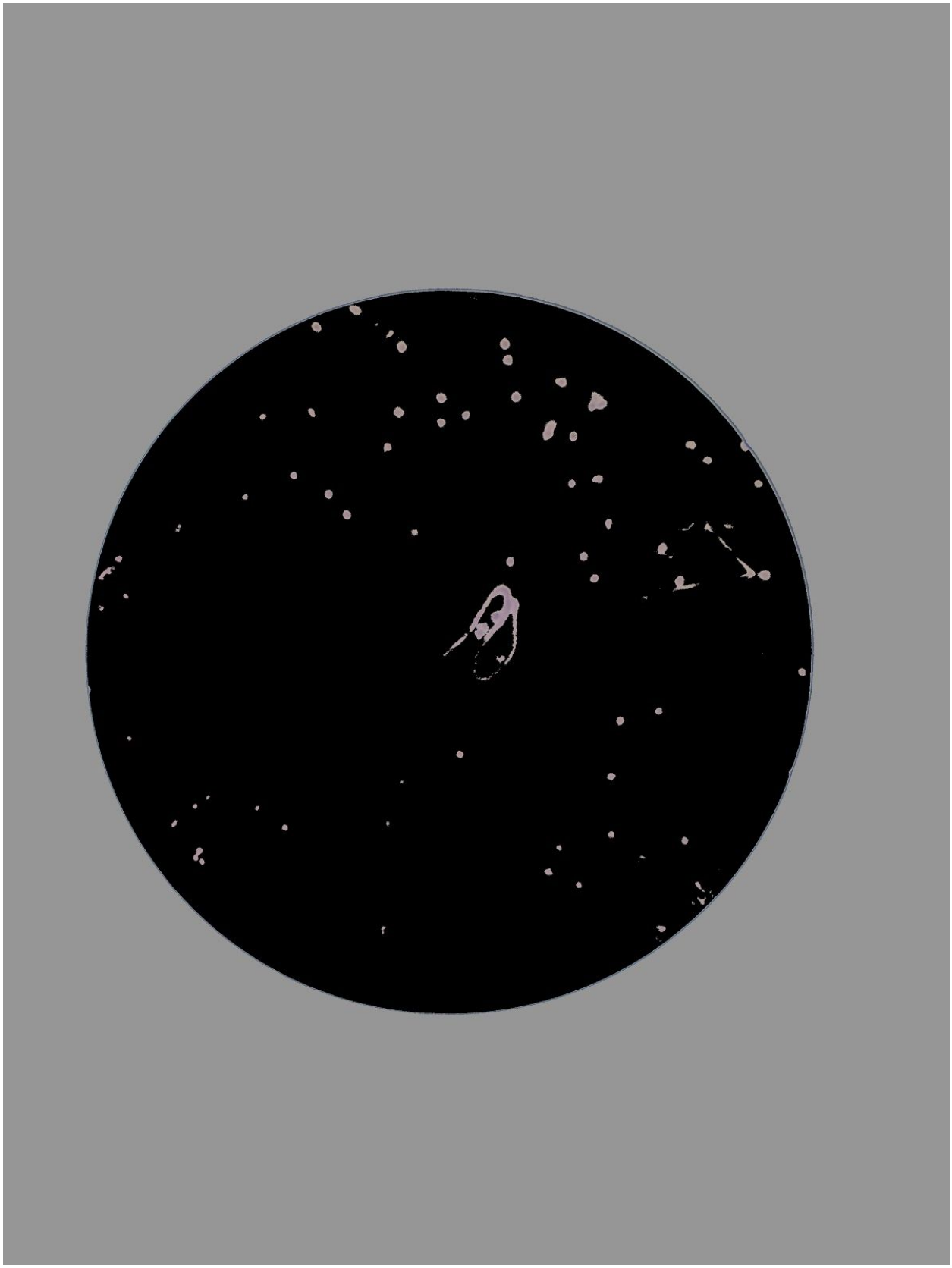

Figure 2.7: Filaria7 image segmented with Manual initialization of Centroids

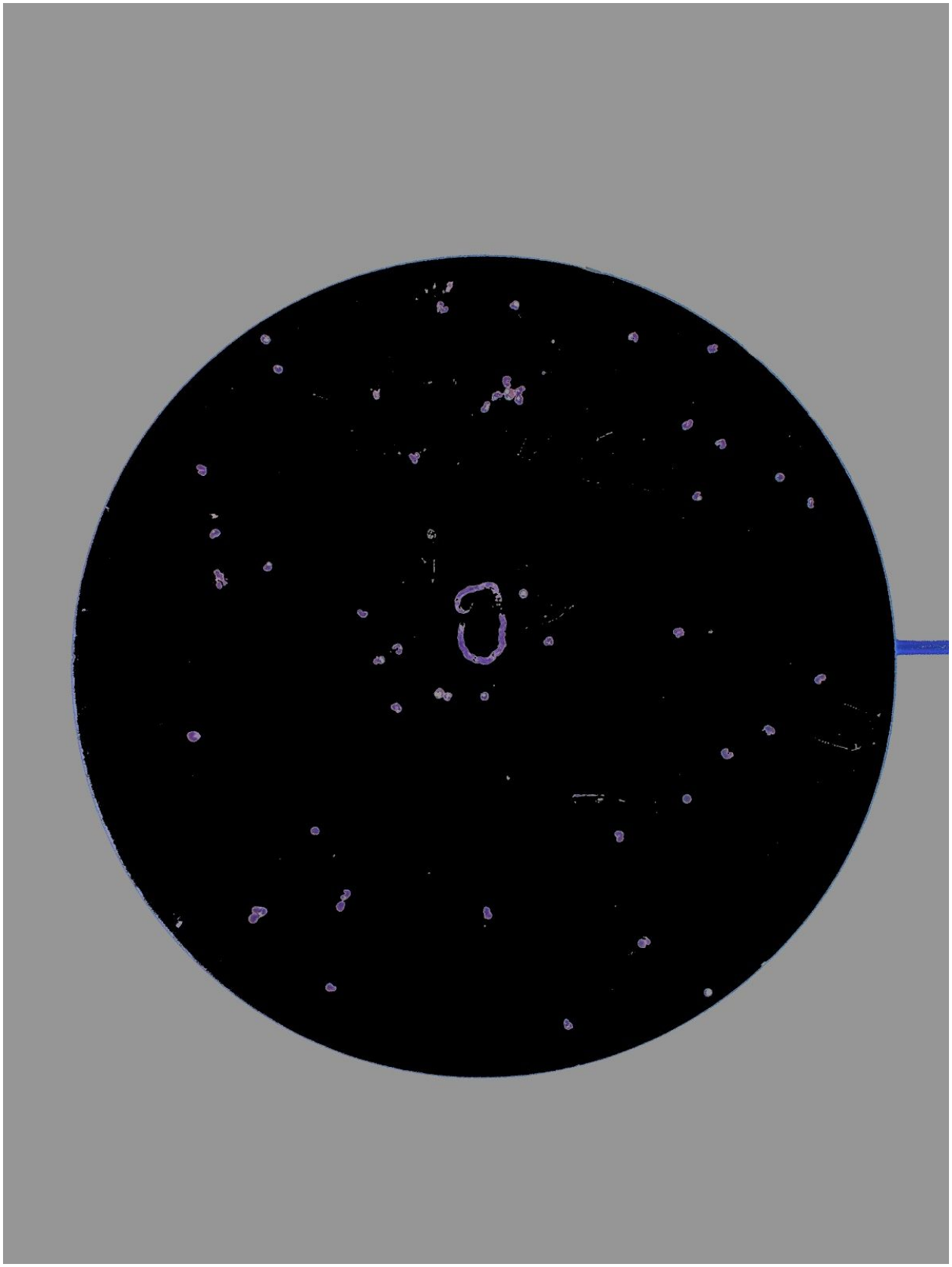

Figure 2.8: Filaria8 image segmented with Manual initialization of Centroids

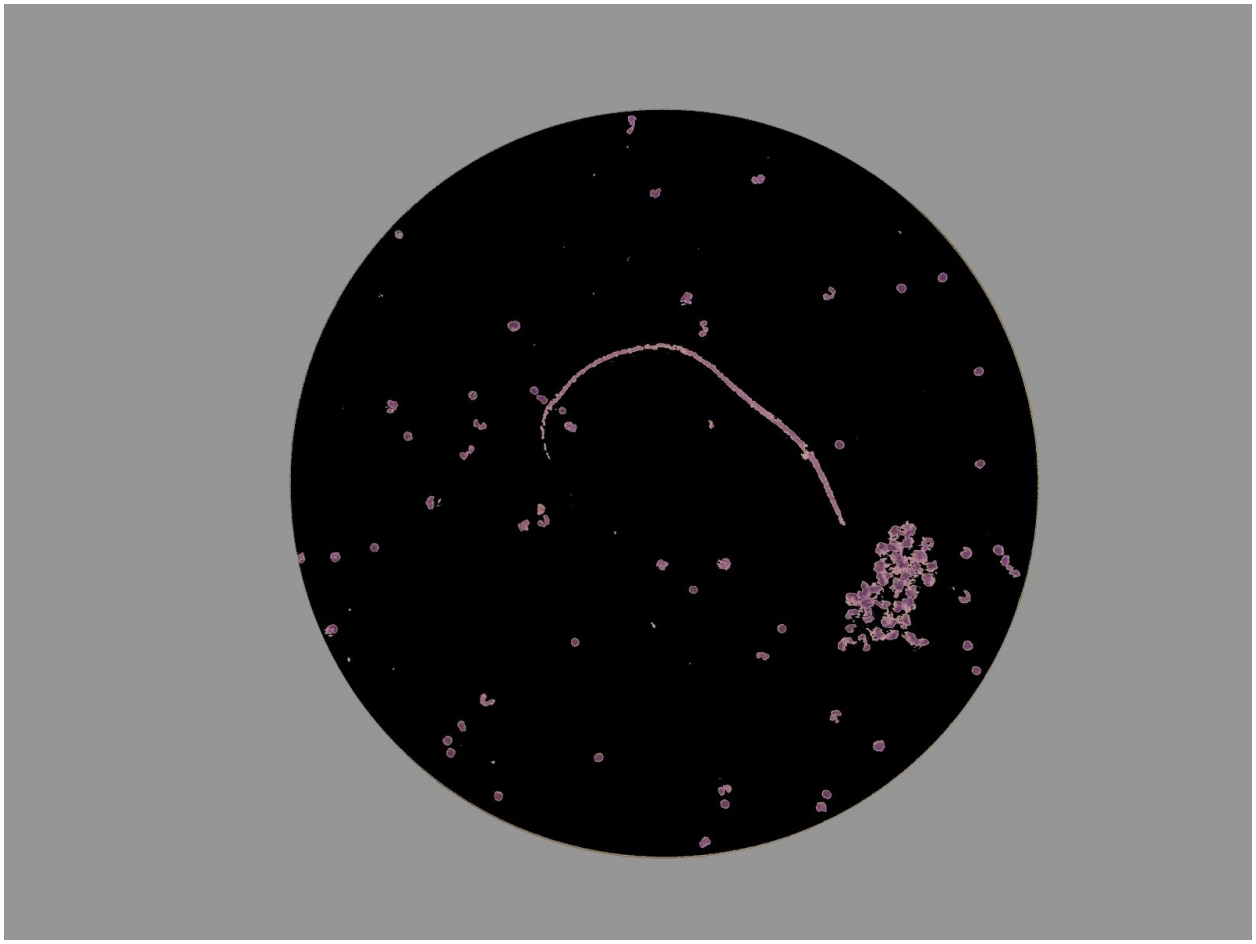

Figure 2.9: Filaria9 image segmented with Manual initialization of Centroids

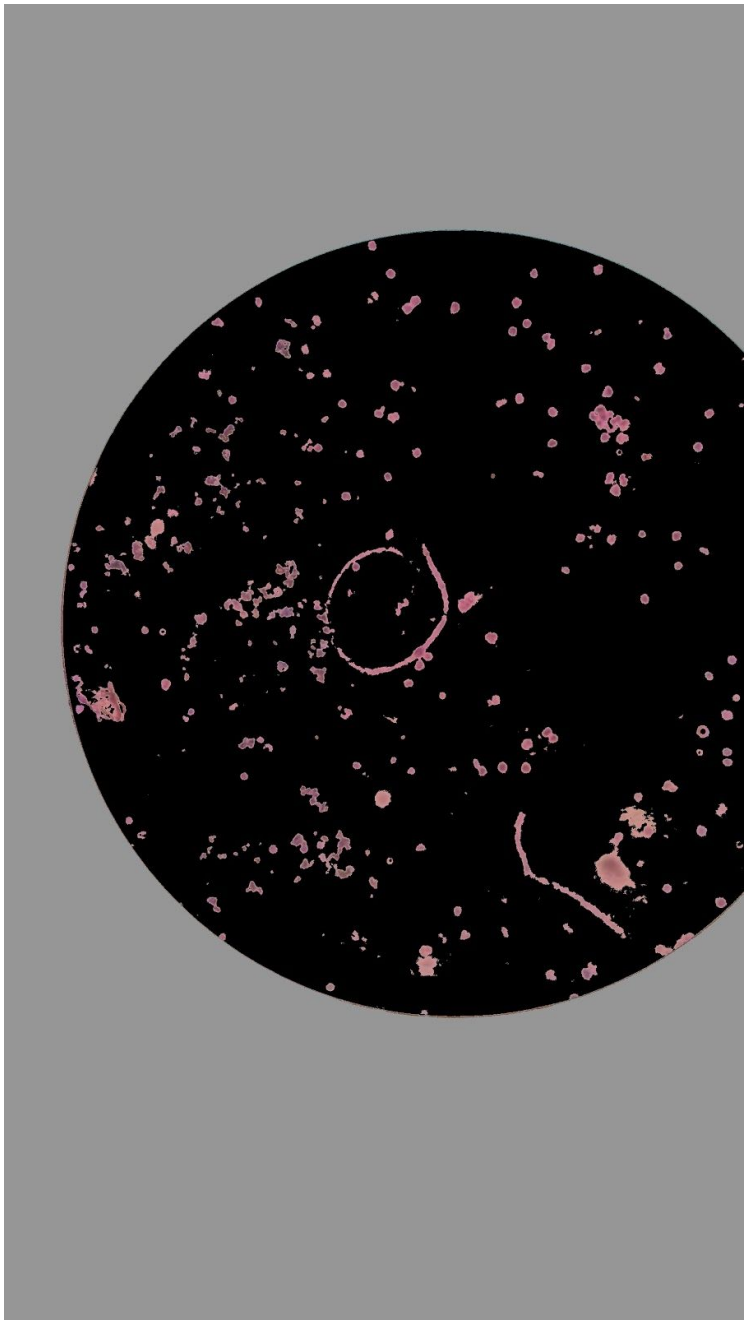

Figure 2.10: Filaria10 image segmented with Manual initialization of Centroids

Specimen : Plasmodium **| centroids =[[174,79,139],[218,201,194]]**

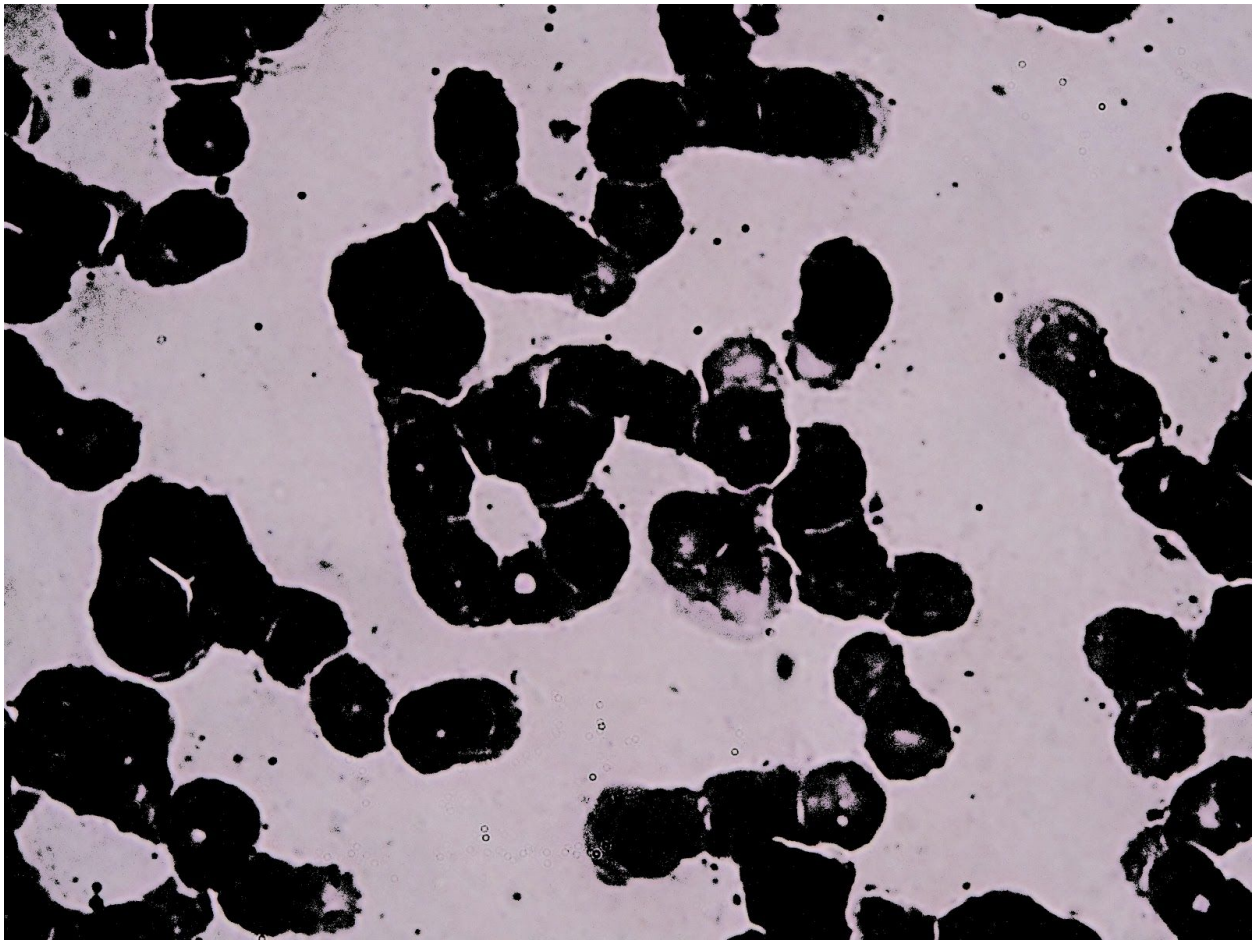

Figure 2.11 : Plasmodium11 image segmented with Manual initialization of Centroids

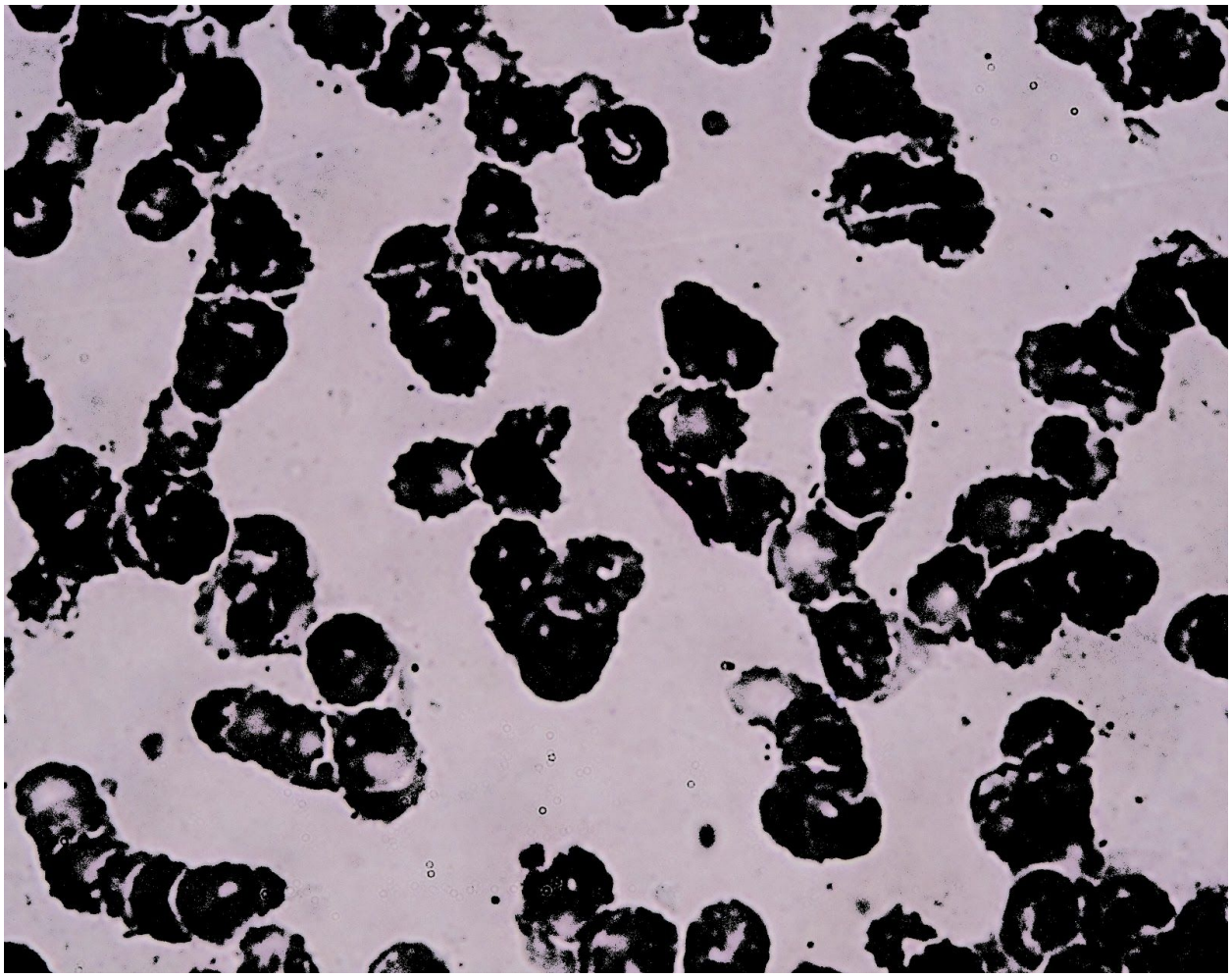

Figure 2.12 : Plasmodium2 image segmented with Manual initialization of Centroids

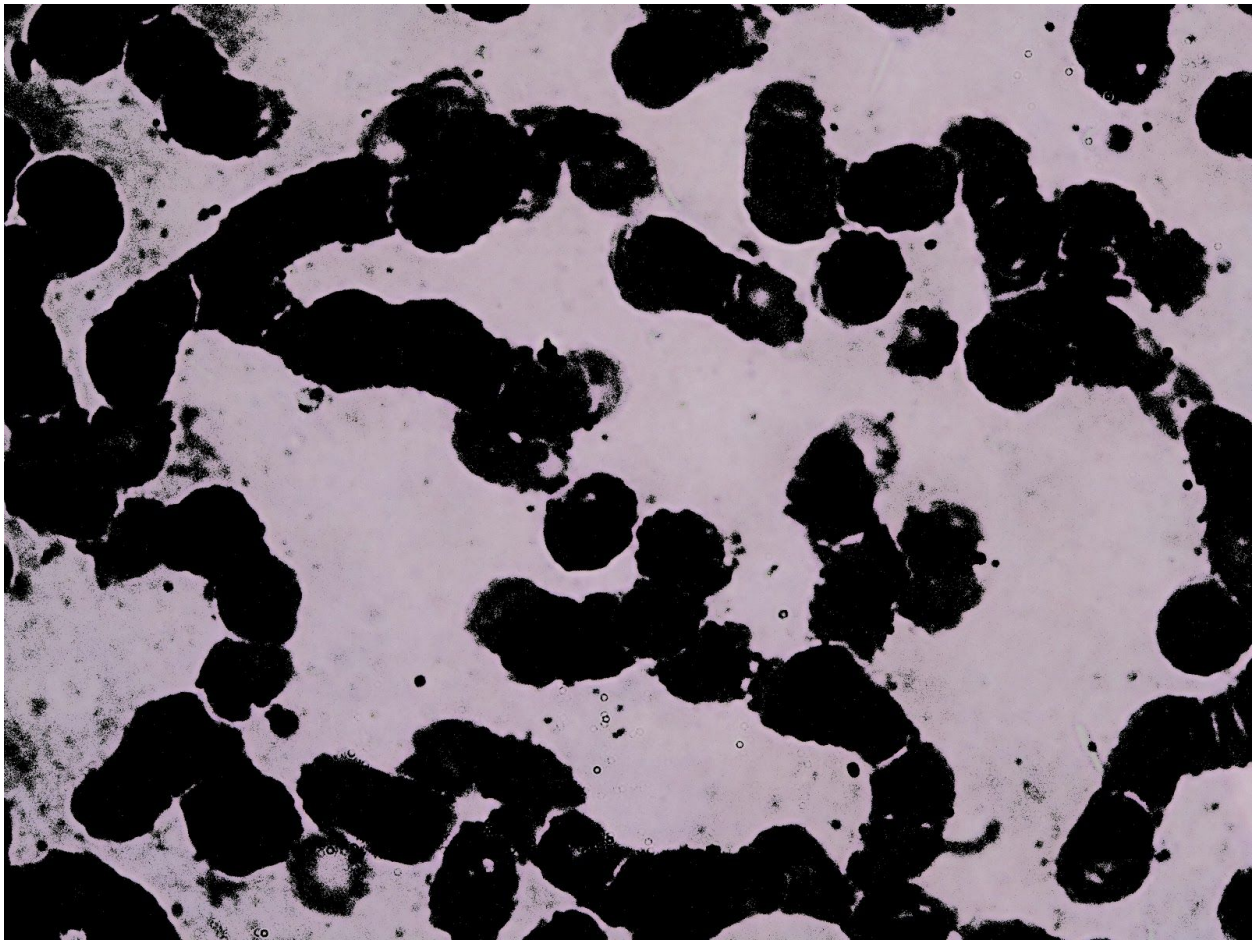

Figure 2.13 : Plasmodium3 image segmented with Manual initialization of Centroids

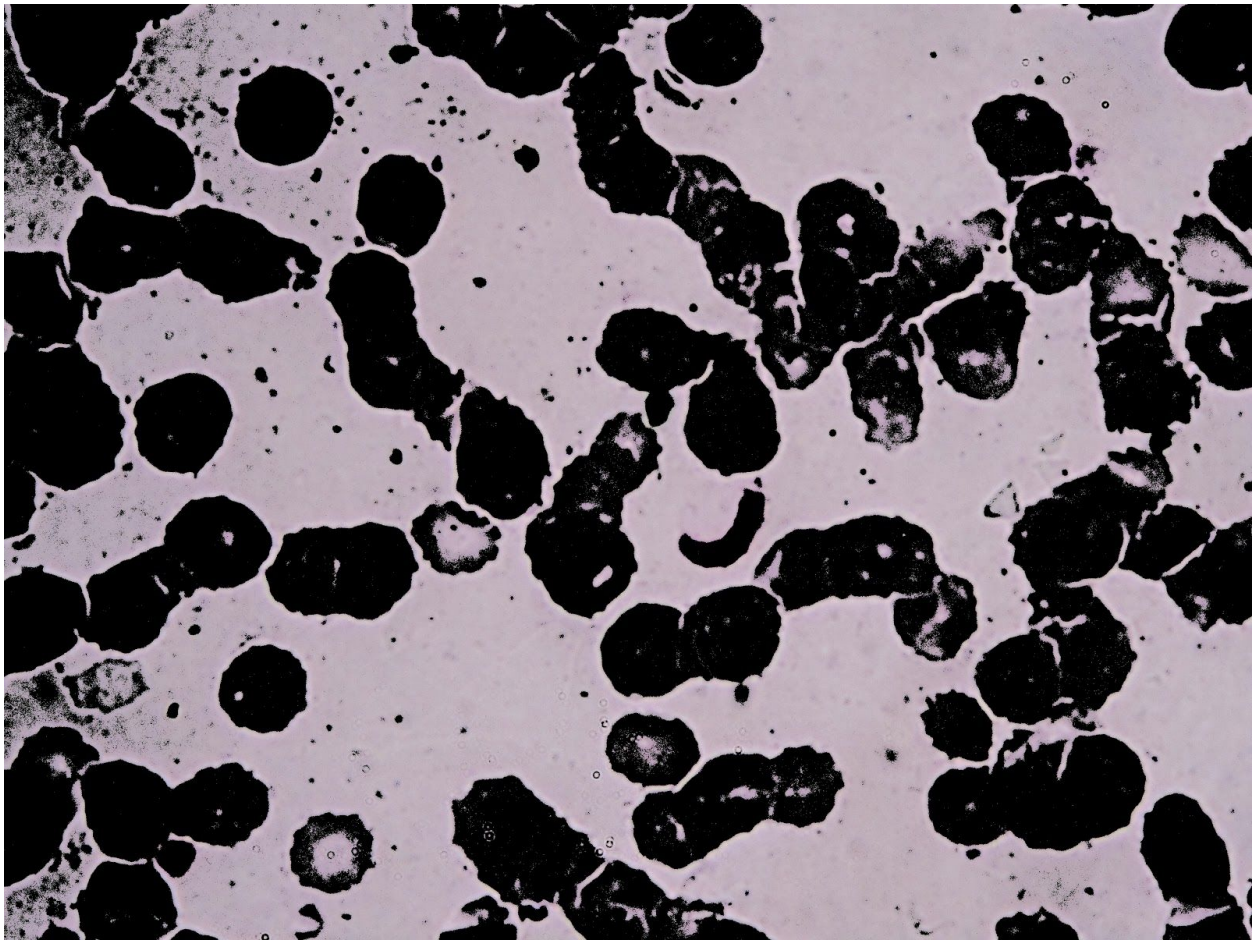

Figure 2.14 : Plasmodium4 image segmented with Manual initialization of Centroids

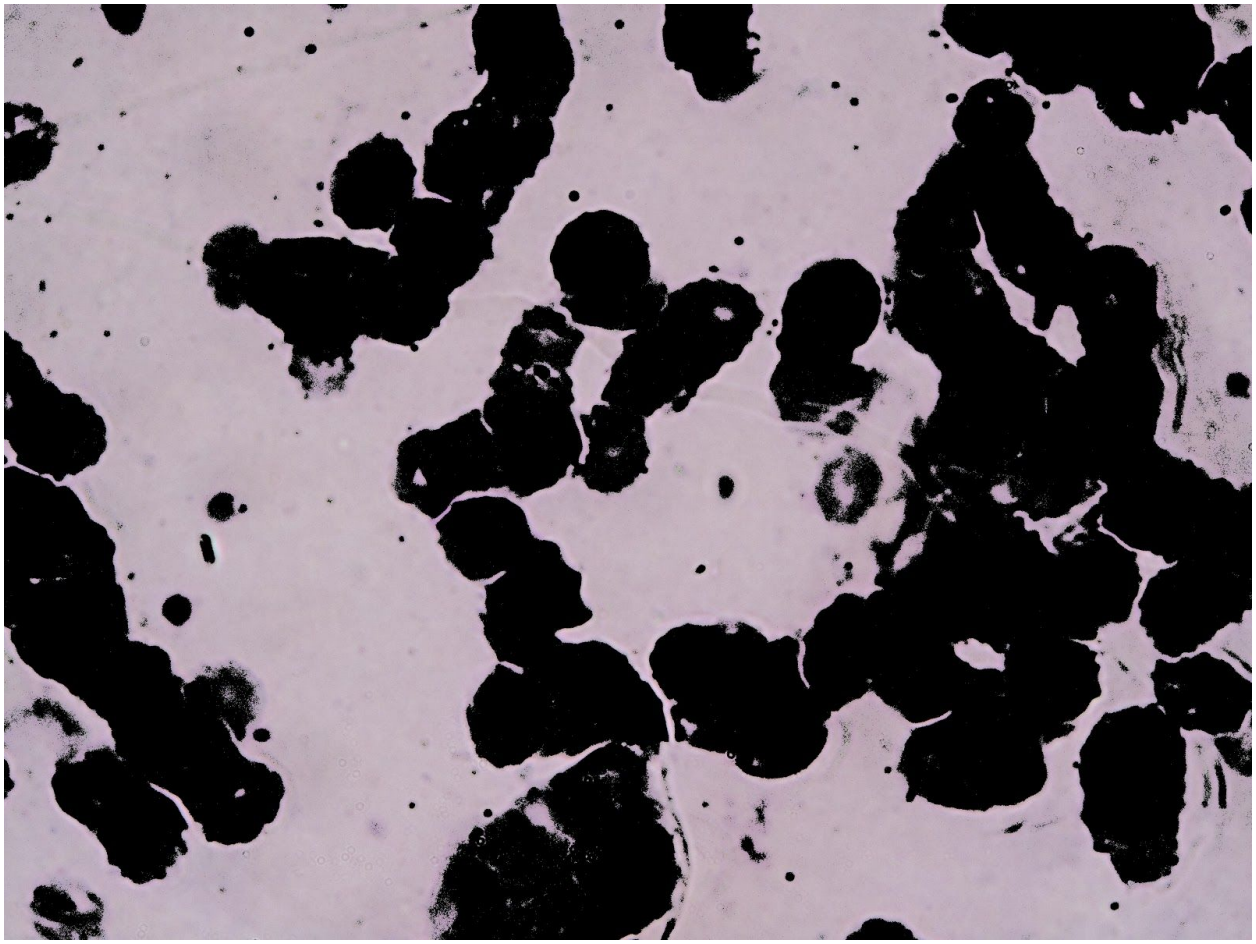

Figure 2.15 : Plasmodium5 image segmented with Manual initialization of Centroids

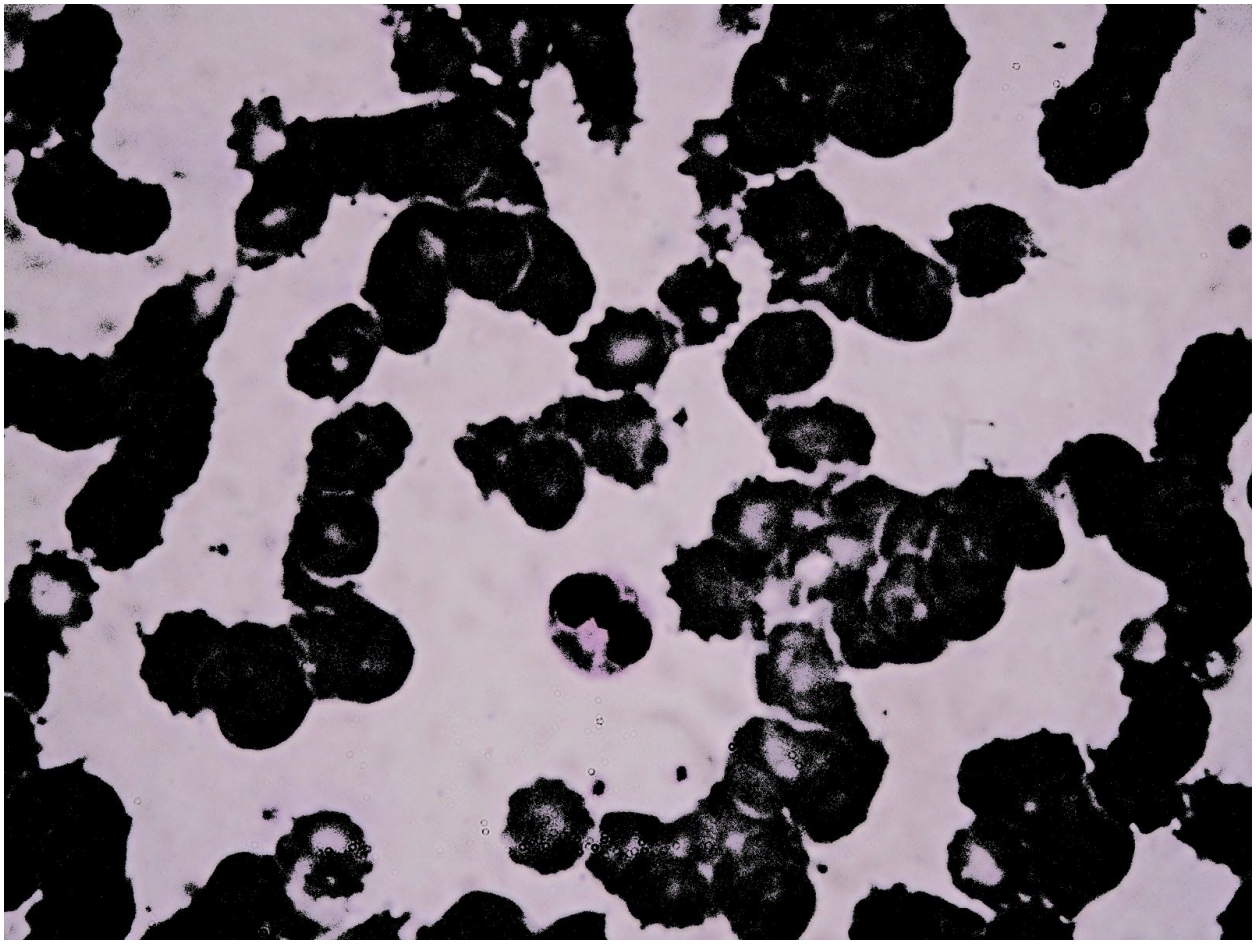

Figure 2.16 : Plasmodium6 image segmented with Manual initialization of Centroids

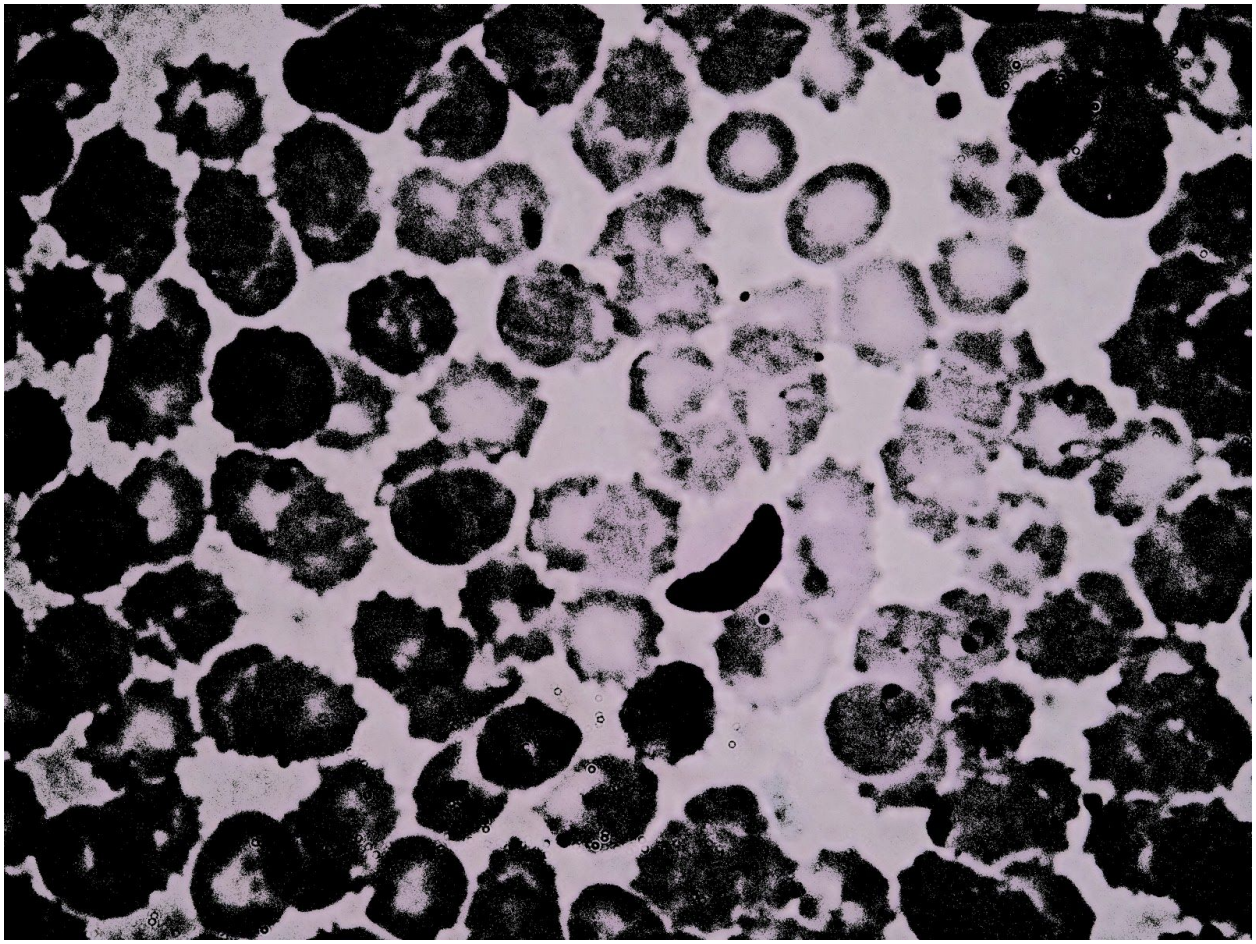

Figure 2.17 : Plasmodium7 image segmented with Manual initialization of Centroids

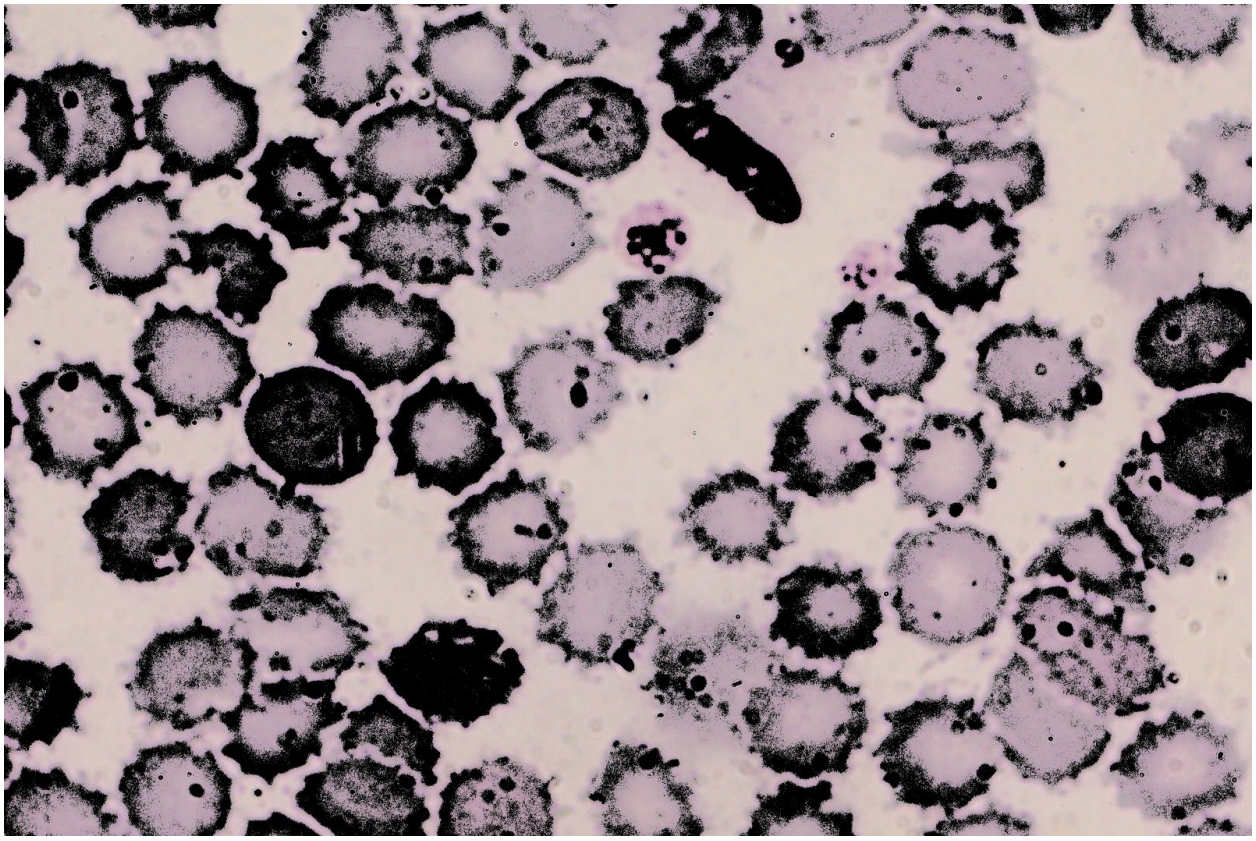

Figure 2.18 : Plasmodium8 image segmented with Manual initialization of Centroids

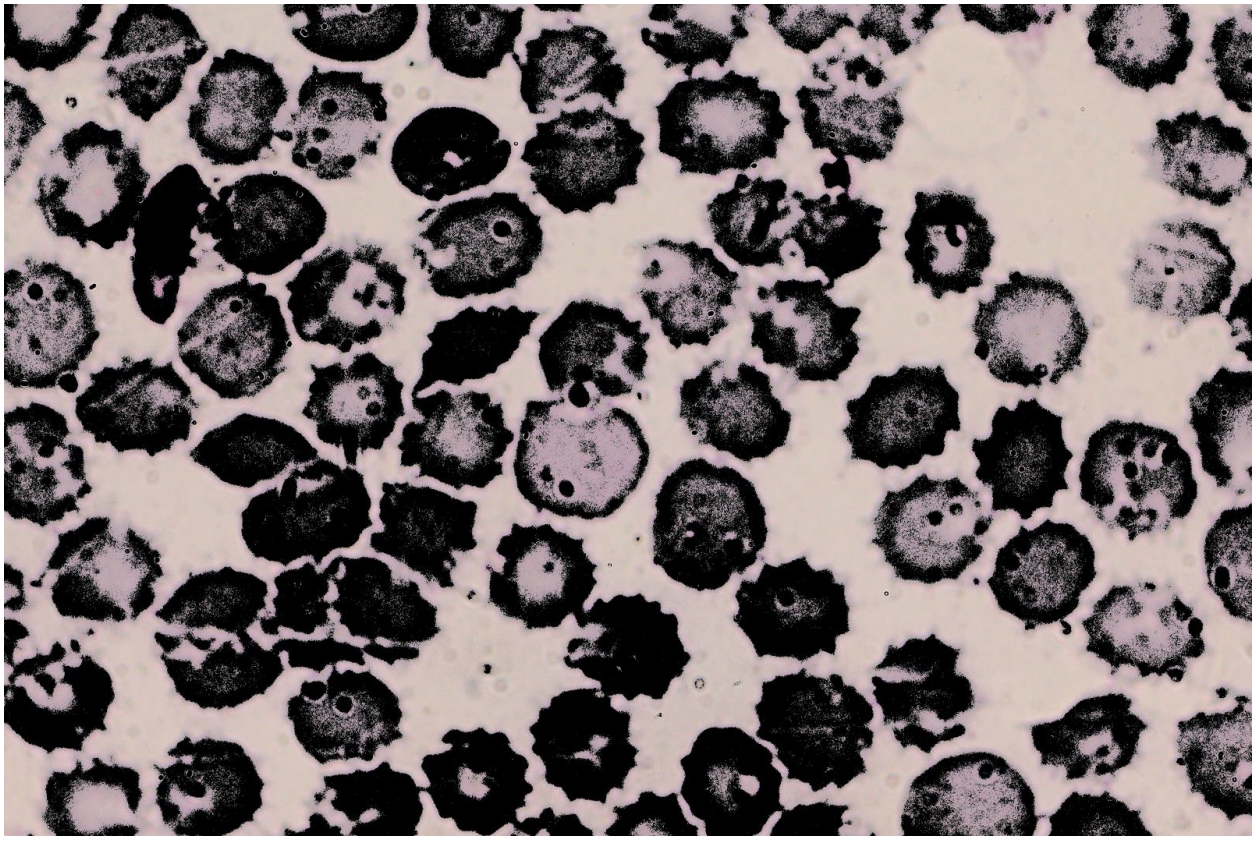

Figure 2.19 : Plasmodium9 image segmented with Manual initialization of Centroids

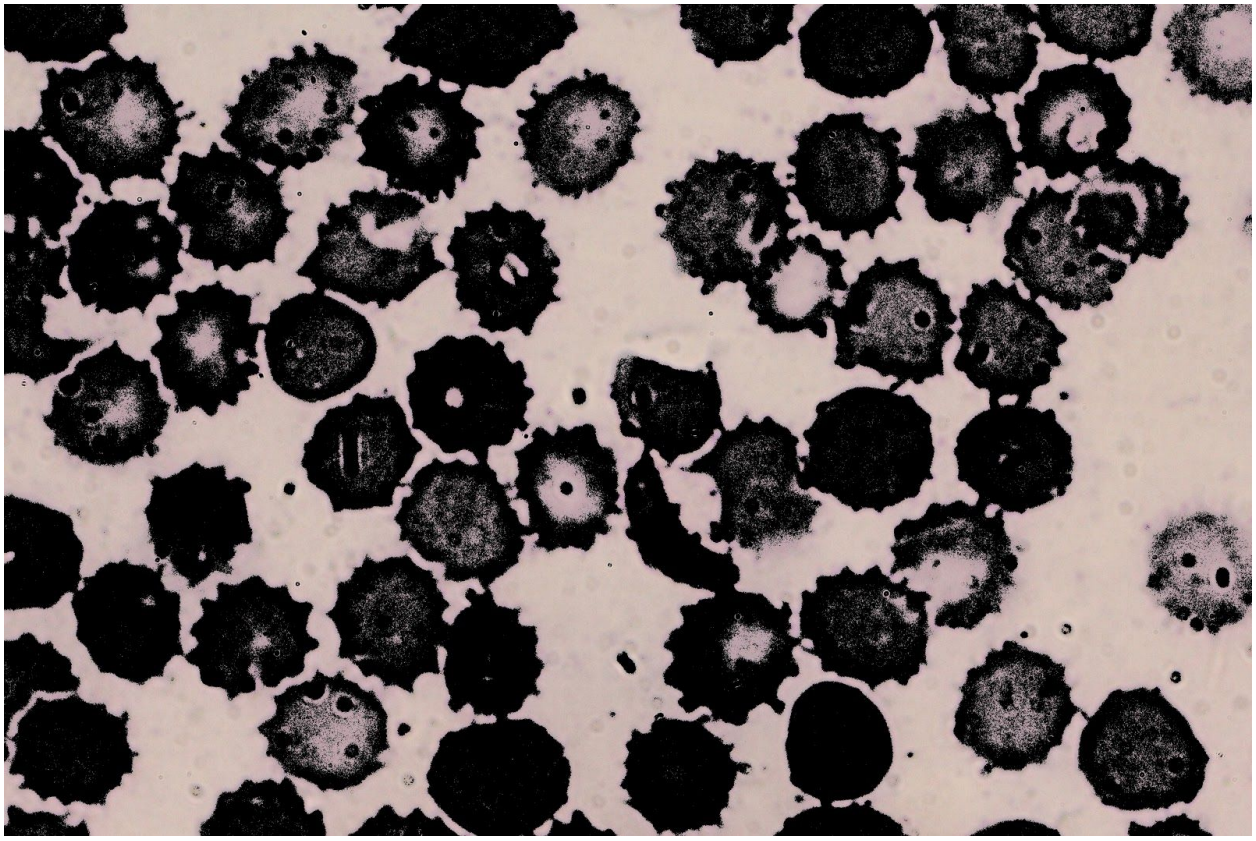

Figure 2.10 : Plasmodium10 image segmented with Manual initialization of Centroids

Specimen : Schistosoma | centroids = [[236,164,26],[0,0,0],[156,85,0]]

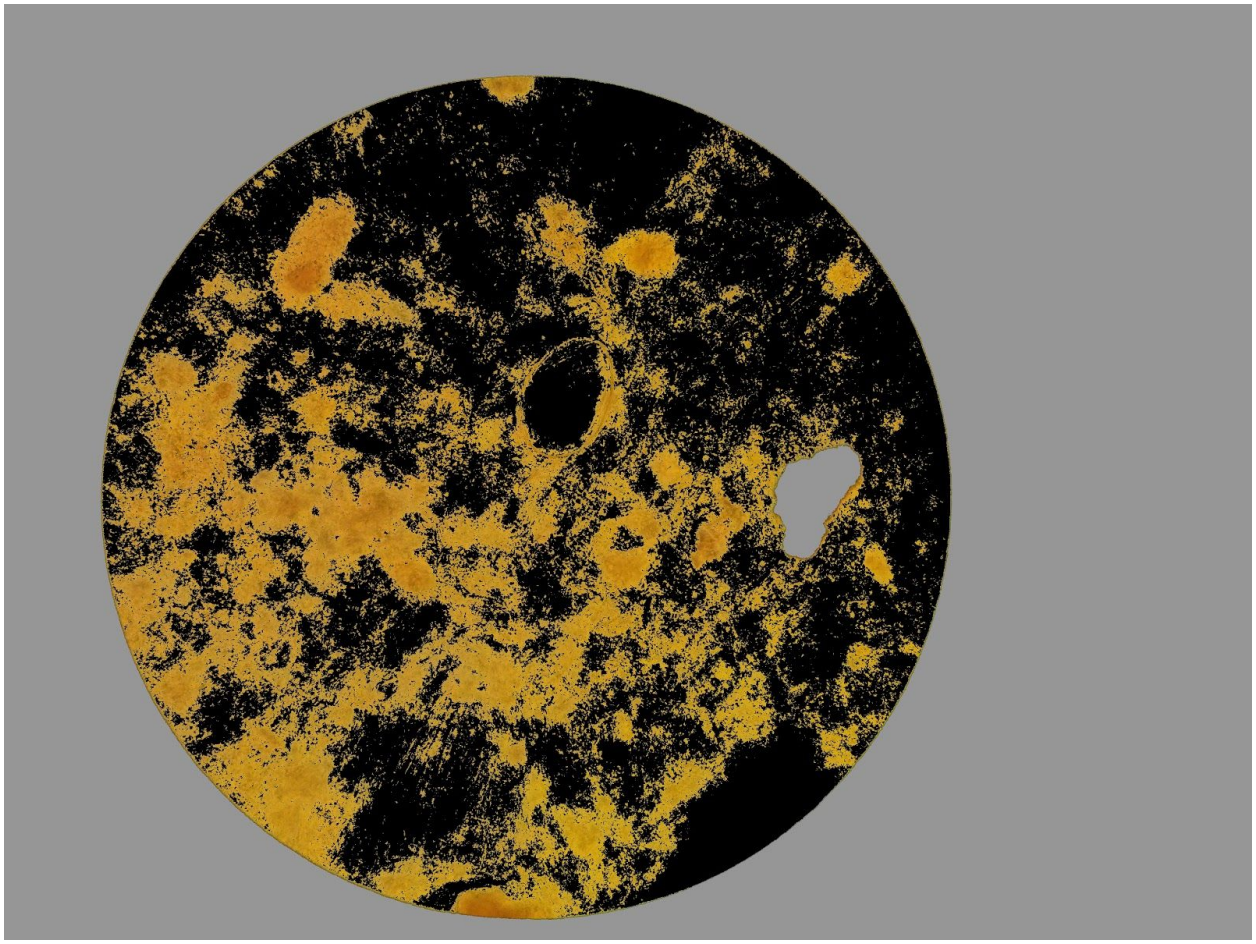

Figure 2.21 : Schistosoma1 image segmented with Manual initialization of Centroids

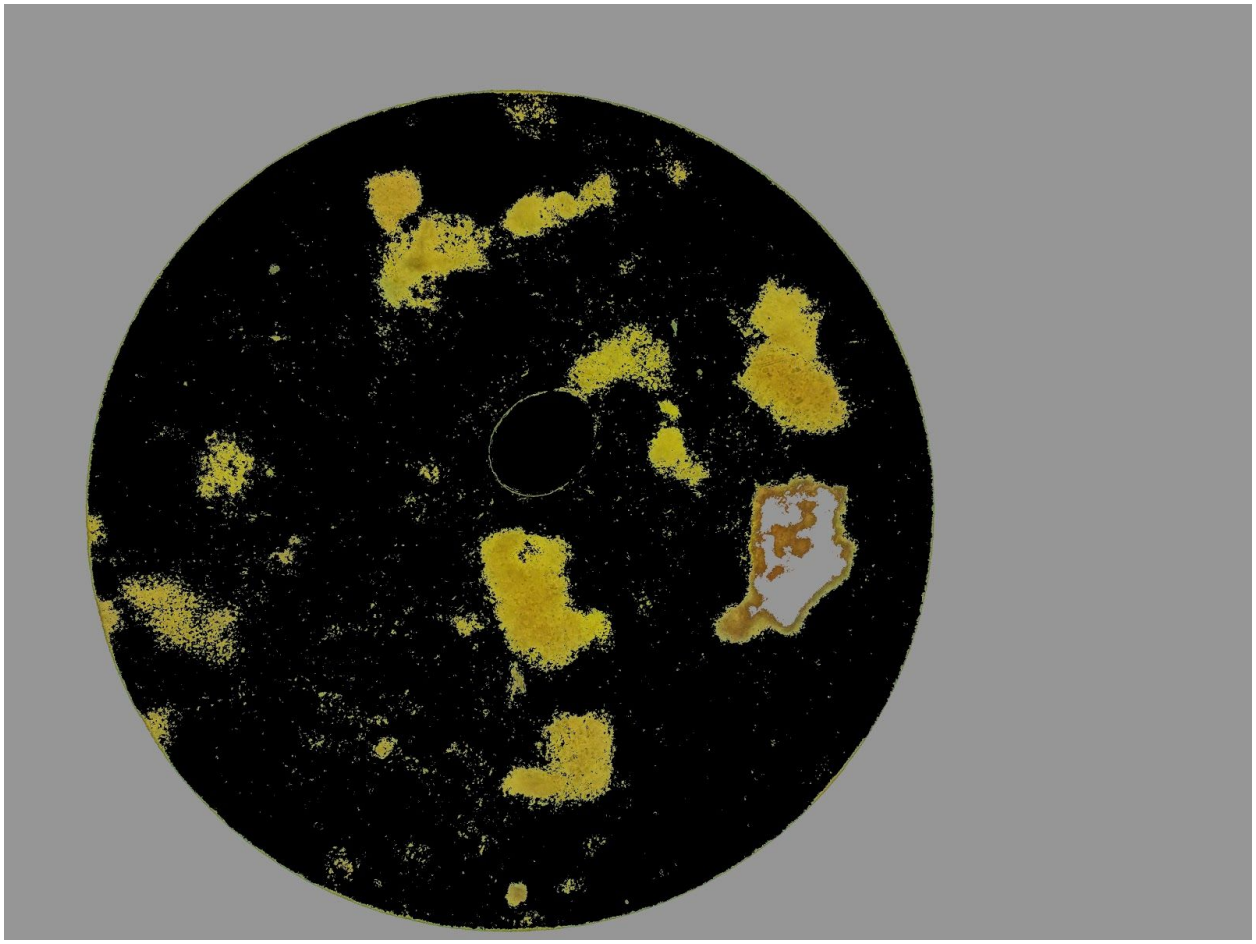

Figure 2.22 : Schistosoma2 image segmented with Manual initialization of Centroids

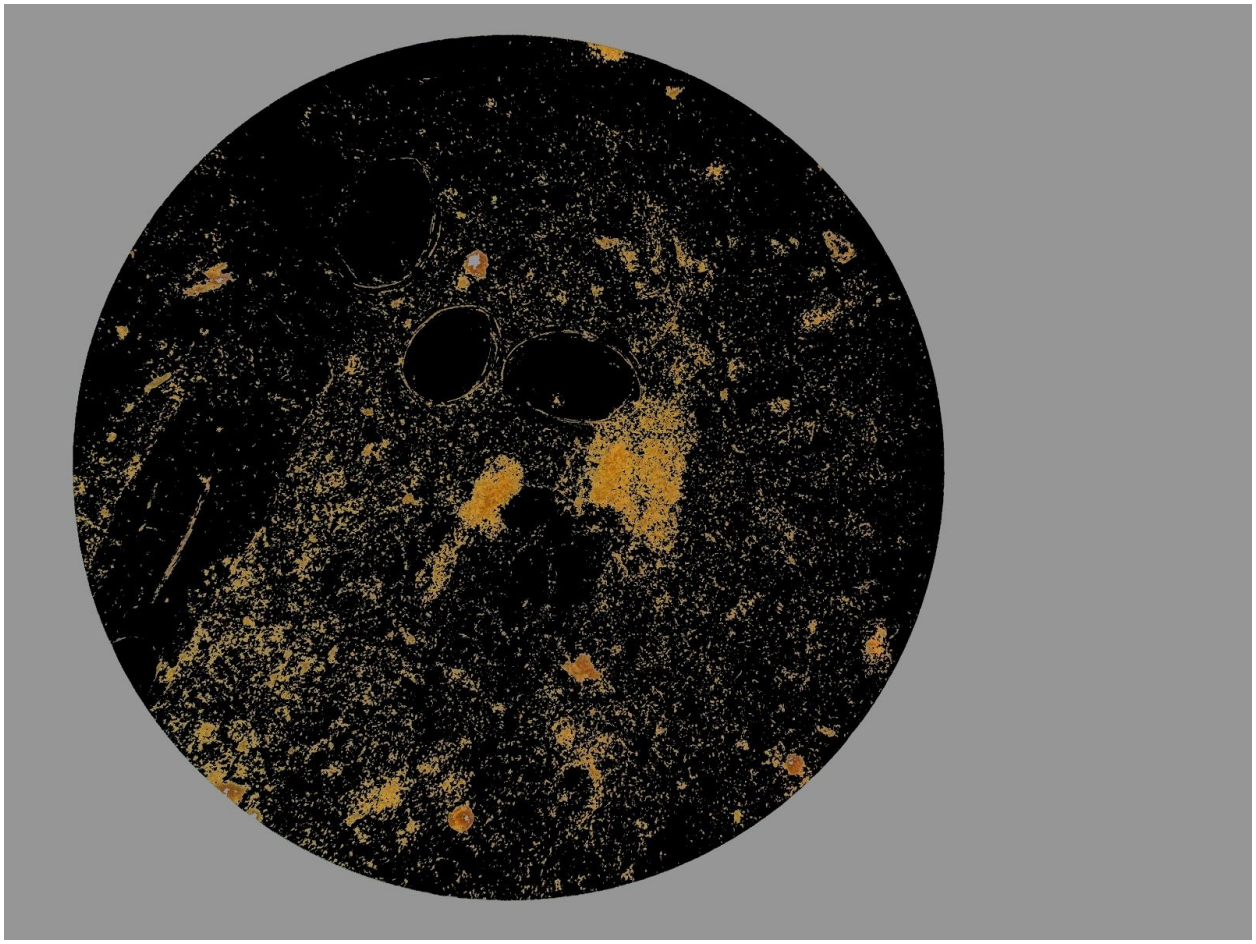

Figure 2.23 : Schistosoma3 image segmented with Manual initialization of Centroids

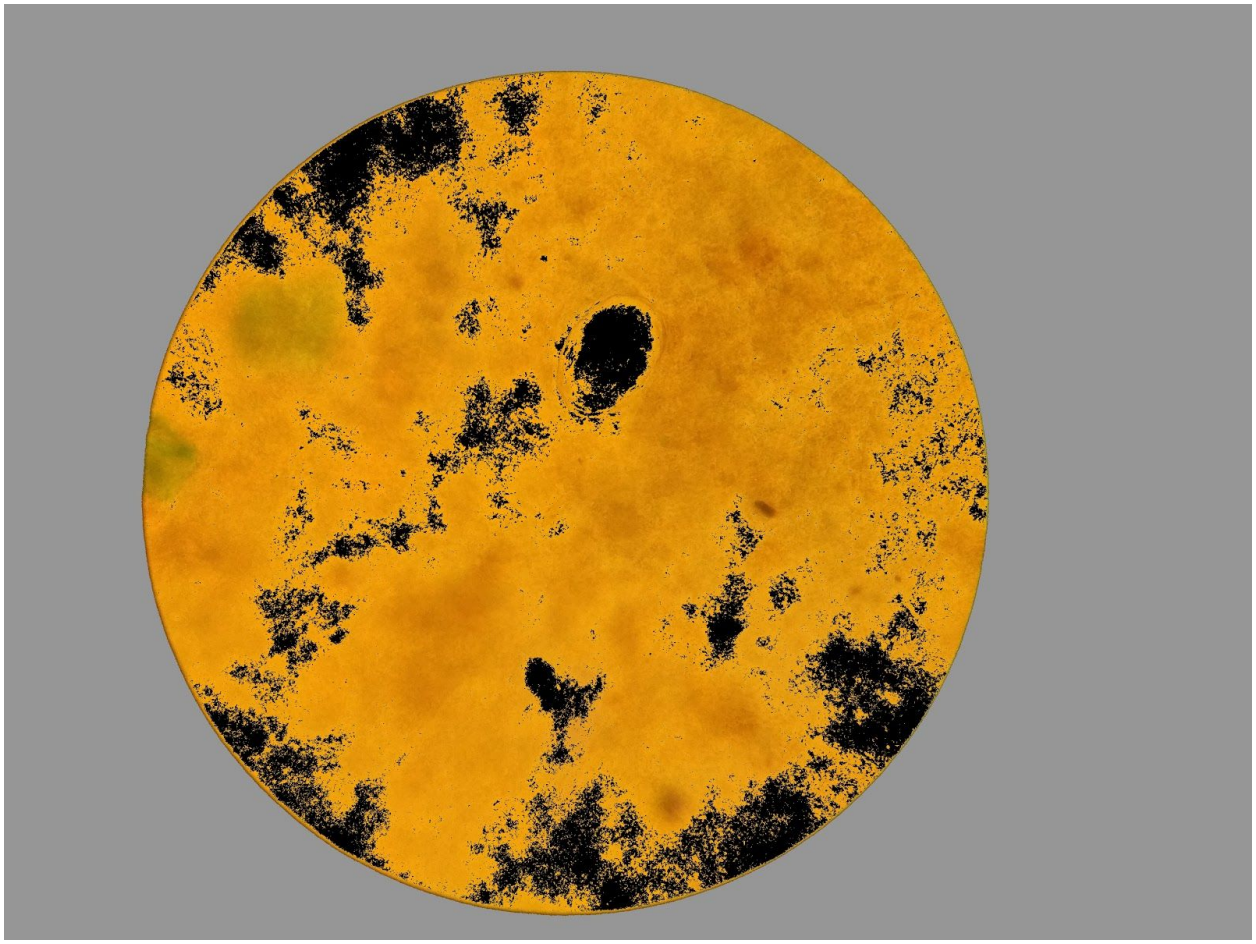

Figure 2.24 : Schistosoma4 image segmented with Manual initialization of Centroids

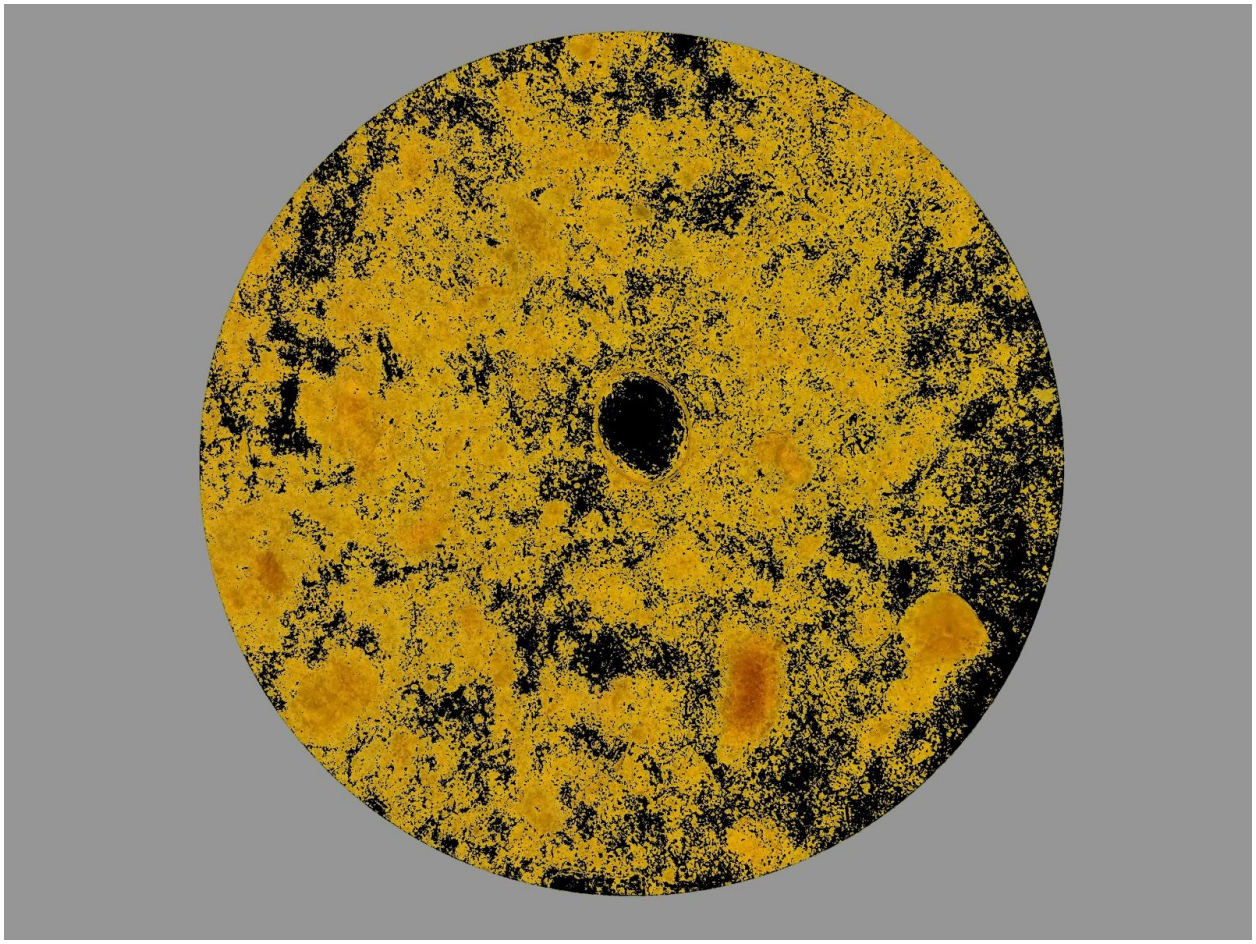

Figure 2.25 : Schistosoma5 image segmented with Manual initialization of Centroids

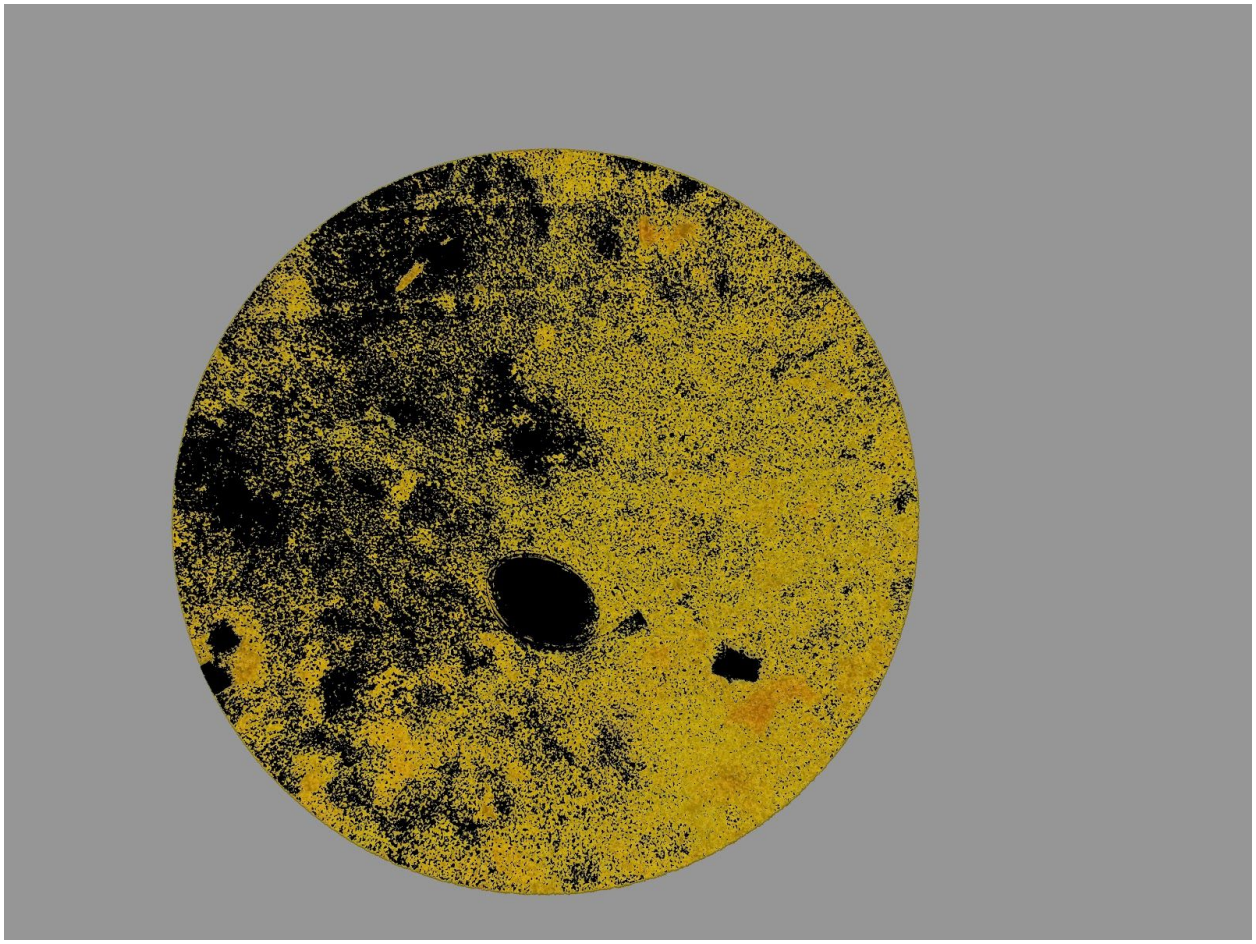

Figure 2.26 : Schistosoma6 image segmented with Manual initialization of Centroids

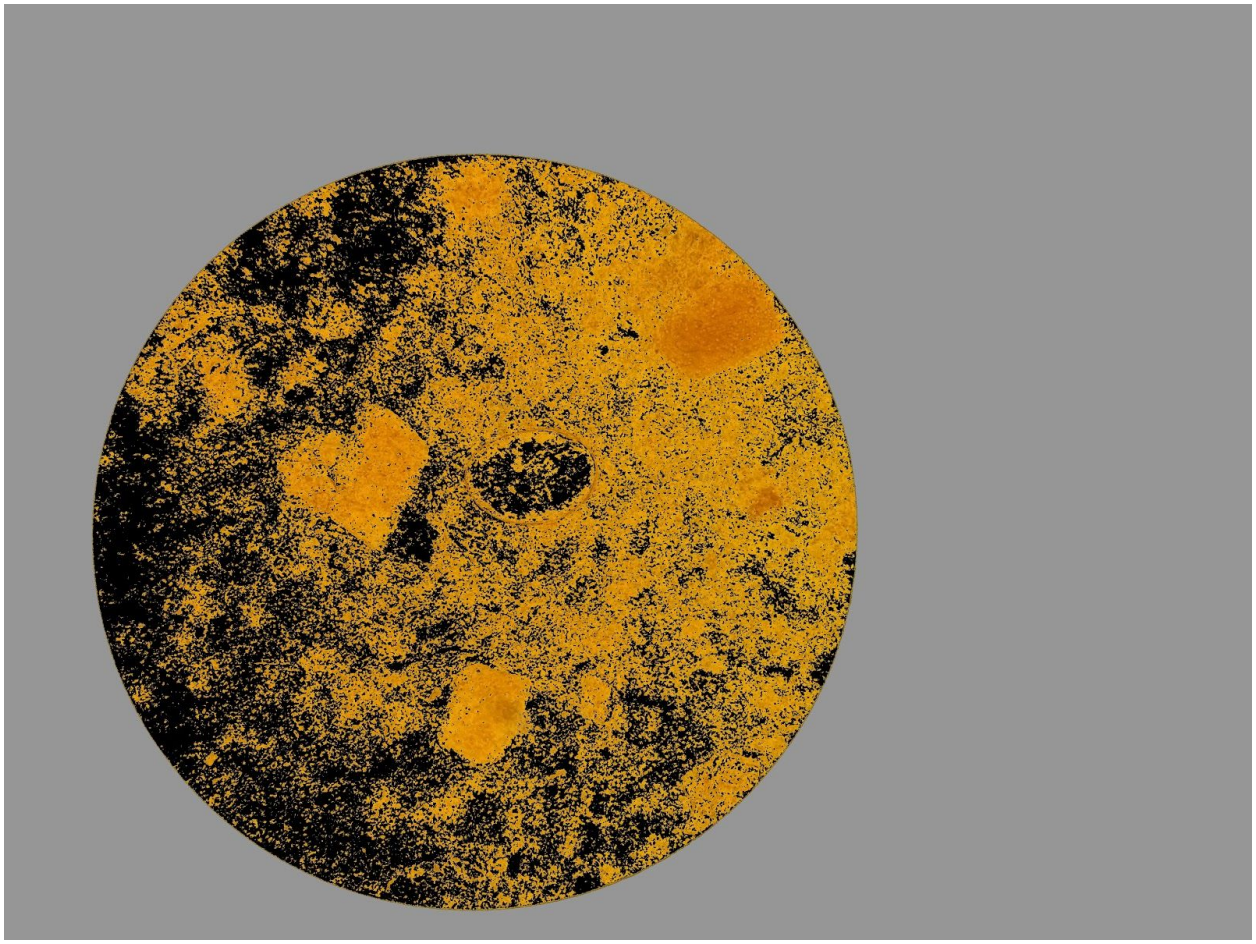

Figure 2.27 : Schistosoma7 image segmented with Manual initialization of Centroids

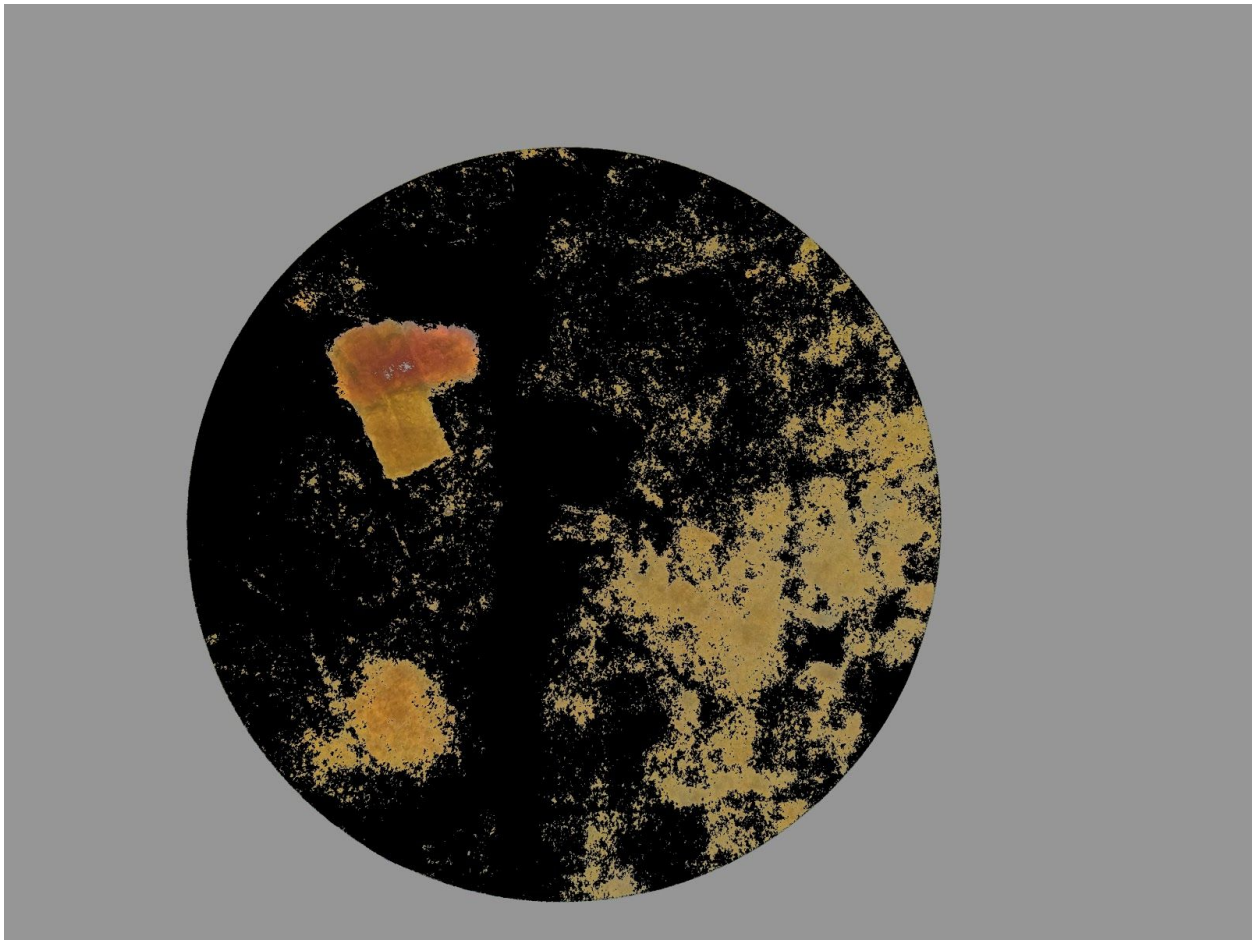

Figure 2.28 : Schistosoma8 image segmented with Manual initialization of Centroids

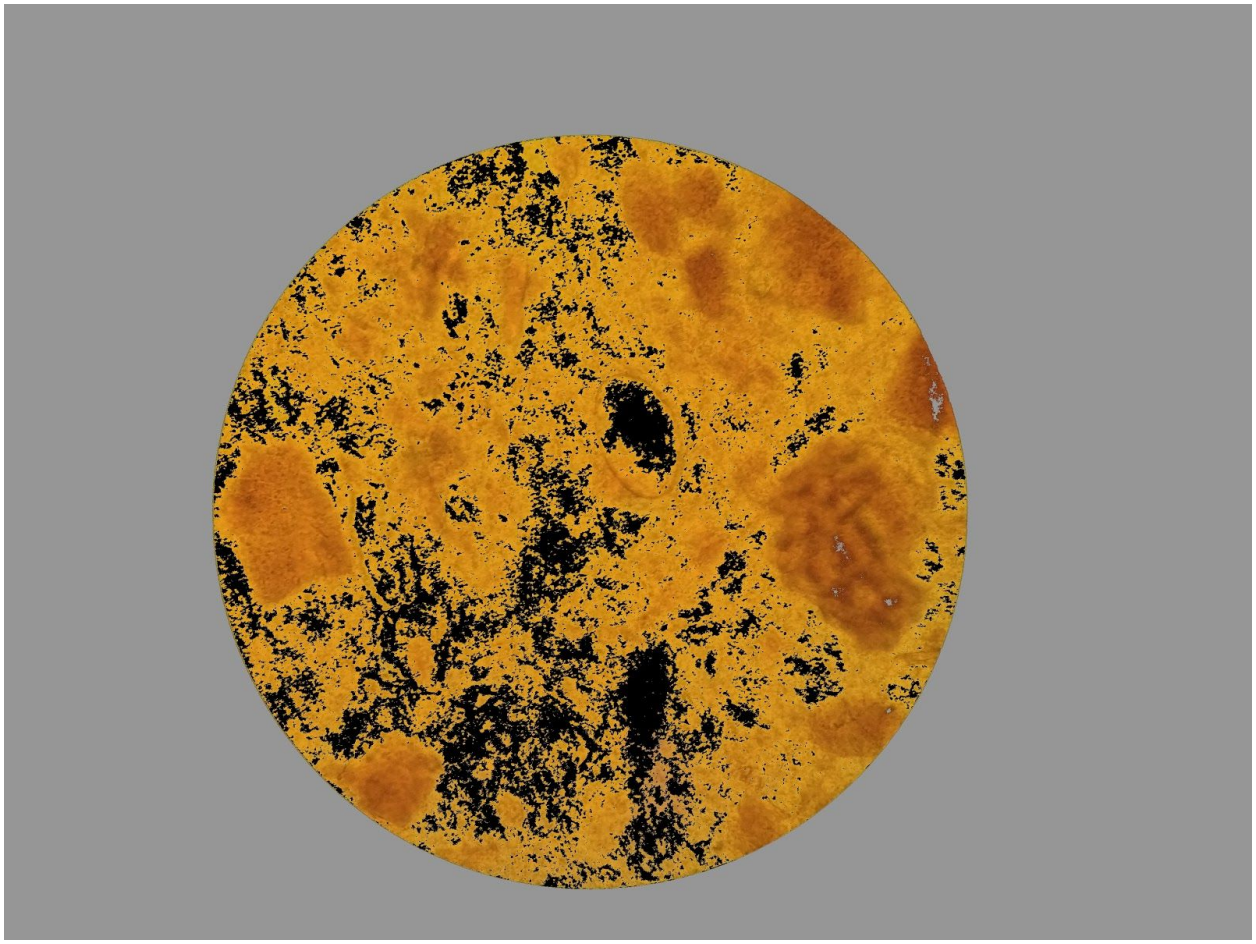

Figure 2.29 : Schistosoma9 image segmented with Manual initialization of Centroids

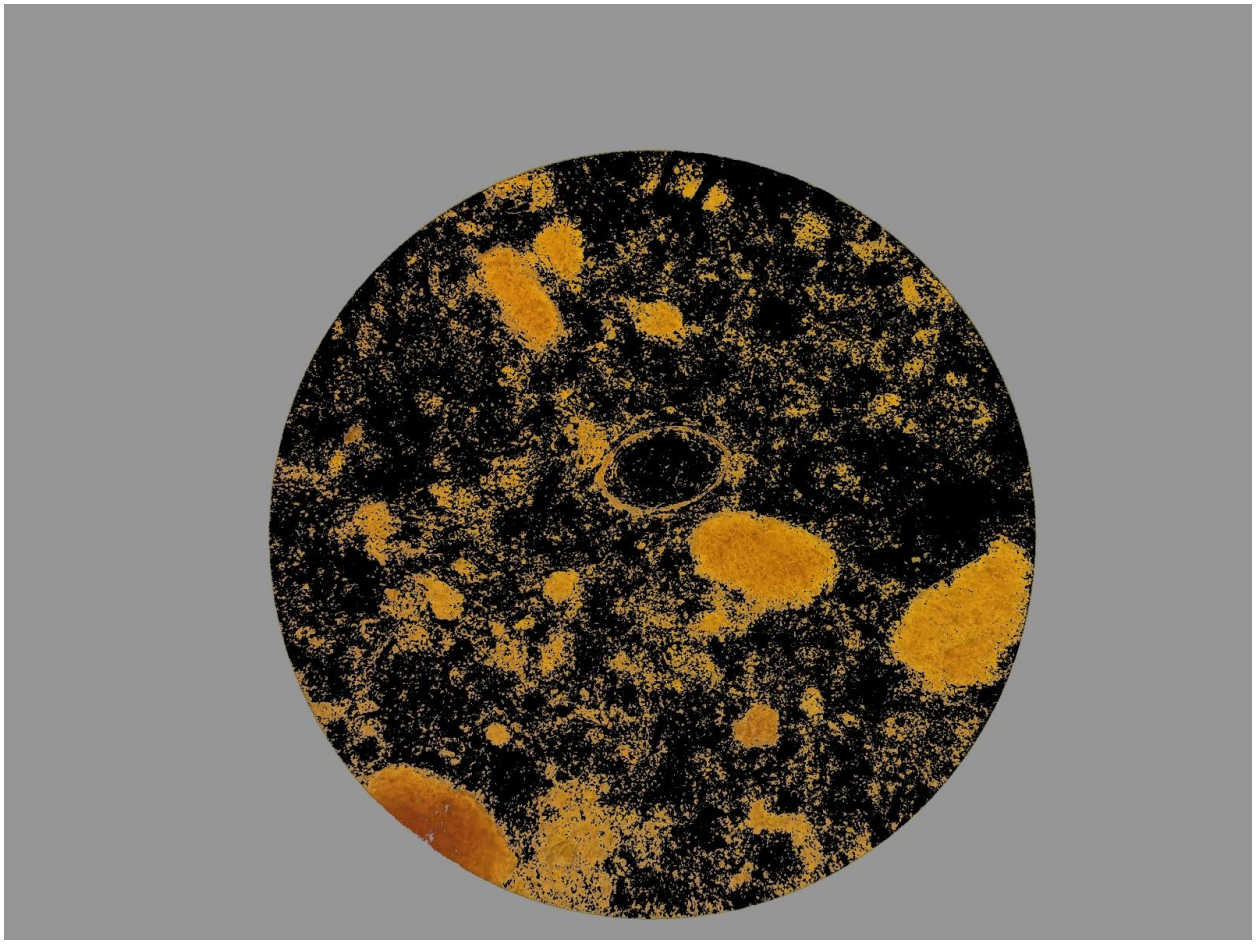

Figure 2.30 : Schistosoma10 image segmented with Manual initialization of Centroids

Number 3

3. If the centroids are increased to more than 2, how would the segmentation change? Are there specific regions other than the parasite segmented?

I used 4 clusters for all of the specimen segmentation.The segmentation changed very greatly in terms of segmenting the different sections of the image. For example, in Filaria, the images were clustered into 4 parts -the microscope limitation, the cells, the parasite and the background/film. In Plasmodium, the images were clustered into the background/film, the 3 different shades of depth of the cells wherein solid blue clusters (clustered heaviliy) shows the plasmodium itself. Lastly, in schistosoma the clusters were divided into the microscope limitation, the background/film, the 2 different shades of the stool(clump of stool and the liquid/soft stool)

Specimen : Filaria

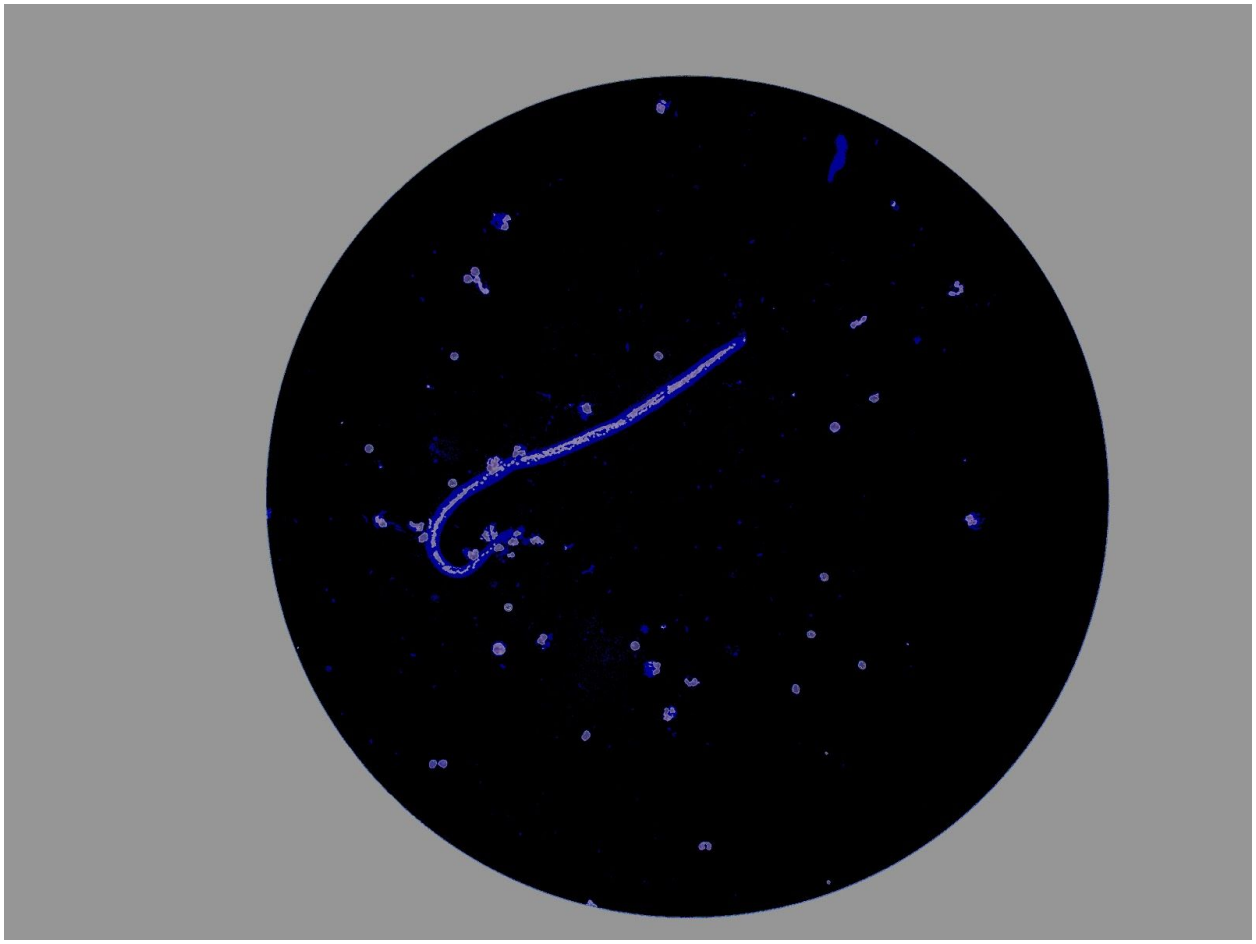

Figure 3.1 : Filaria1 clustered with 4 centroids

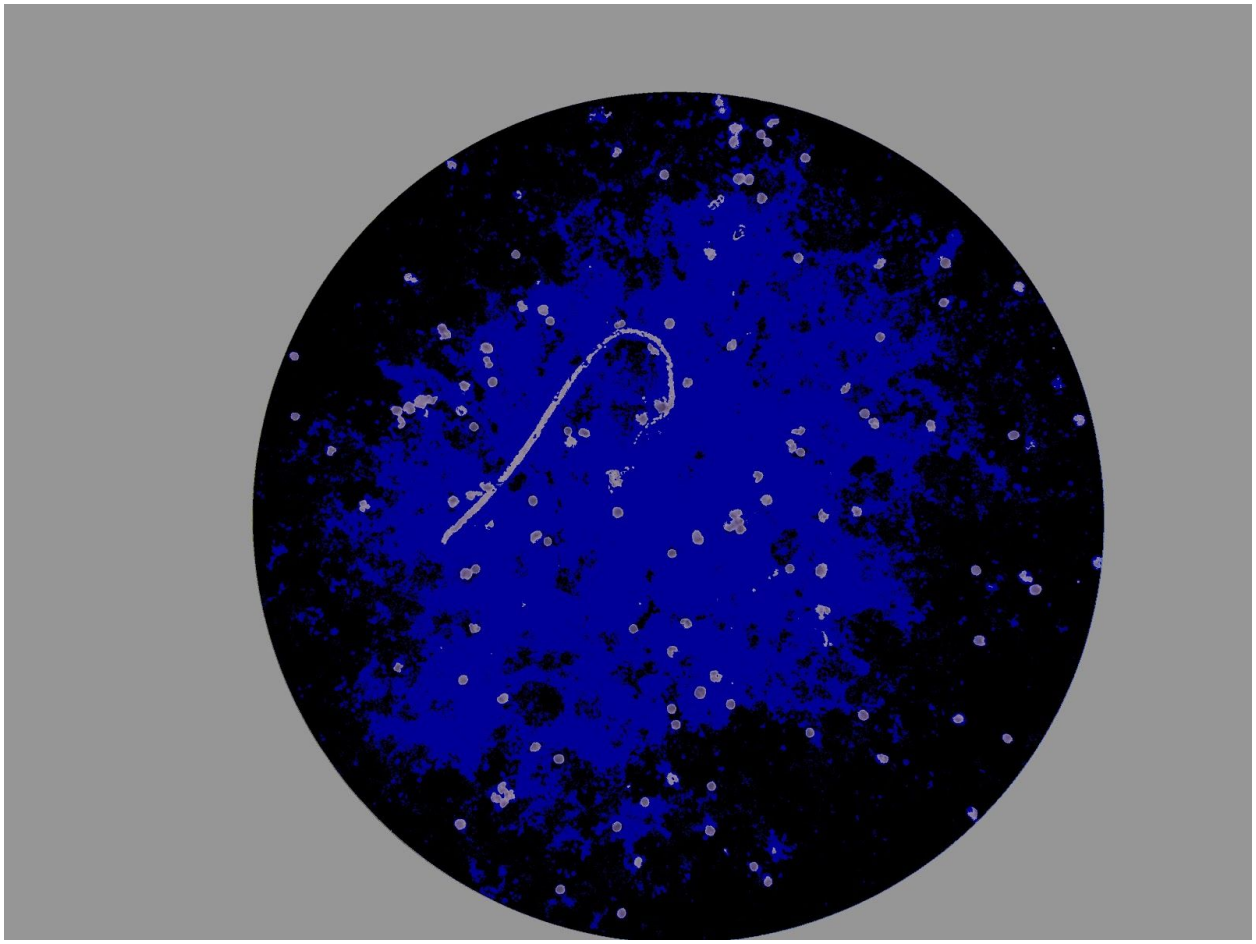

Figure 3.2 : Filaria2 clustered with 4 centroids

Figure 3.3 : Filaria3 clustered with 4 centroids

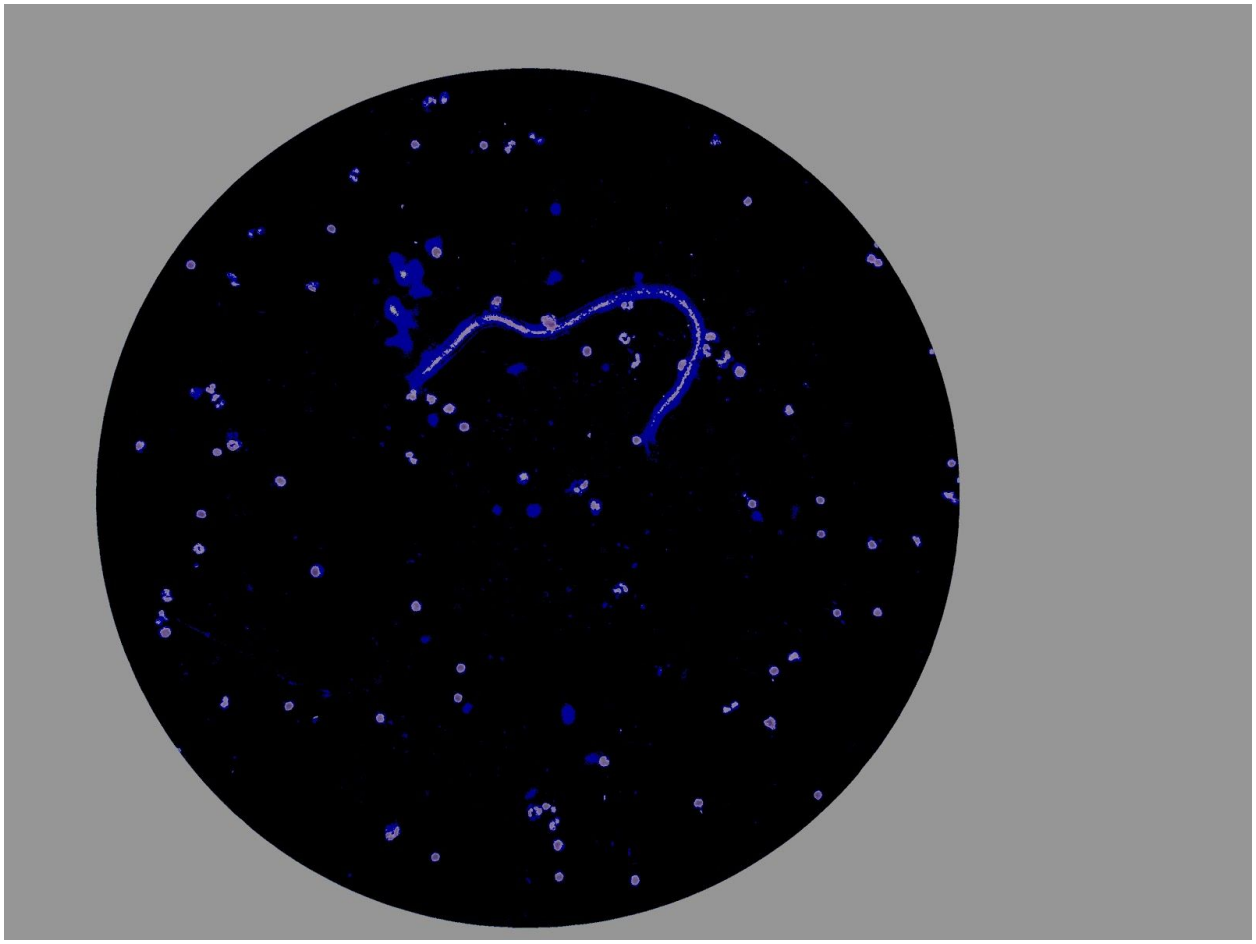

Figure 3.4 : Filaria4 clustered with 4 centroids

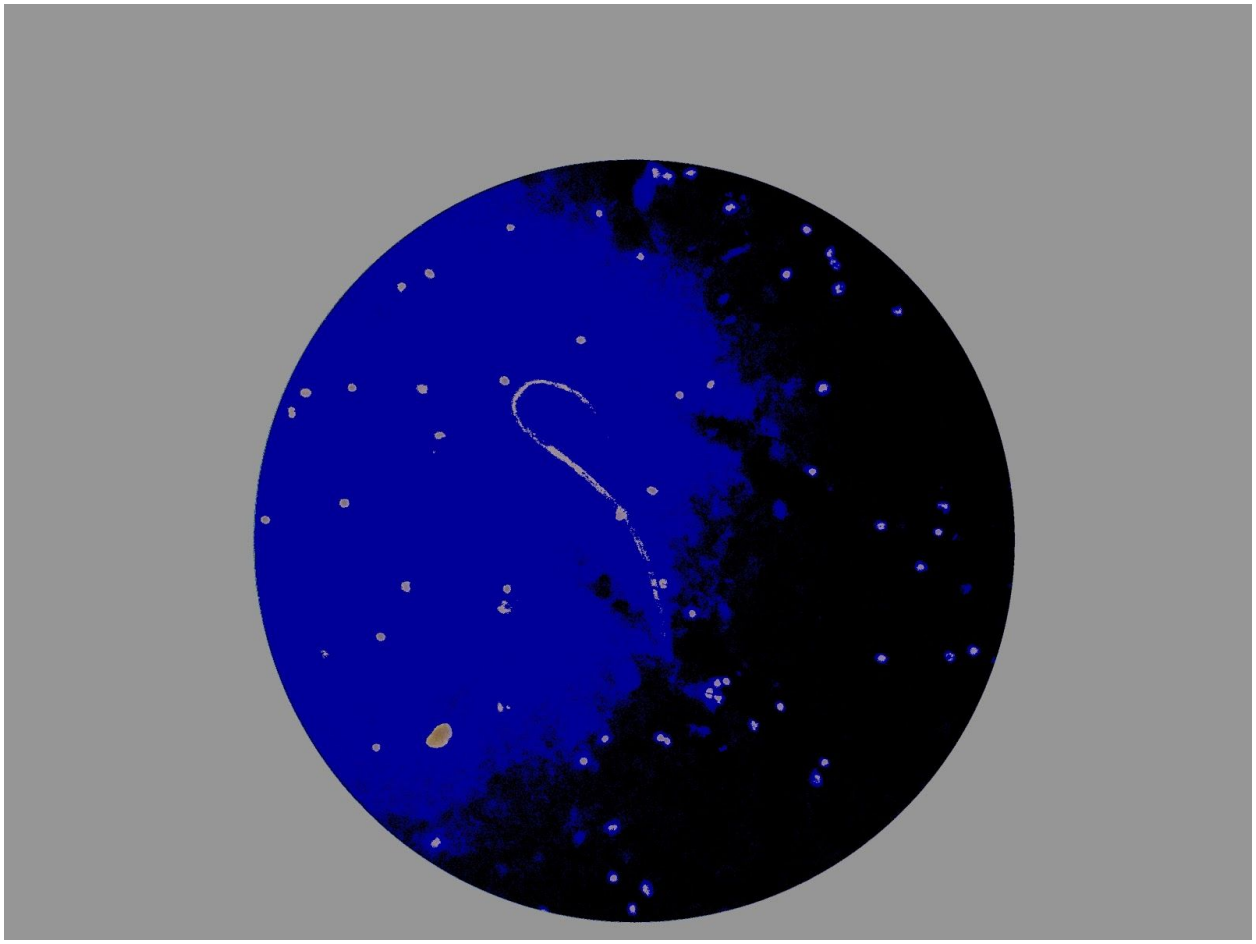

Figure 3.5 : Filaria5 clustered with 4 centroids

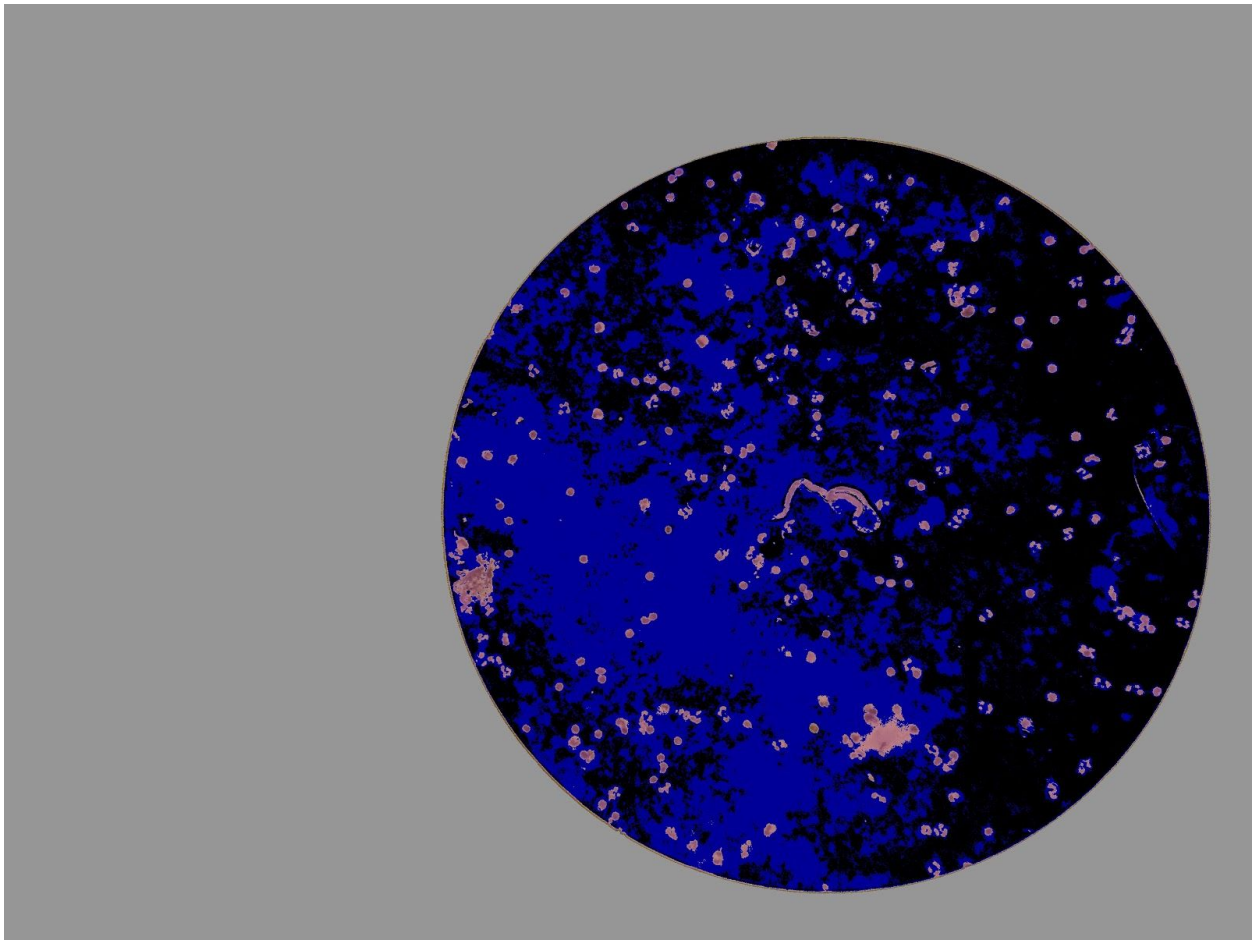

Figure 3.6 : Filaria6 clustered with 4 centroids

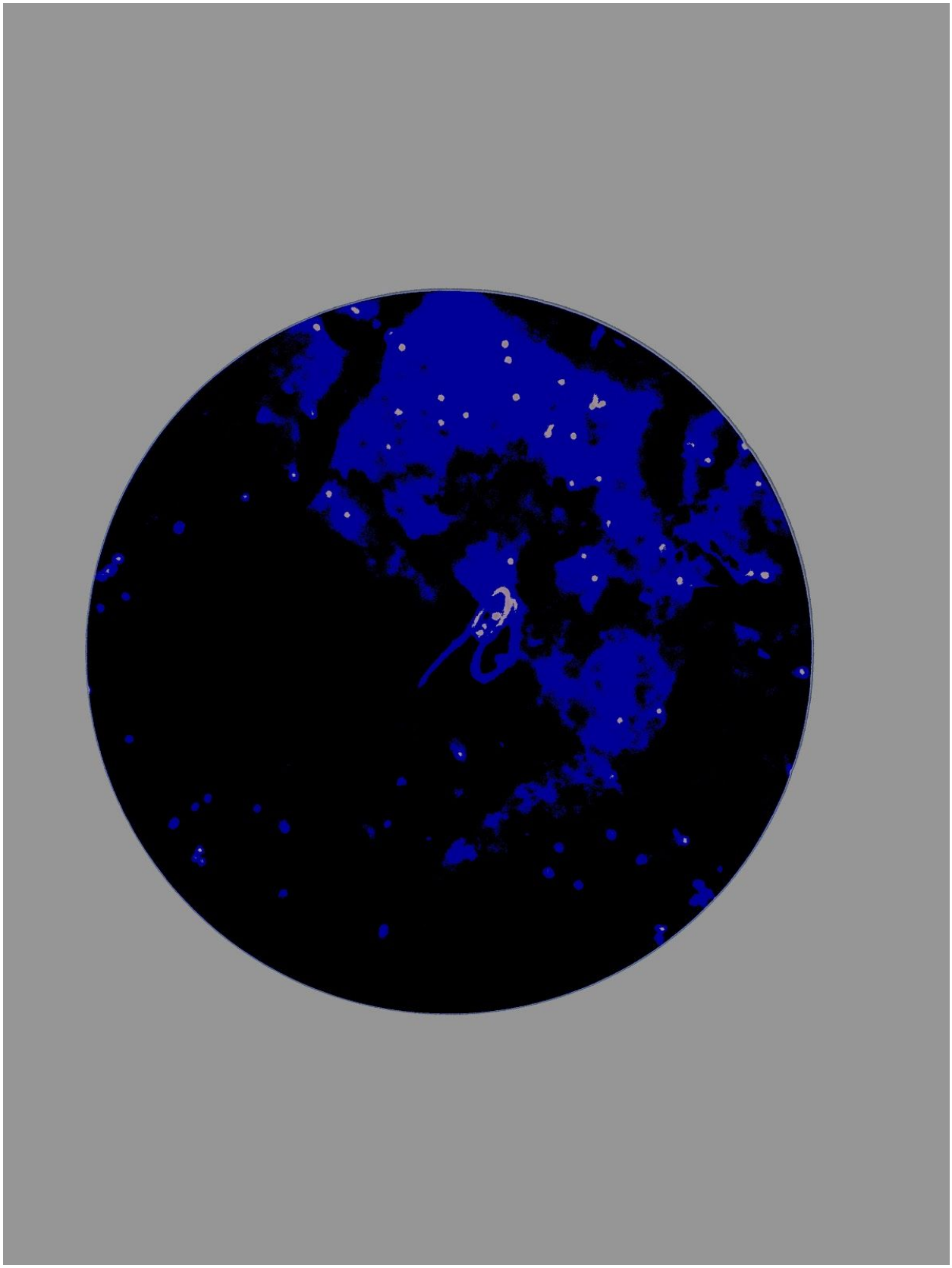

Figure 3.7 : Filaria7 clustered with 4 centroids

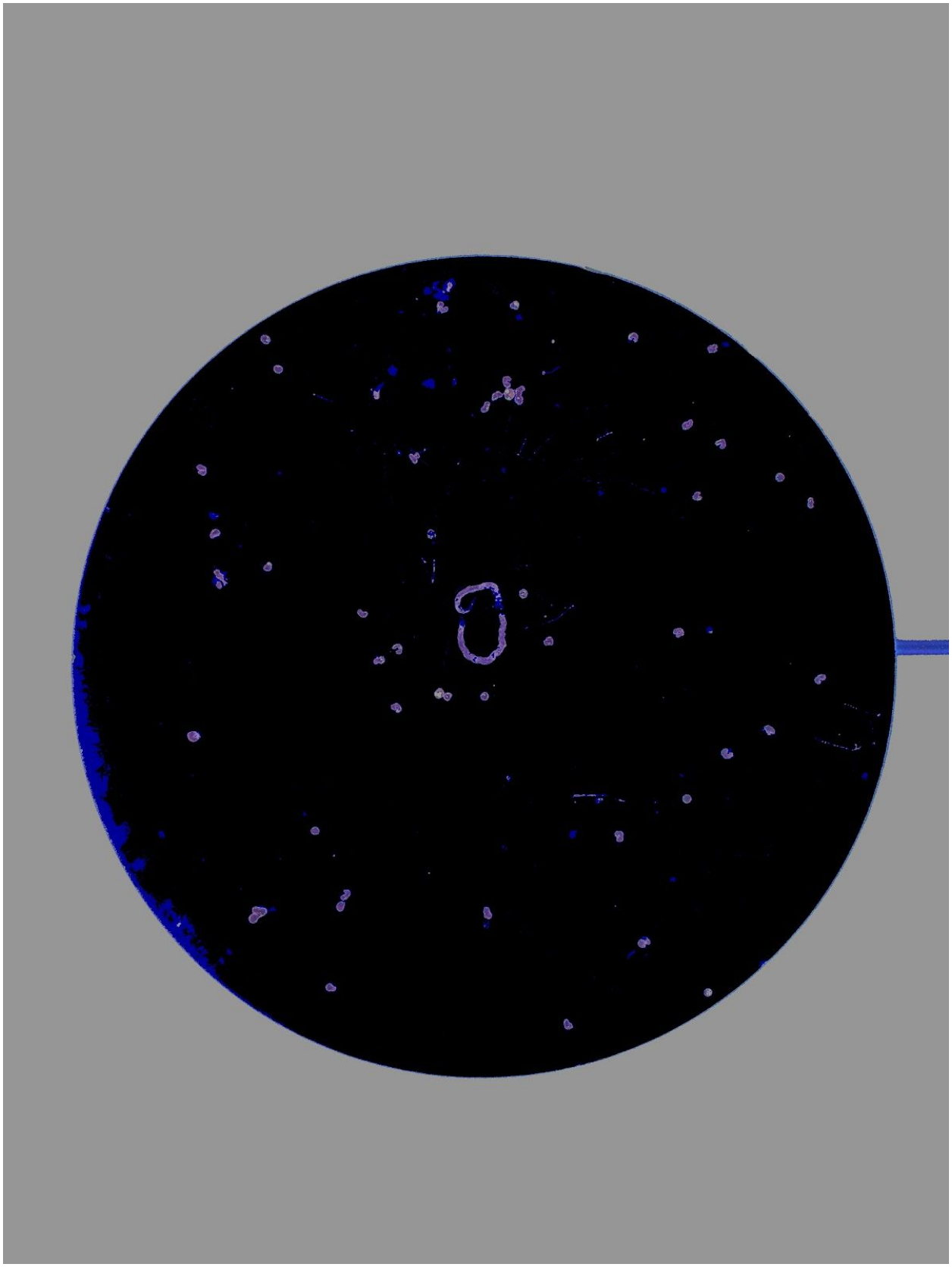

Figure 3.8 : Filaria8 clustered with 4 centroids

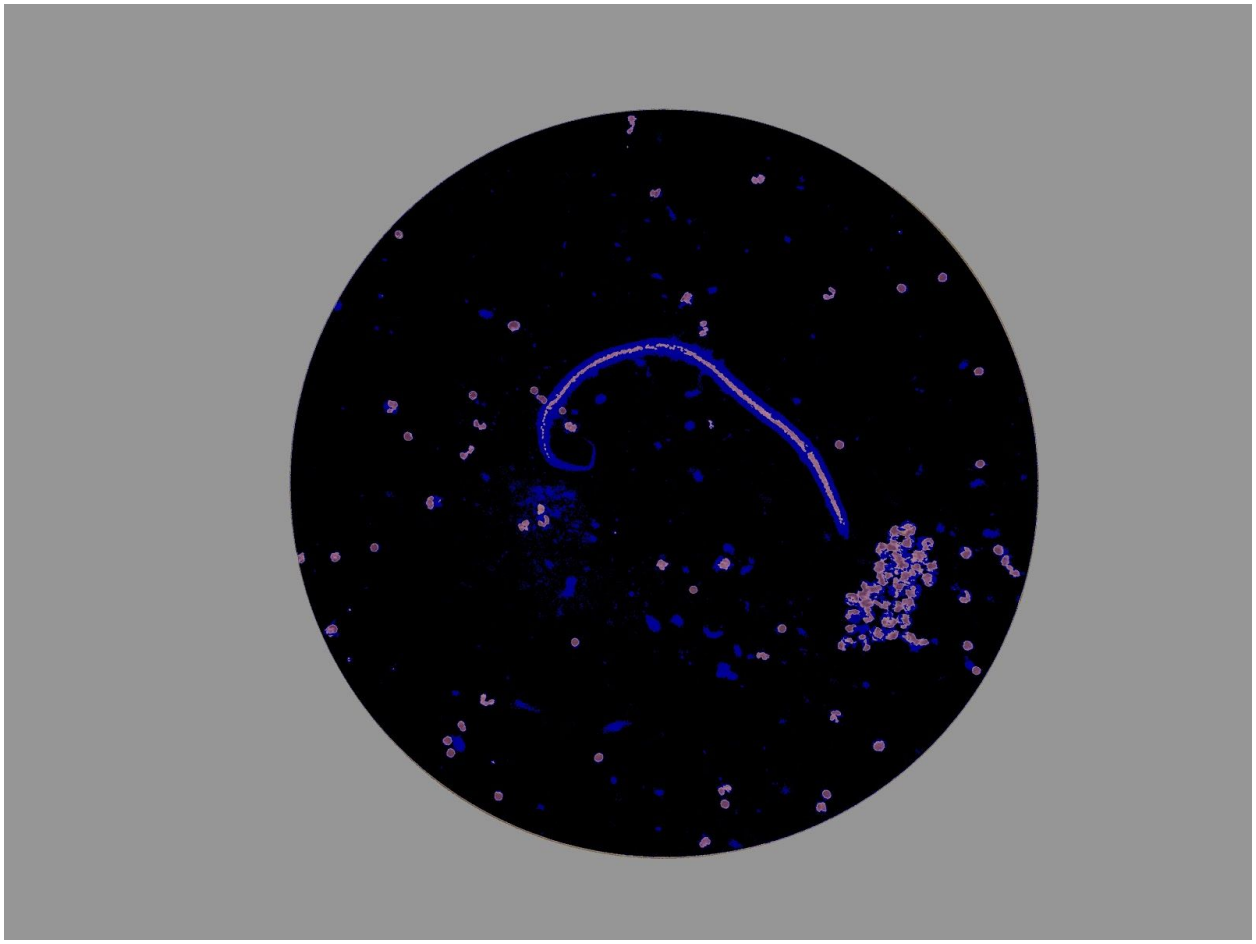

Figure 3.9 : Filaria9 clustered with 4 centroids

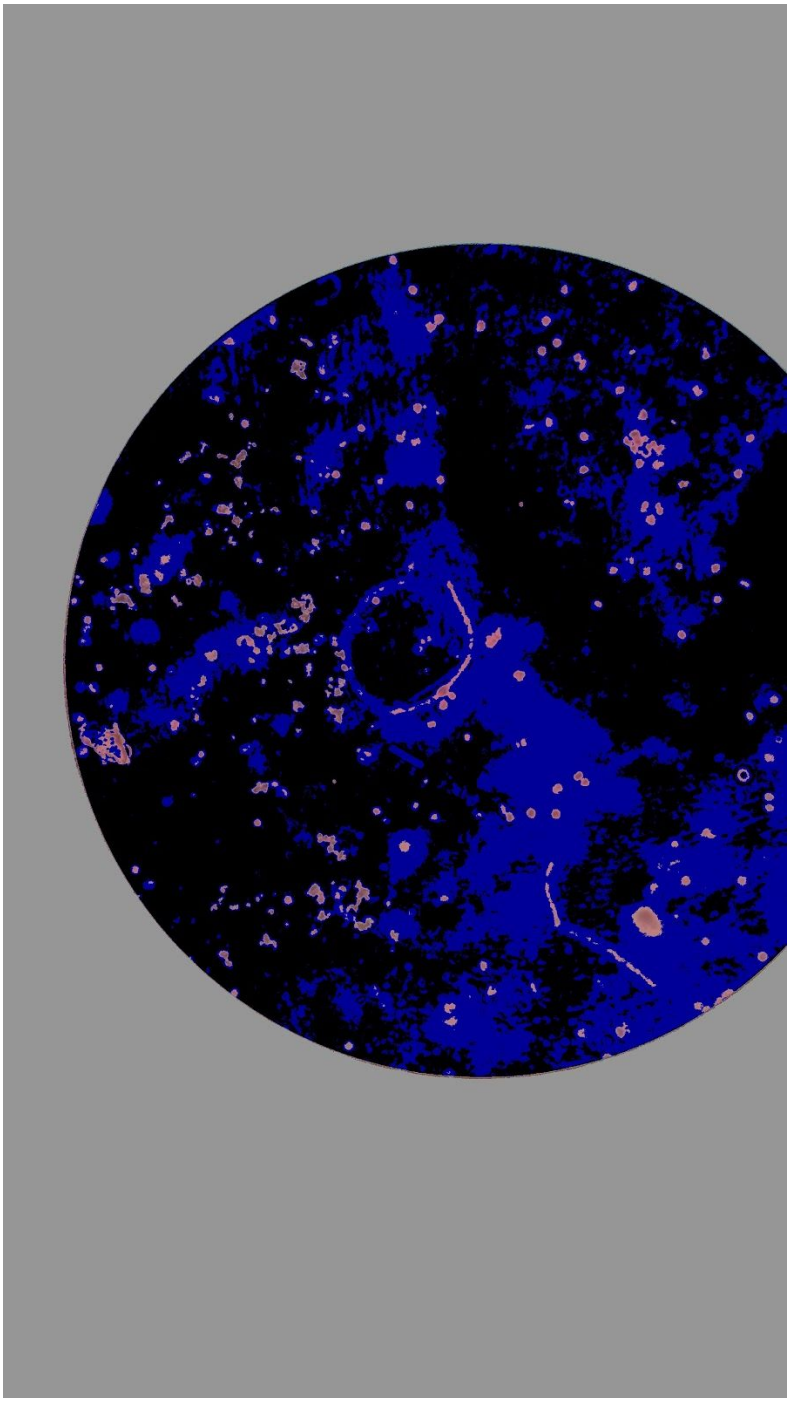

Figure 3.10 : Filaria10 clustered with 4 centroids

Specimen : Plasmodium

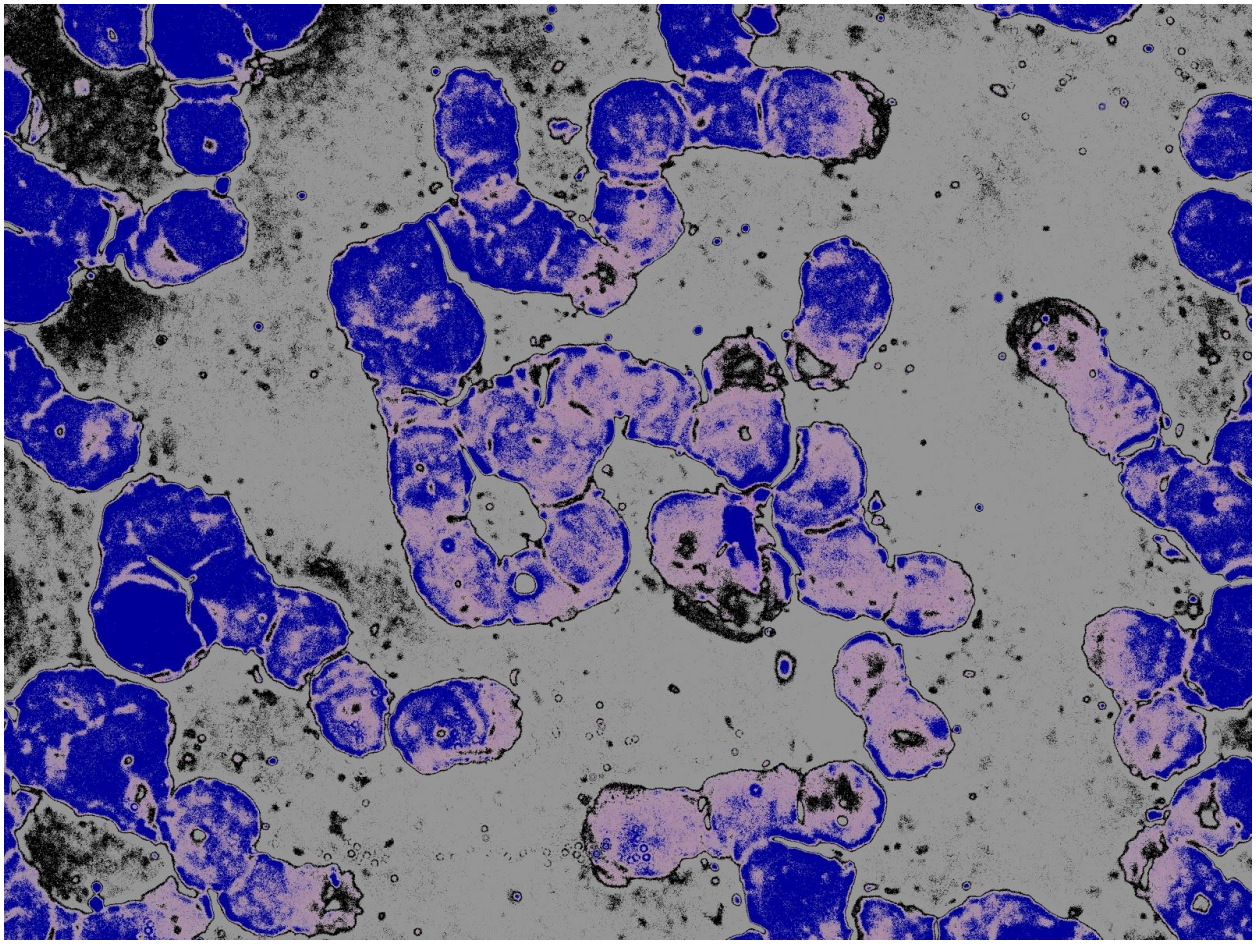

Figure 3.11 : Plasmodium1 clustered 4 centroids

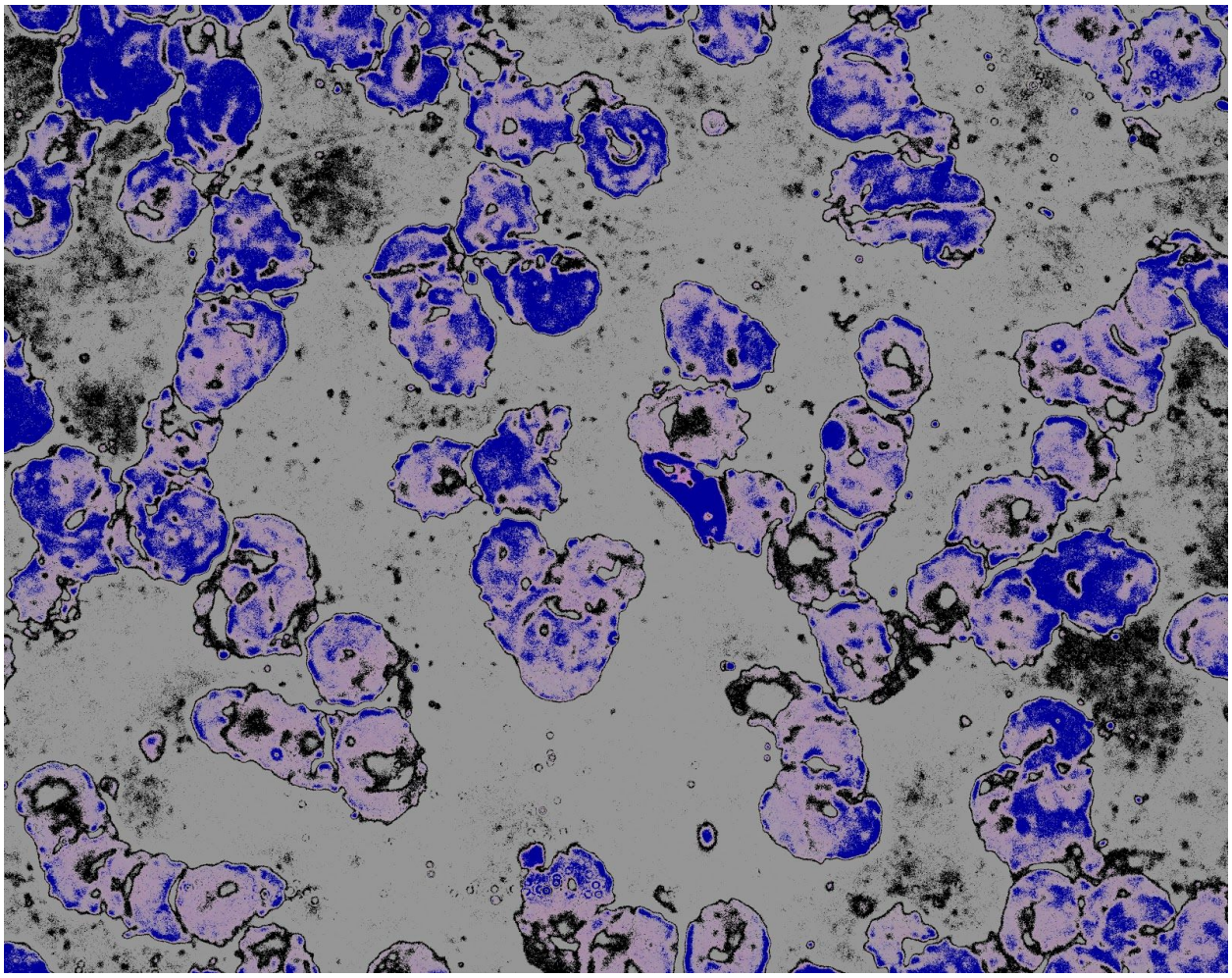

Figure 3.12 : Plasmodium2 clustered 4 centroids

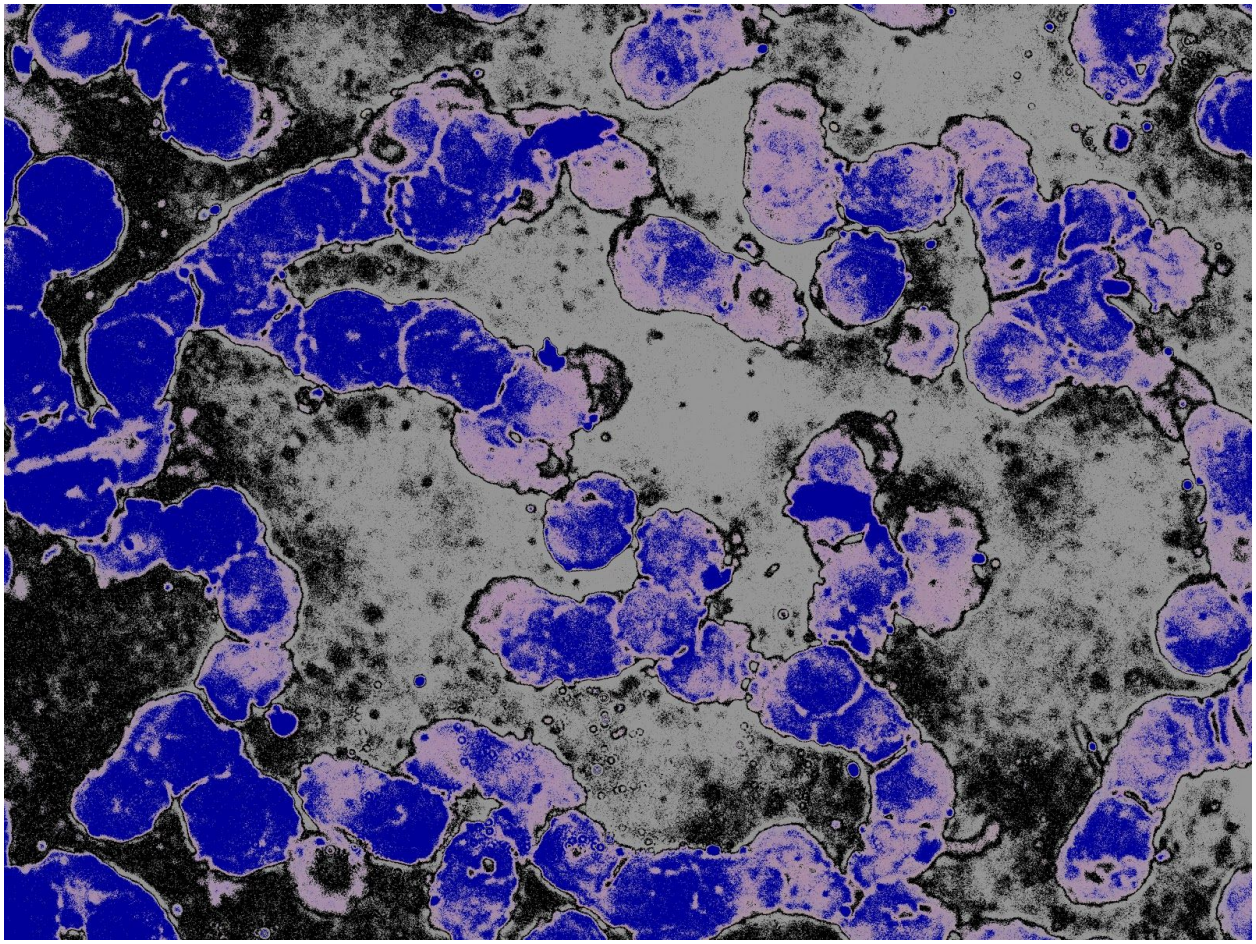

Figure 3.13 : Plasmodium3 clustered 4 centroids

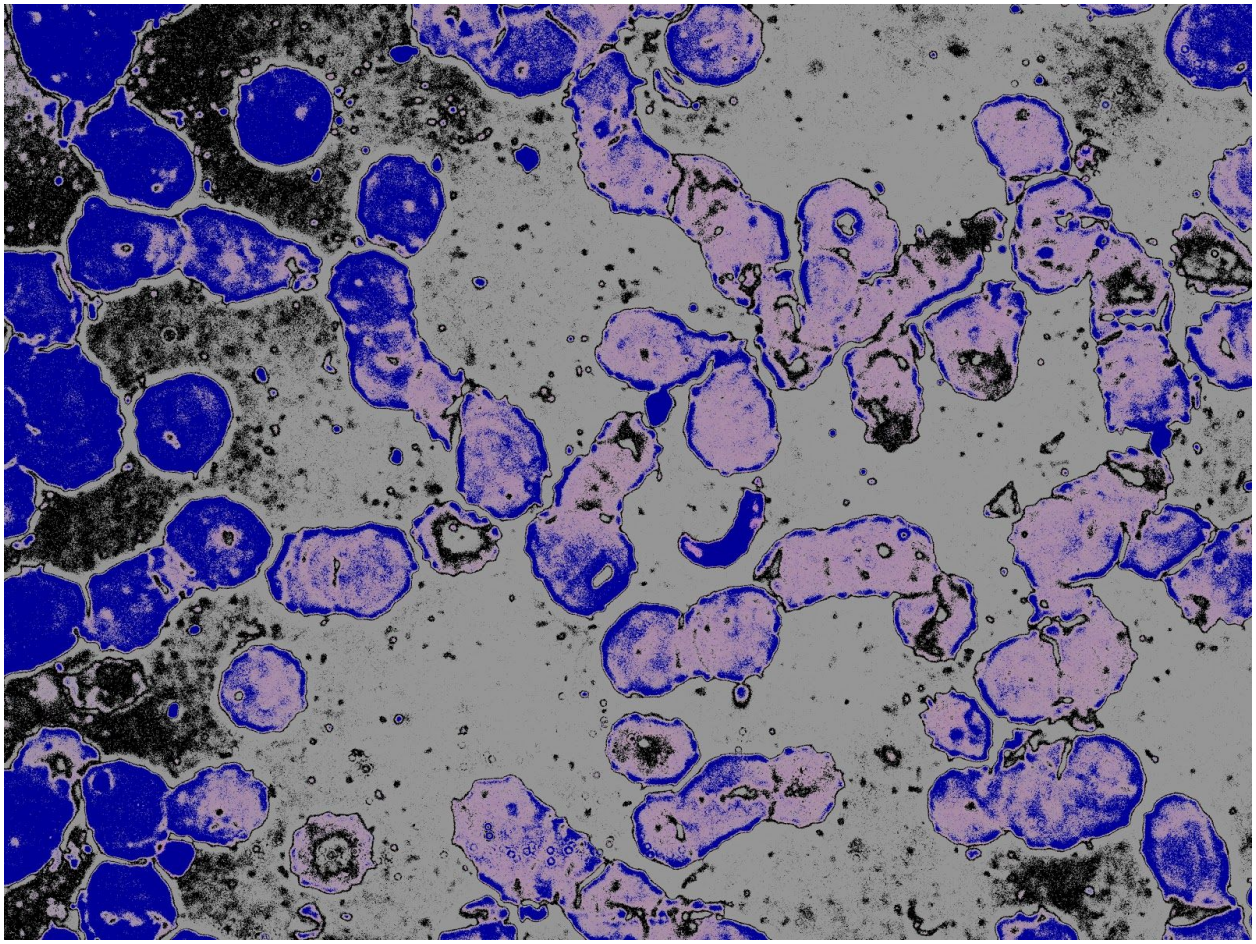

Figure 3.14 : Plasmodium4 clustered 4 centroids

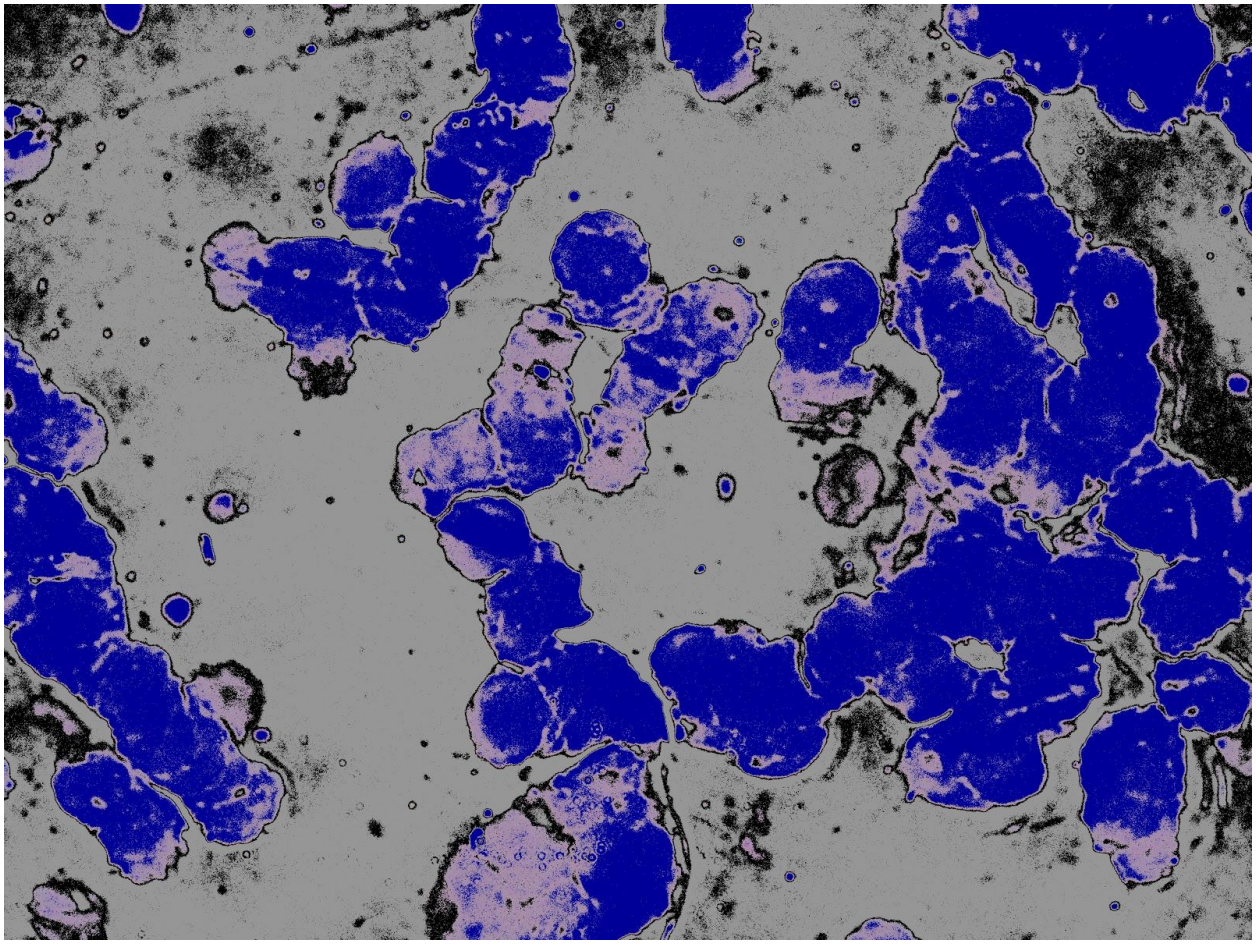

Figure 3.15 : Plasmodium5 clustered 4 centroids

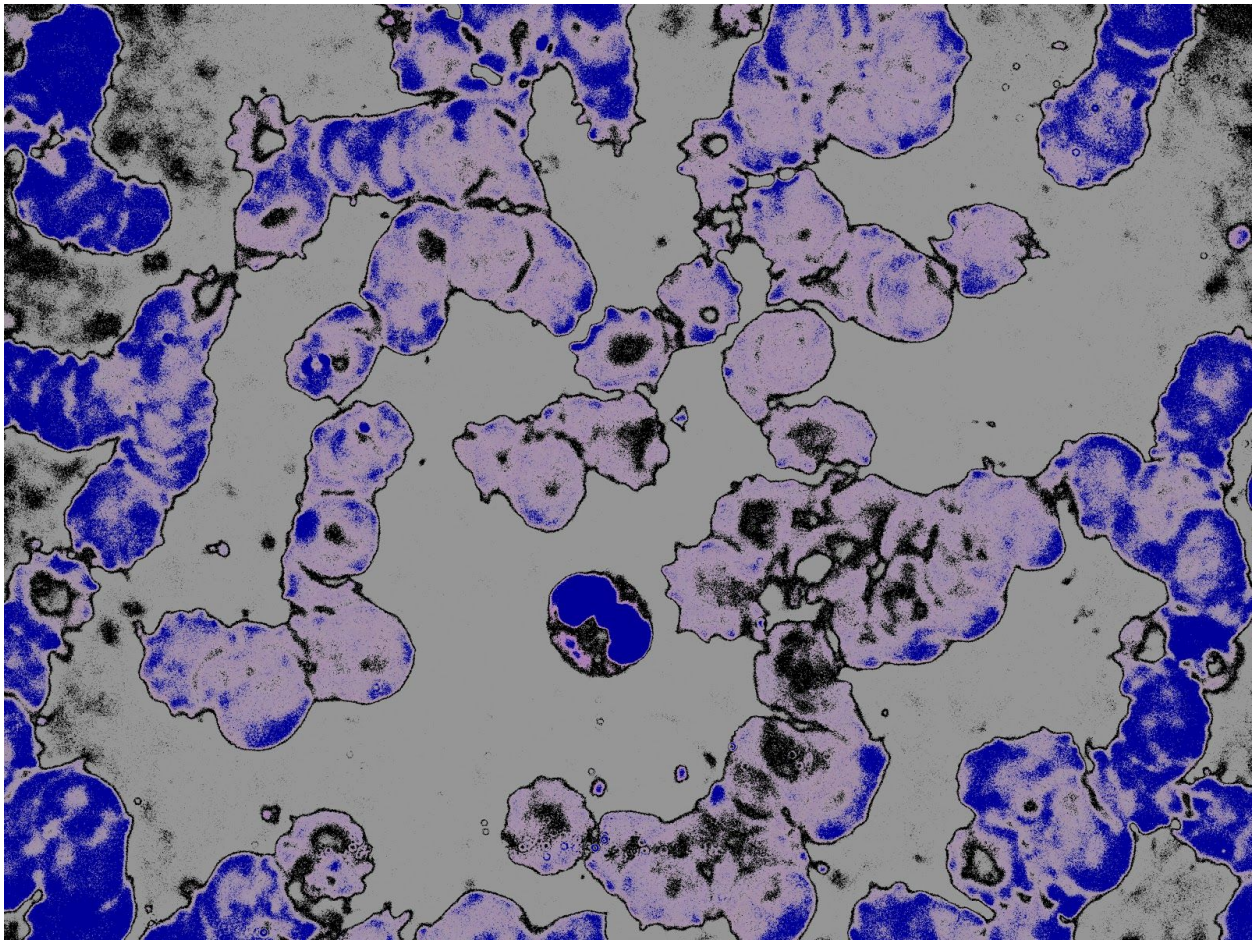

Figure 3.16 : Plasmodium6 clustered 4 centroids

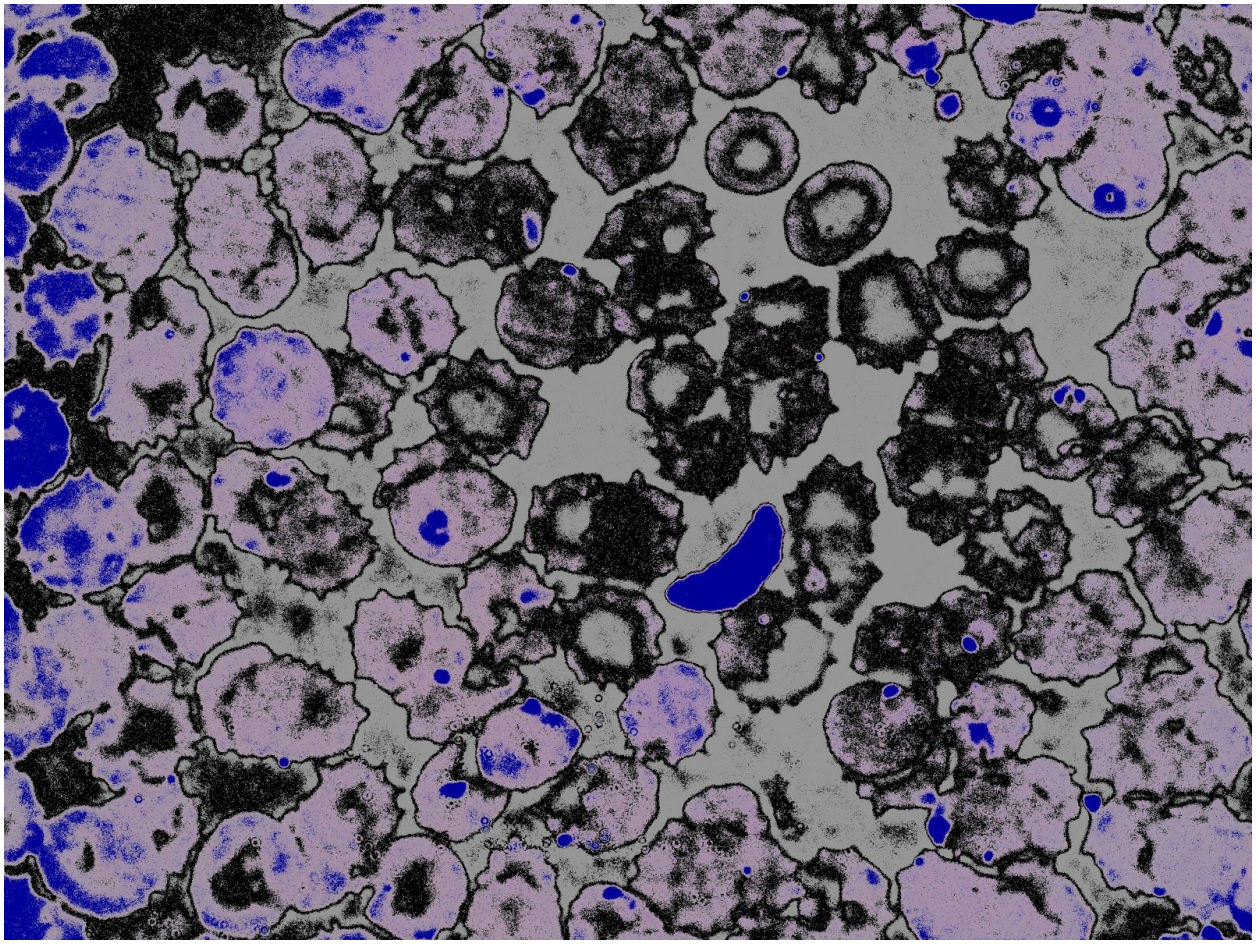

Figure 3.17 : Plasmodium7 clustered 4 centroids

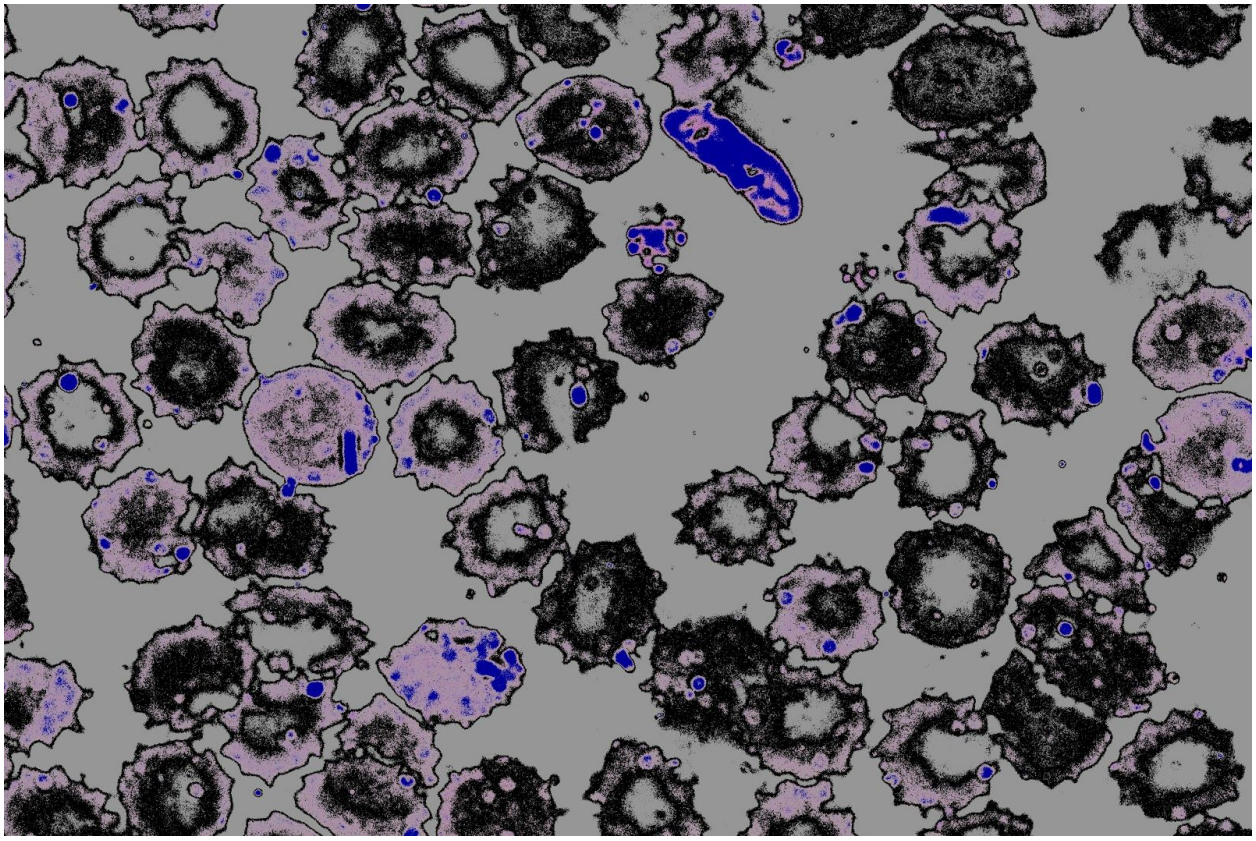

Figure 3.18 : Plasmodium8 clustered 4 centroids

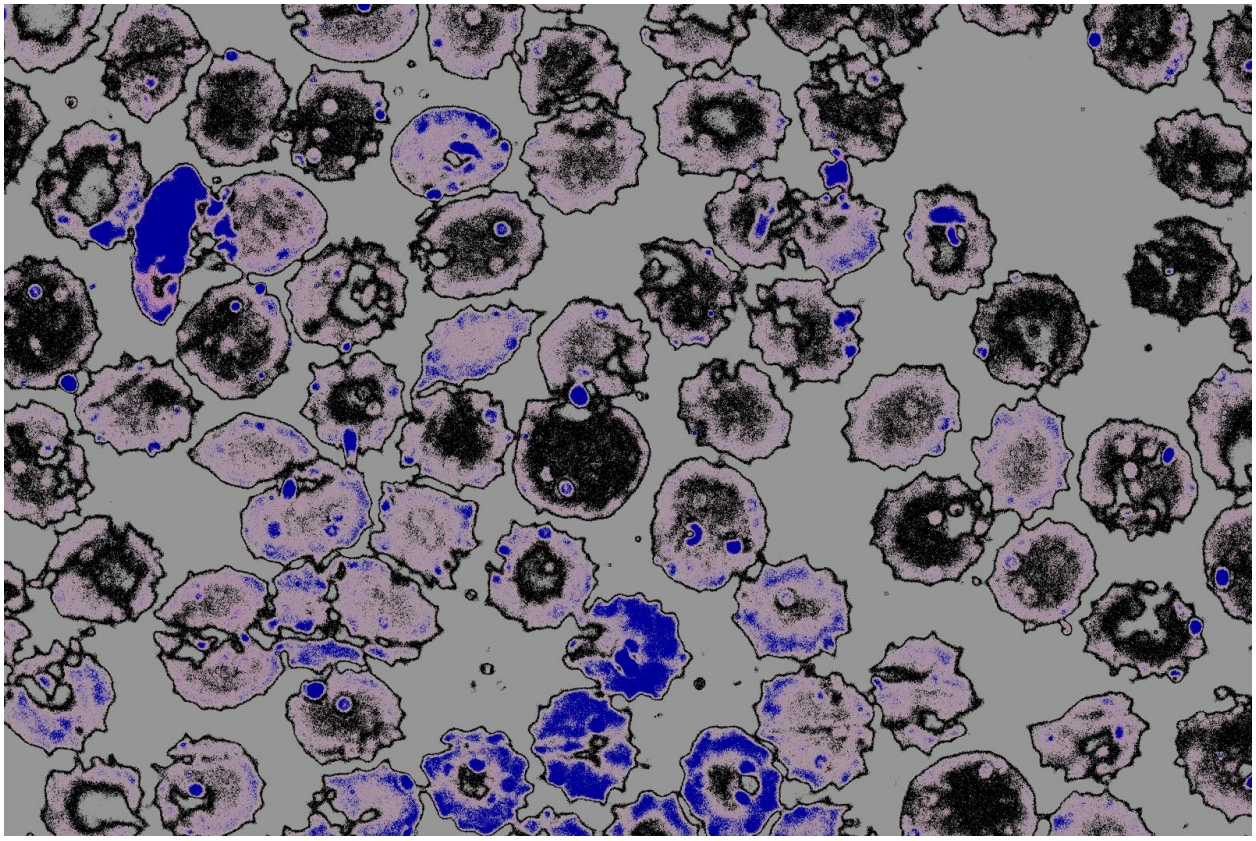

Figure 3.19 : Plasmodium9 clustered 4 centroids

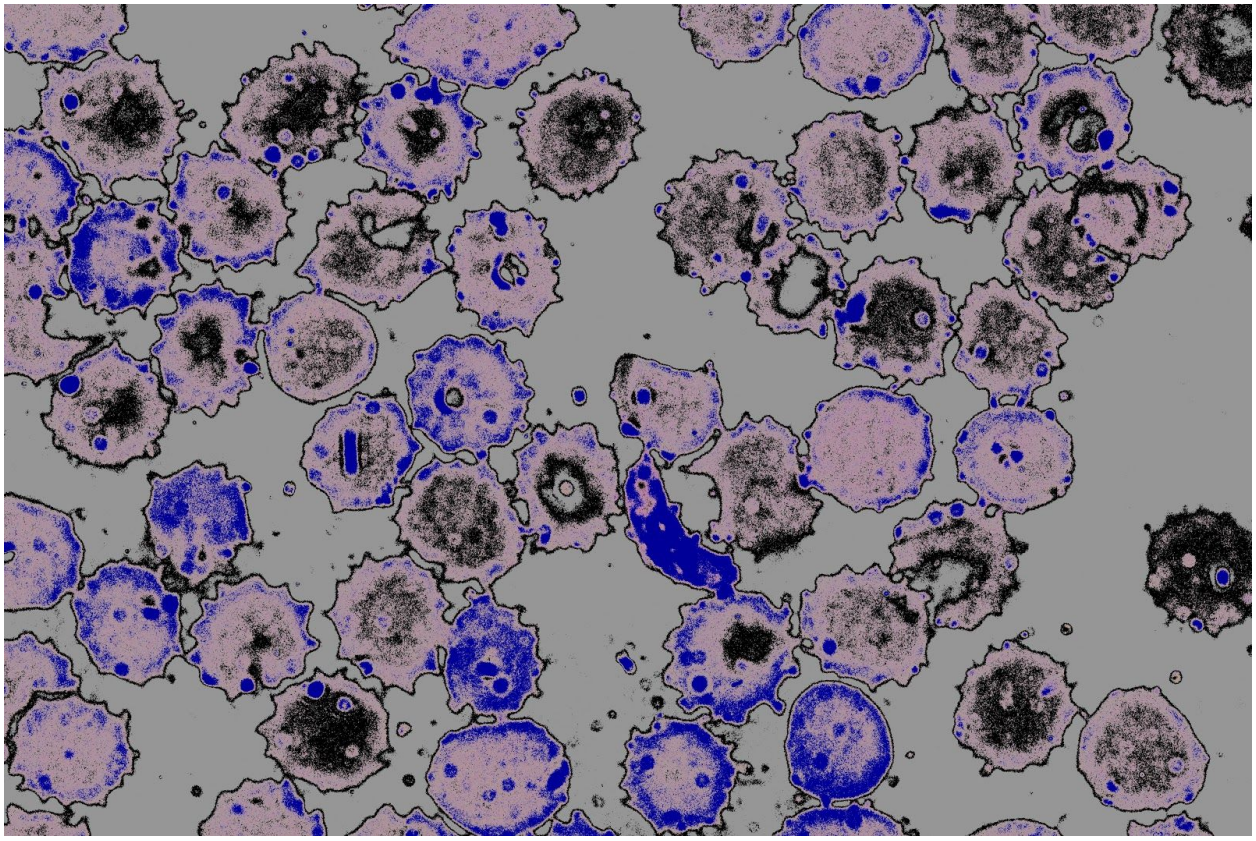

Figure 3.20 : Plasmodium10 clustered 4 centroids

Specimen : Schistosoma

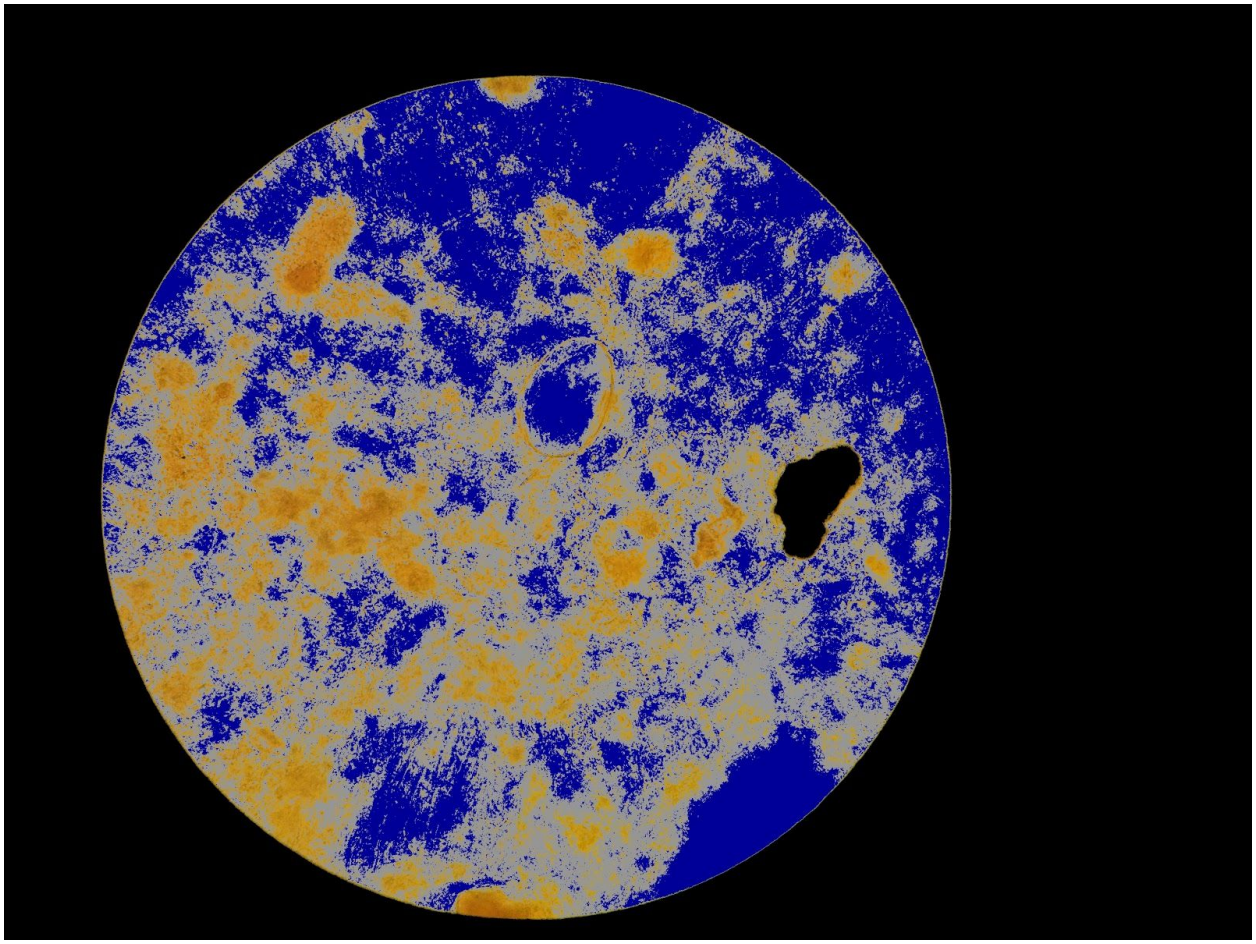

Figure 3.21 : Schis1osoma1 clustered 4 centroids

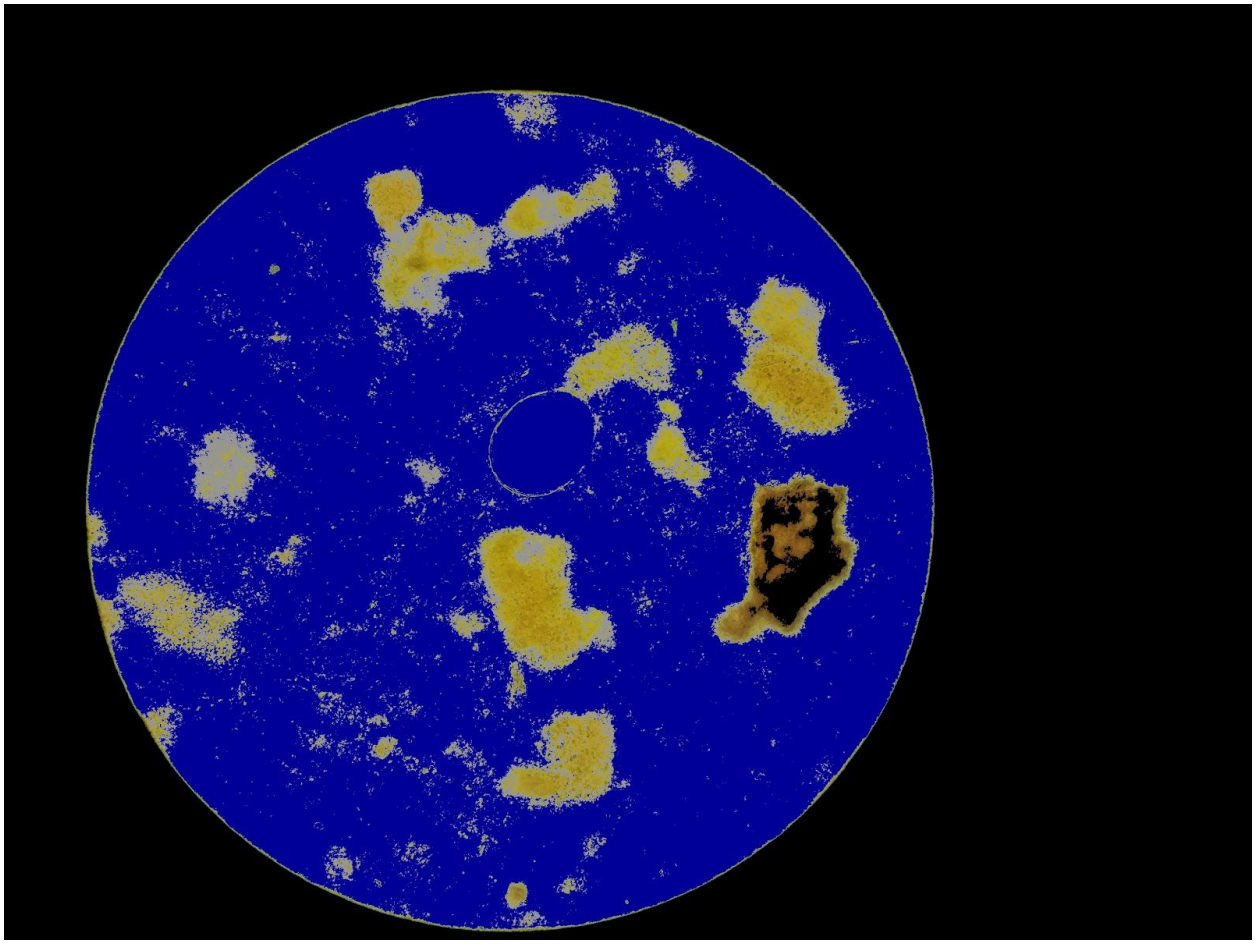

Figure 3.22 : Schis1osoma2 clustered 4 centroids

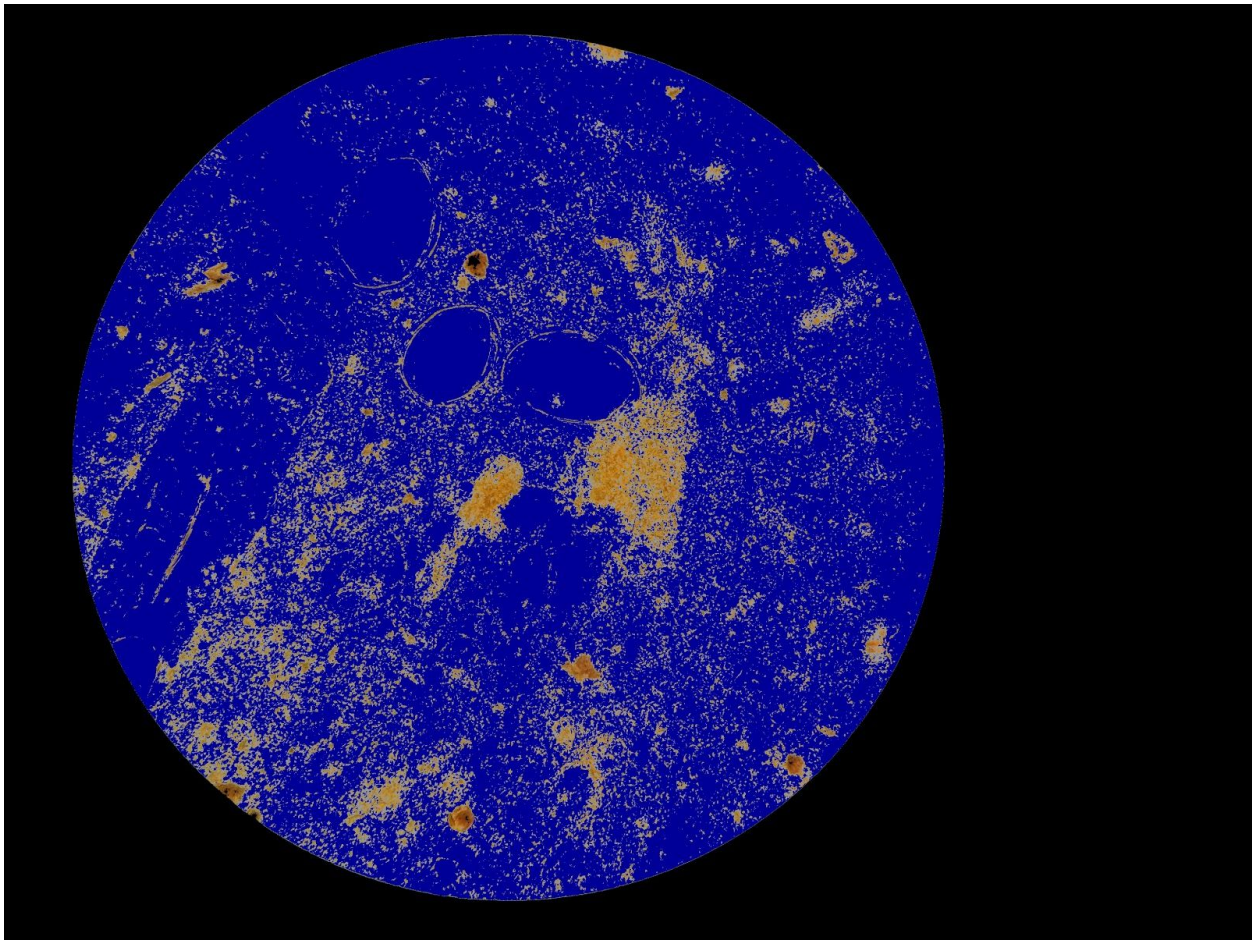

Figure 3.23 : Schis1osoma3 clustered 4 centroids

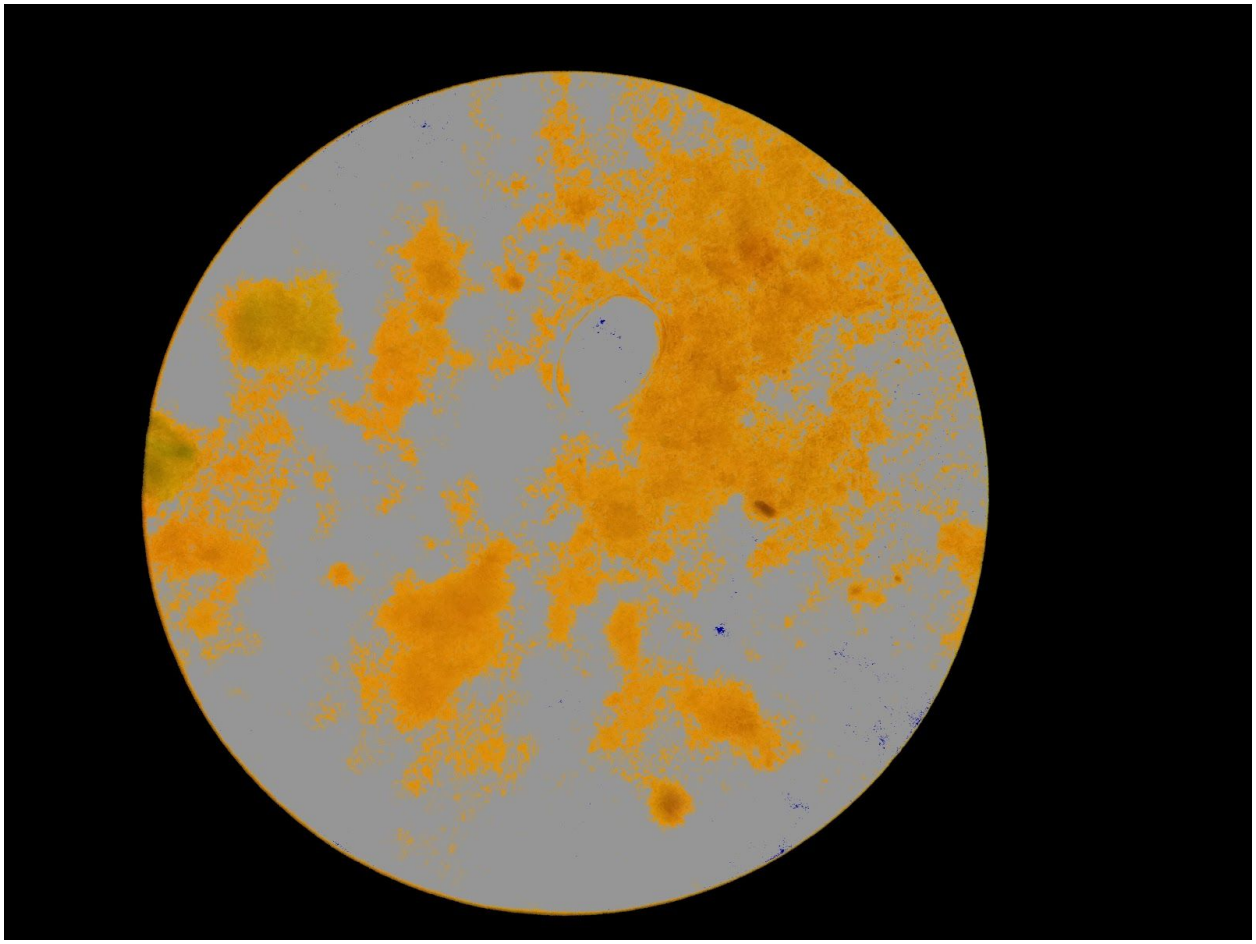

Figure 3.24 : Schis1osoma4 clustered 4 centroids

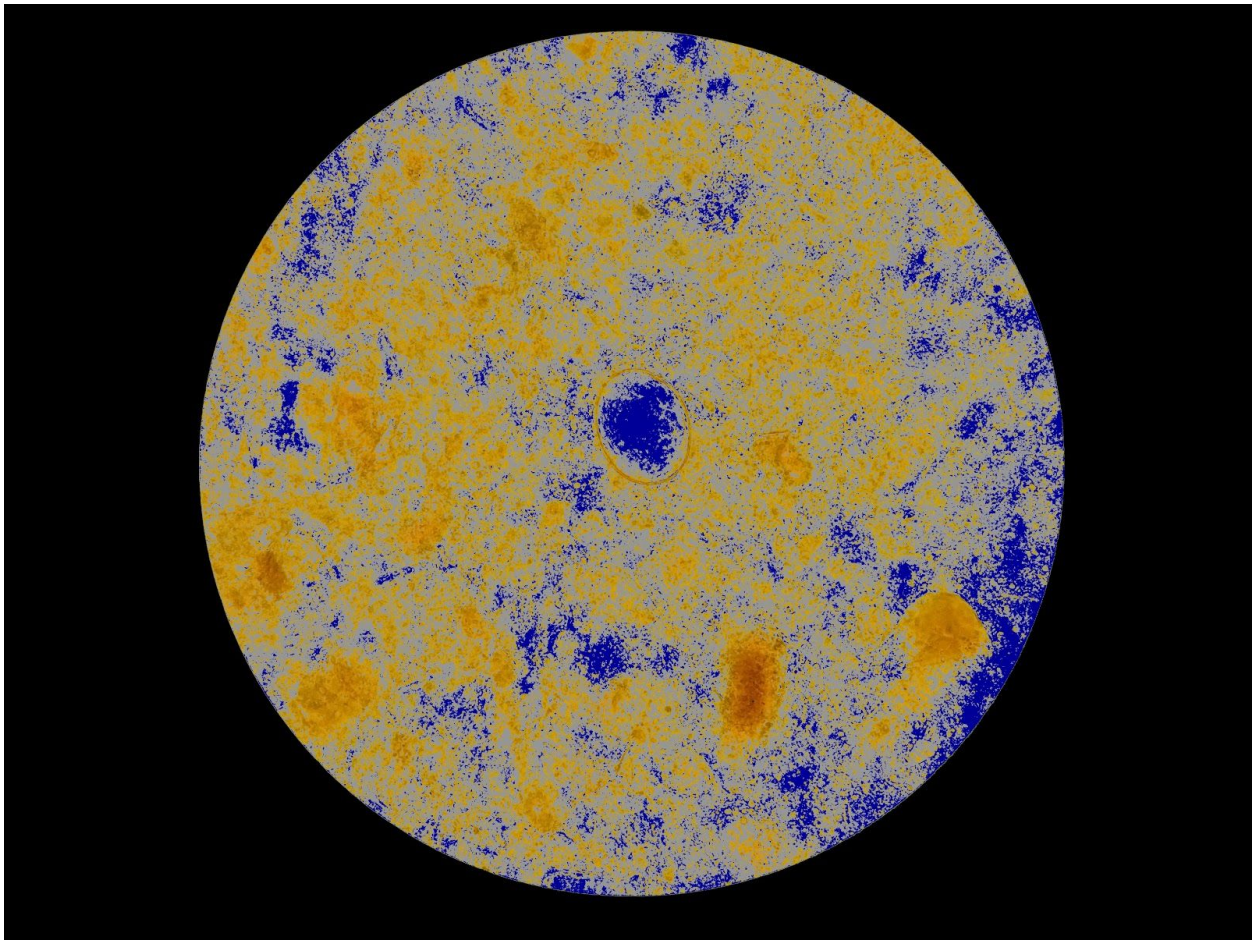

Figure 3.25 : Schis1osoma5 clustered 4 centroids

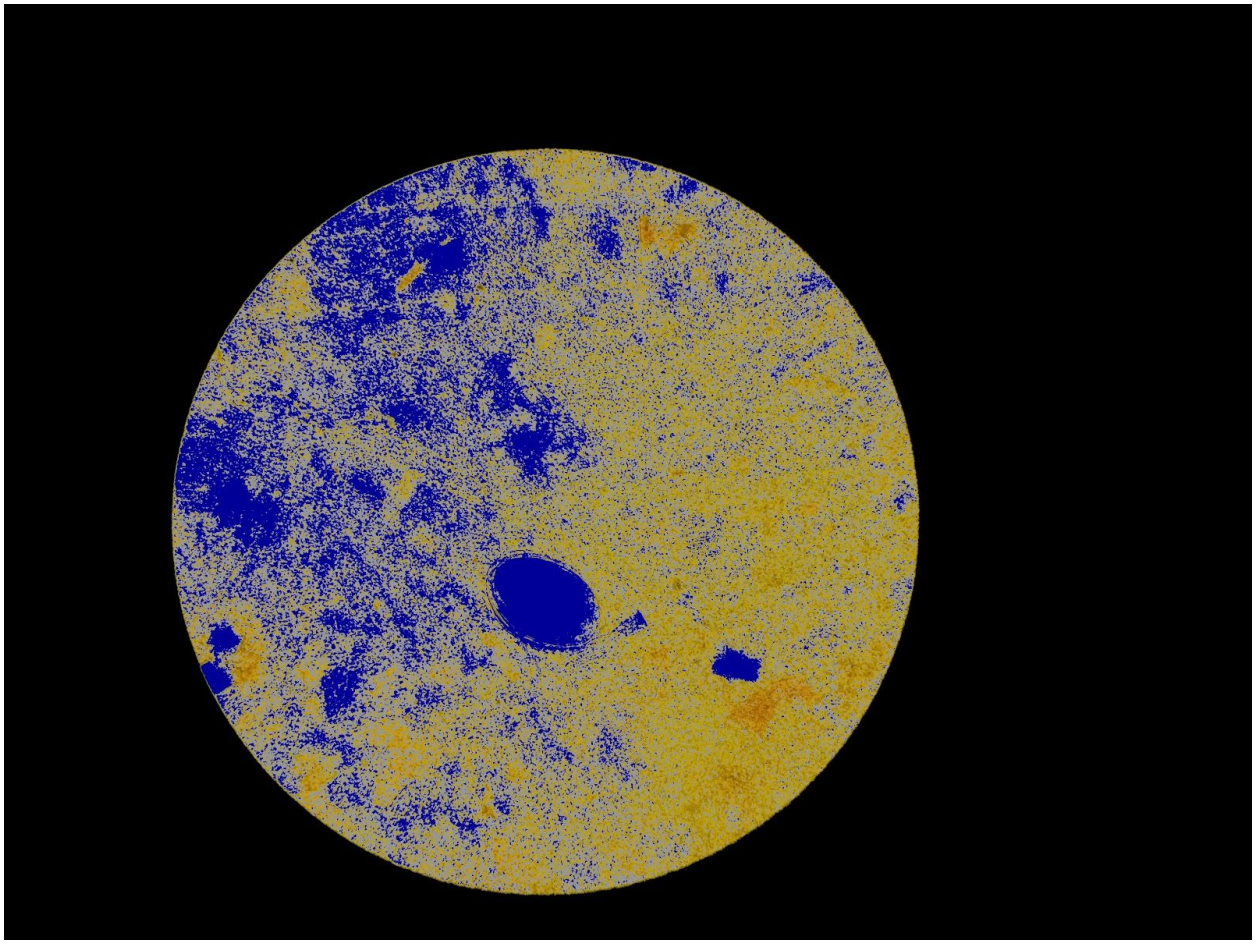

Figure 3.26 : Schis1osoma6 clustered 4 centroids

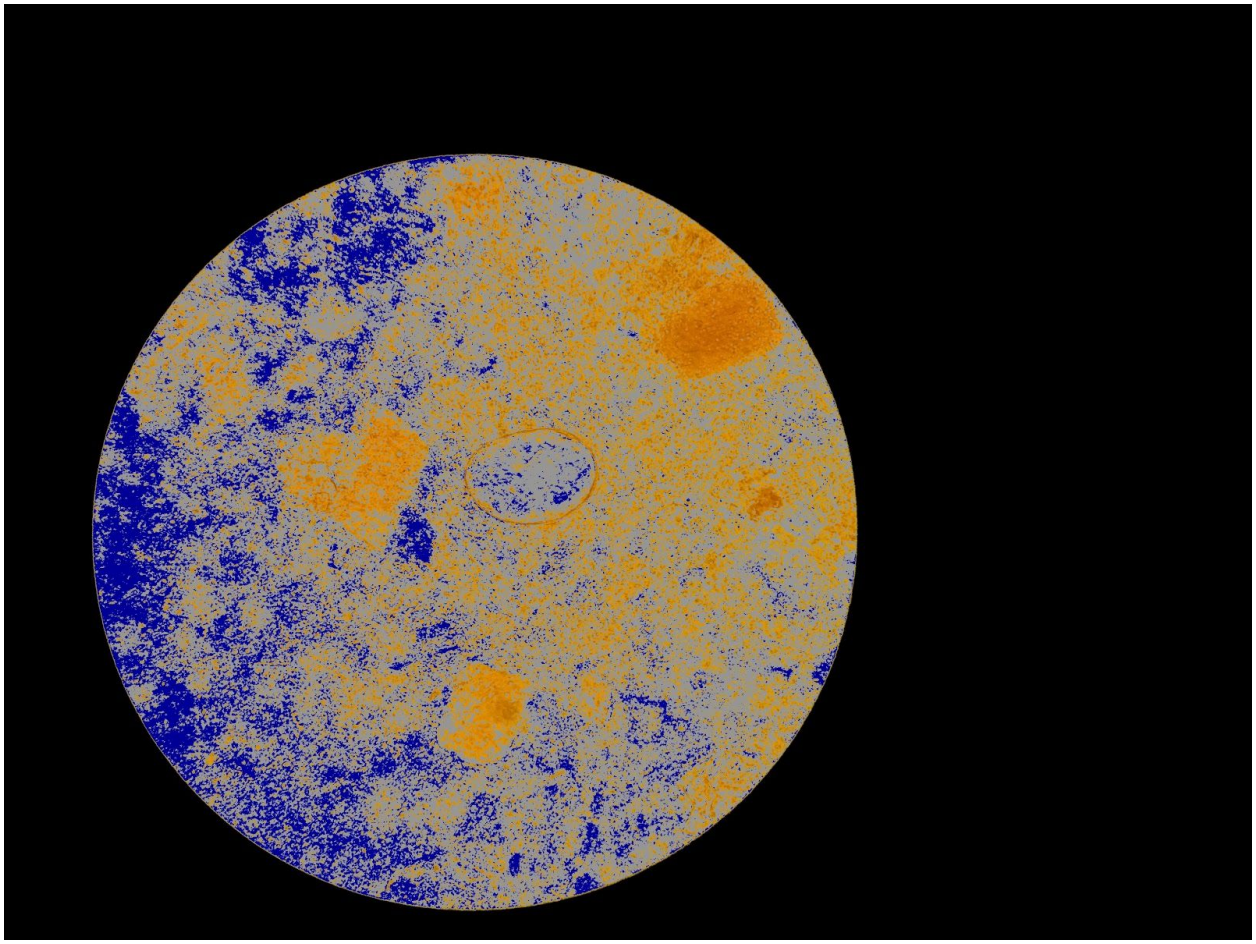

Figure 3.27 : Schis1osoma7 clustered 4 centroids

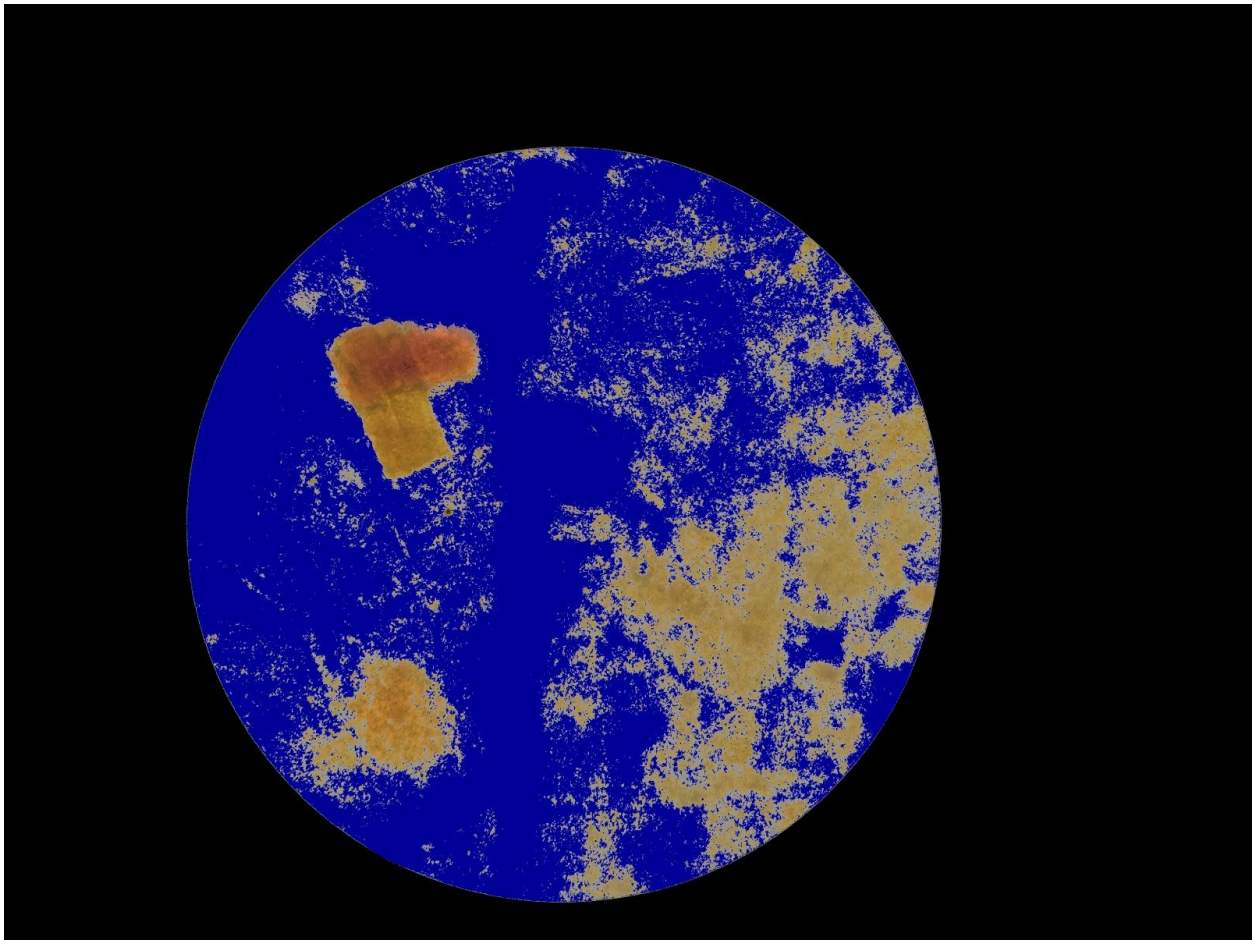

Figure 3.28 : Schis1osoma8 clustered 4 centroids

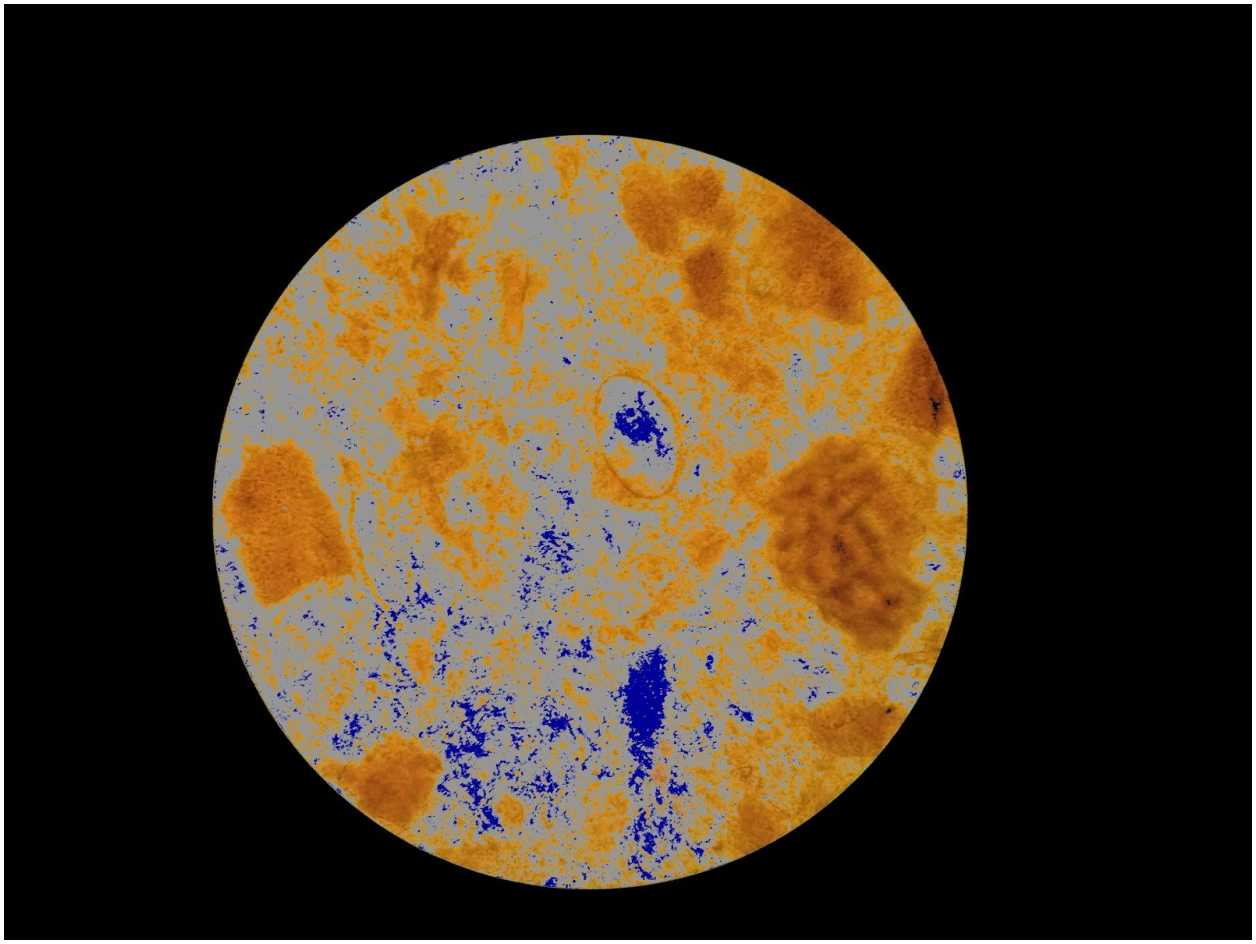

Figure 3.29 : Schis1osoma9 clustered 4 centroids

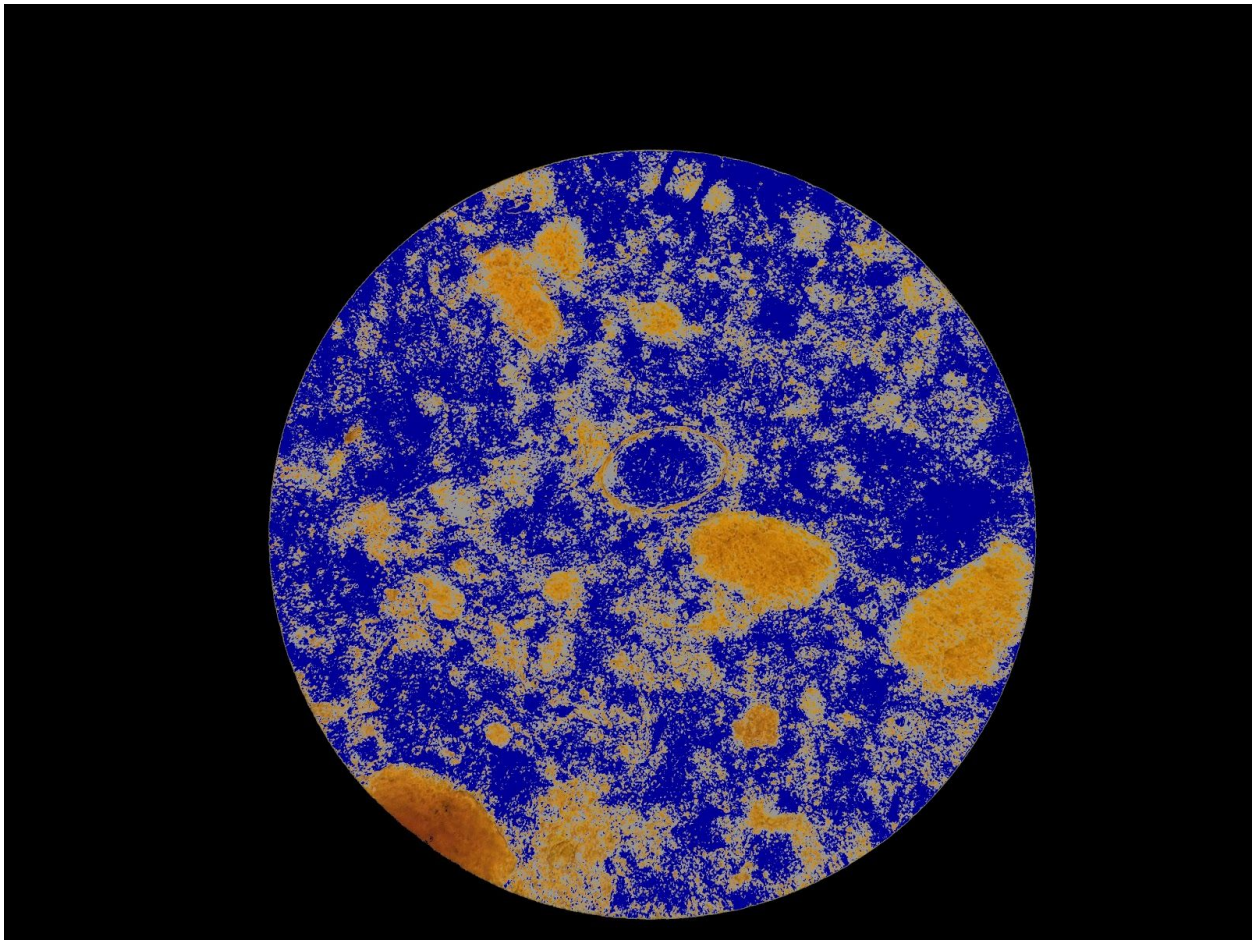

Figure 3.30 : Schis1osoma10 clustered 4 centroids

Number 4

4. Try the segmentation using different color spaces (HSV,CIELa*b*). How would the segmentation change? Which colorspace produced the best segmentation?

The normal BGR and CielLan colorspace produced almost (if ever not extremely the same) the same segmentation as the BGR since almost only the colors of the two were the only things that changed. The HSV color space was rather chaotic and thus,wasn't able to segment the image properly. While RGB color space is the main color space for the image, CielLab produced just the same segmentation. They both produced the best segmentation.

A. HSV

Specimen : Filaria

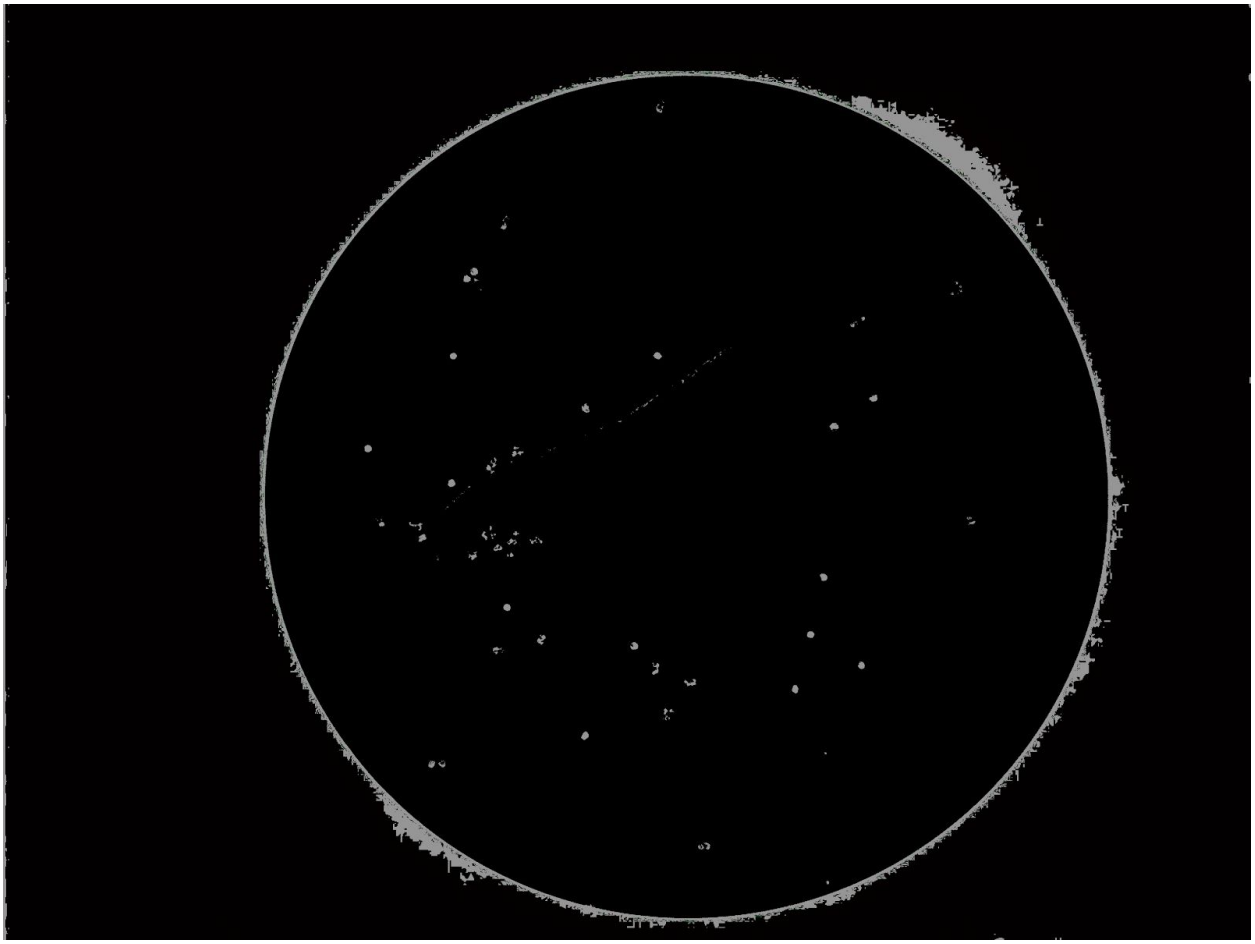

Figure 4.a.1 : Filaria1 in the HSV colorspace

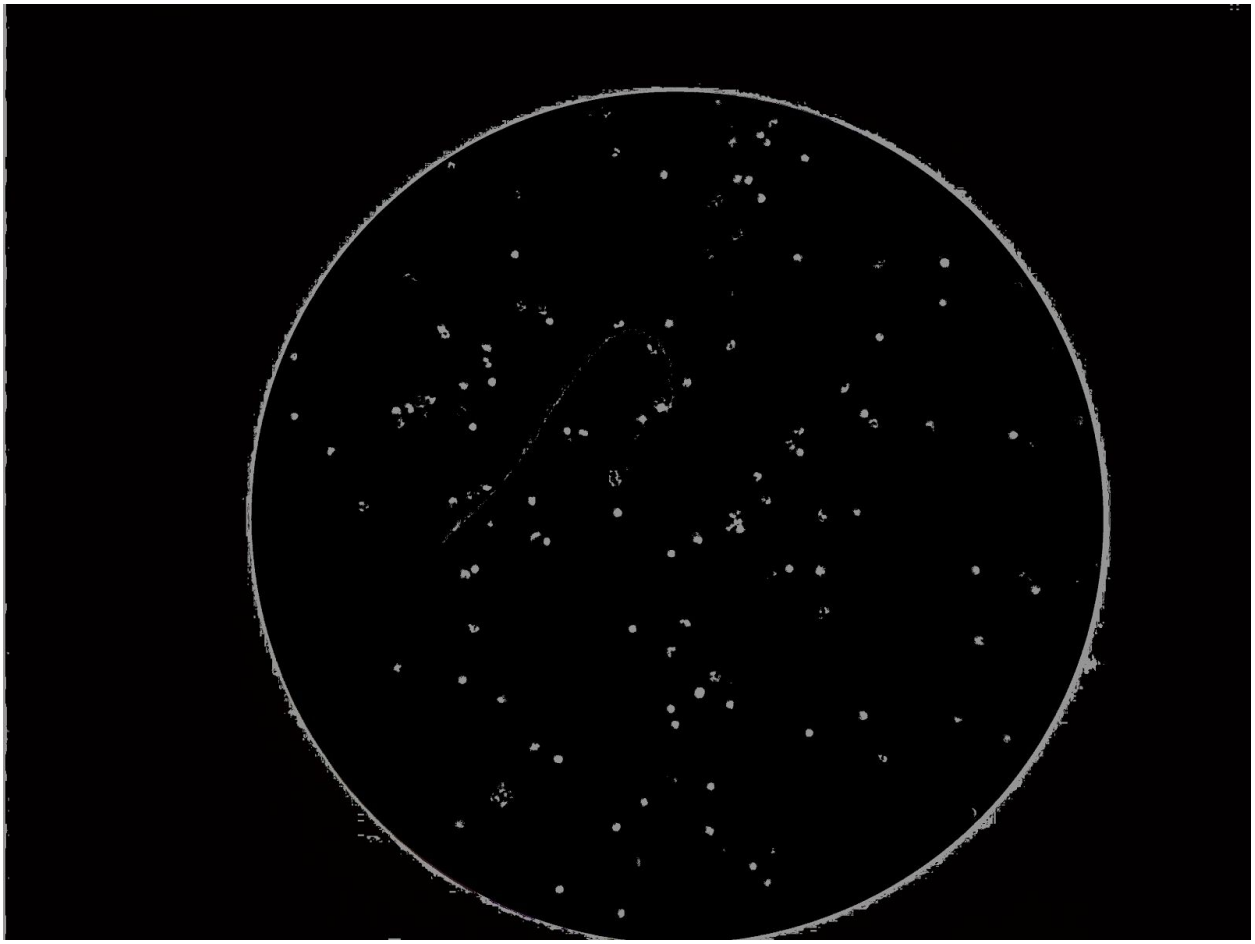

Figure 4.a.2 : Filaria2 in the HSV colorspace

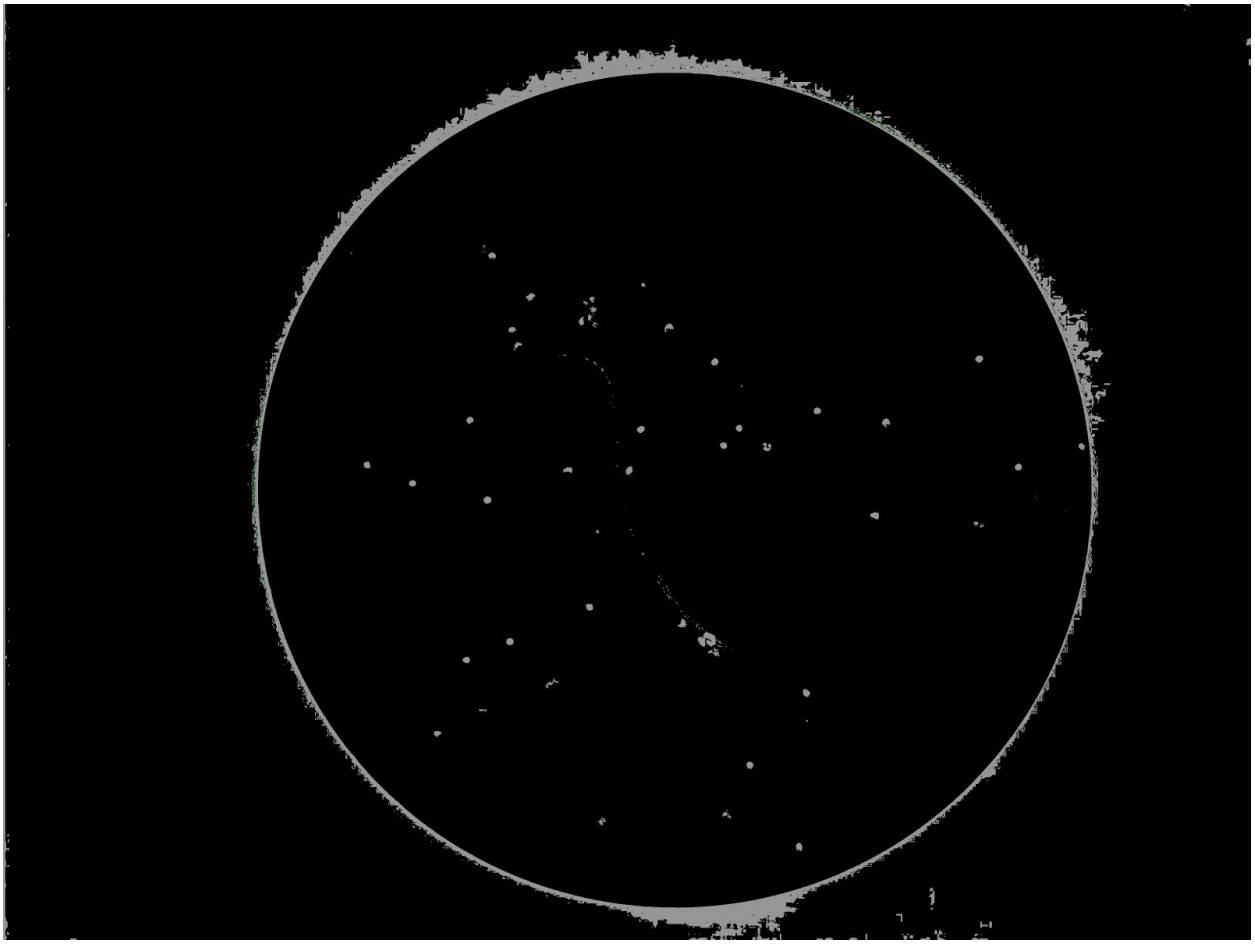

Figure 4.a.3 : Filaria3 in the HSV colorspace

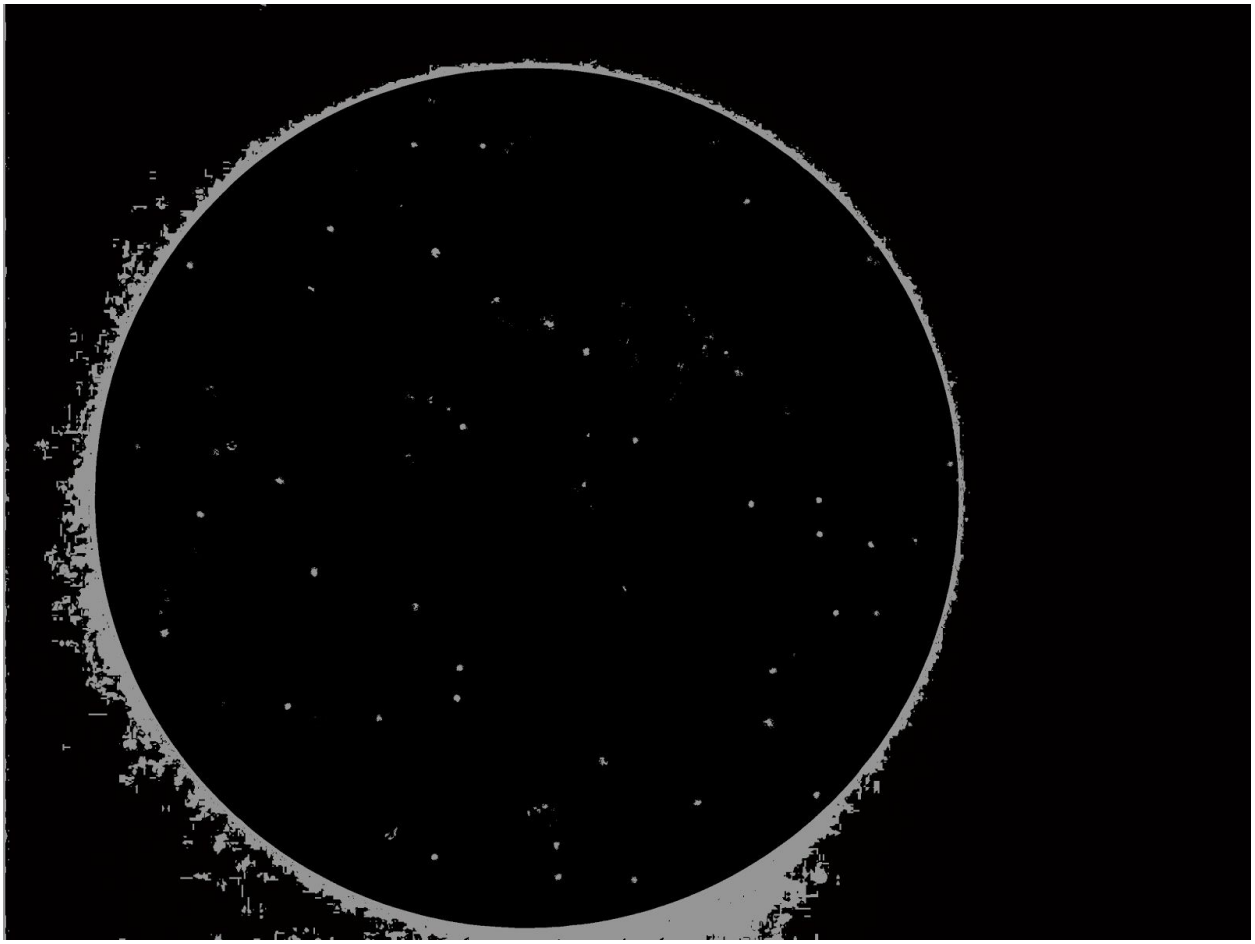

Figure 4.a.4 : Filaria4 in the HSV colorspace

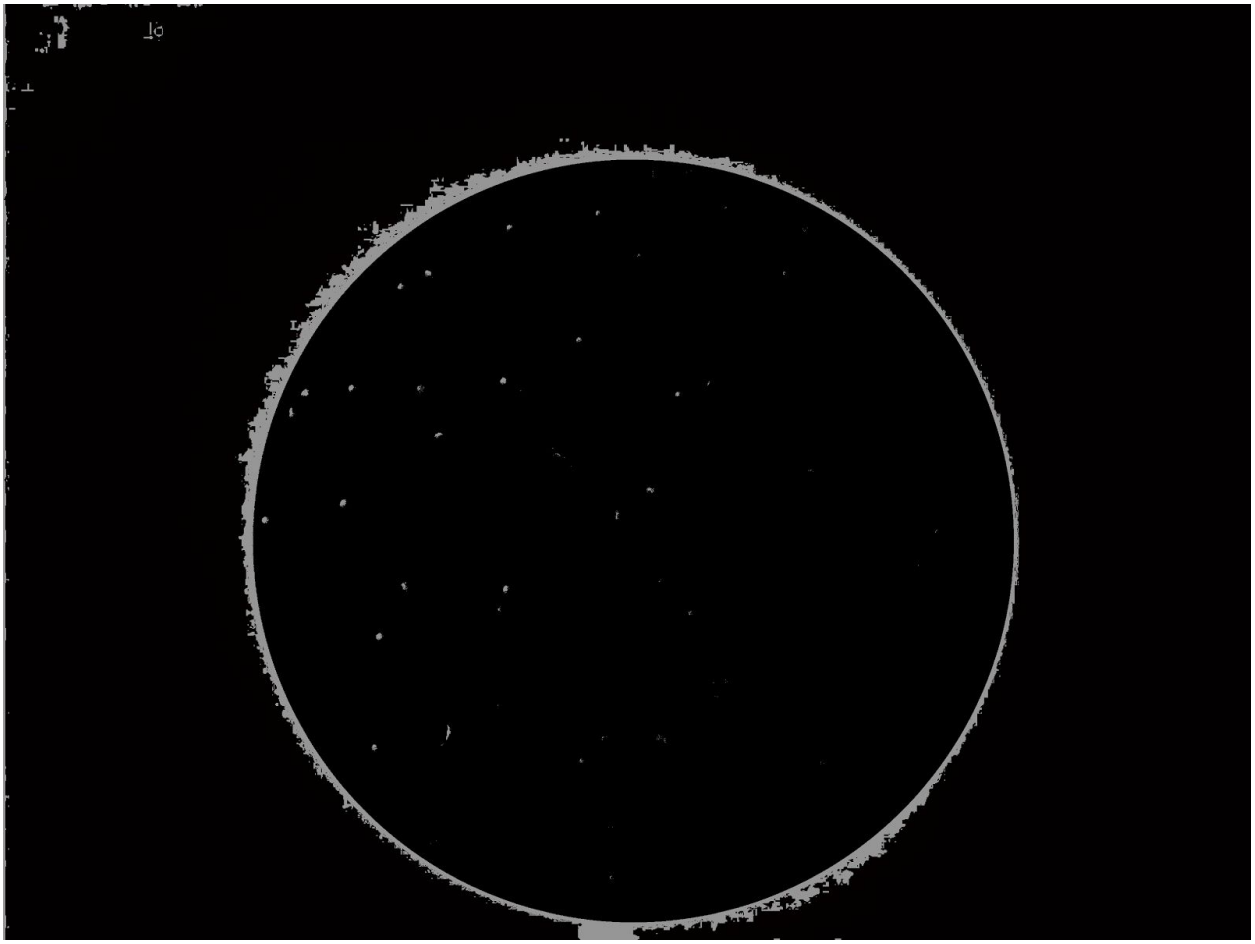

Figure 4.a.5 : Filaria5 in the HSV colorspace

Figure 4.a.6 : Filaria6 in the HSV colorspace

Figure 4.a.7 : Filaria7 in the HSV colorspace

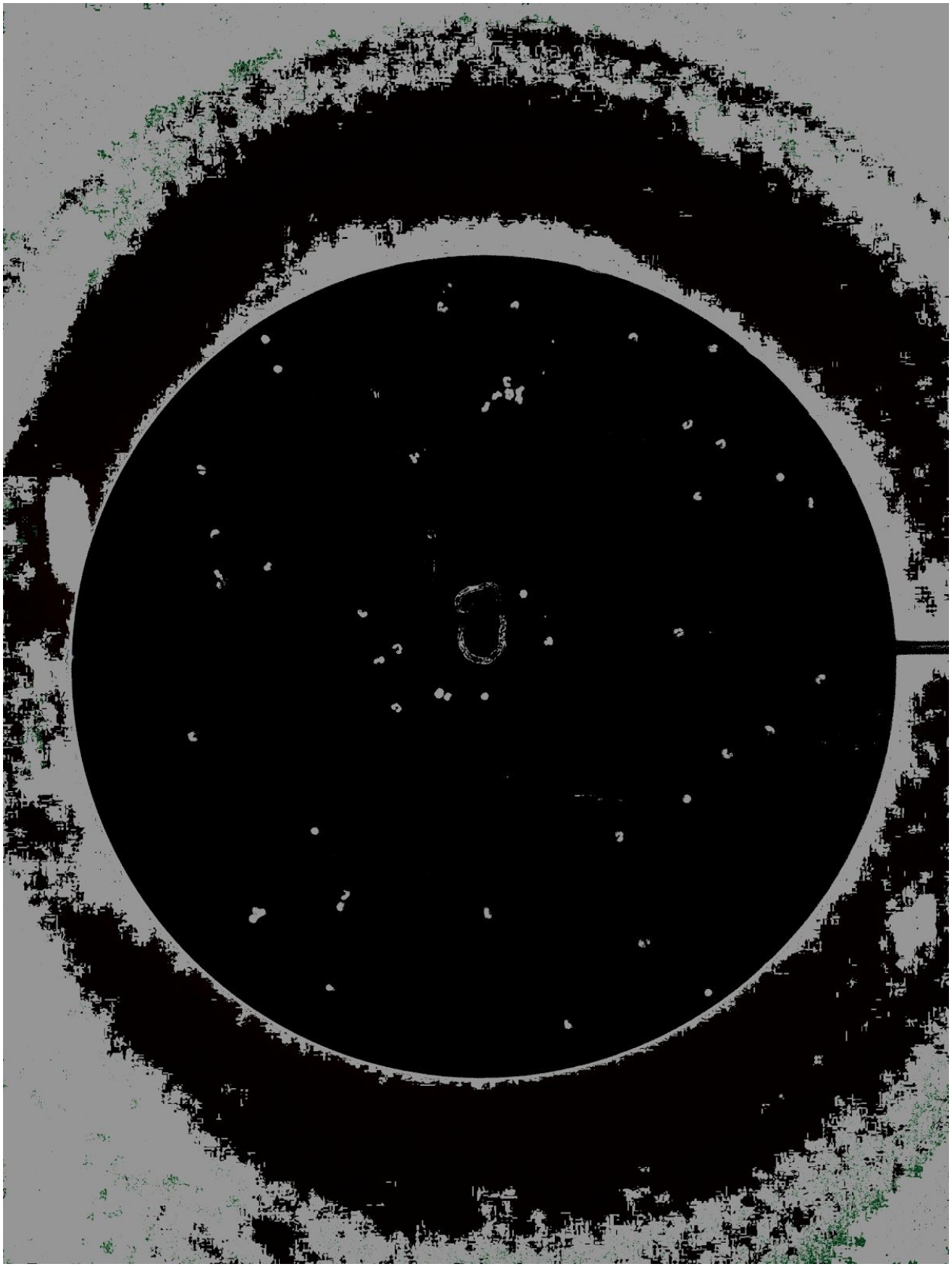

Figure 4.a.8 : Filaria8 in the HSV colorspace

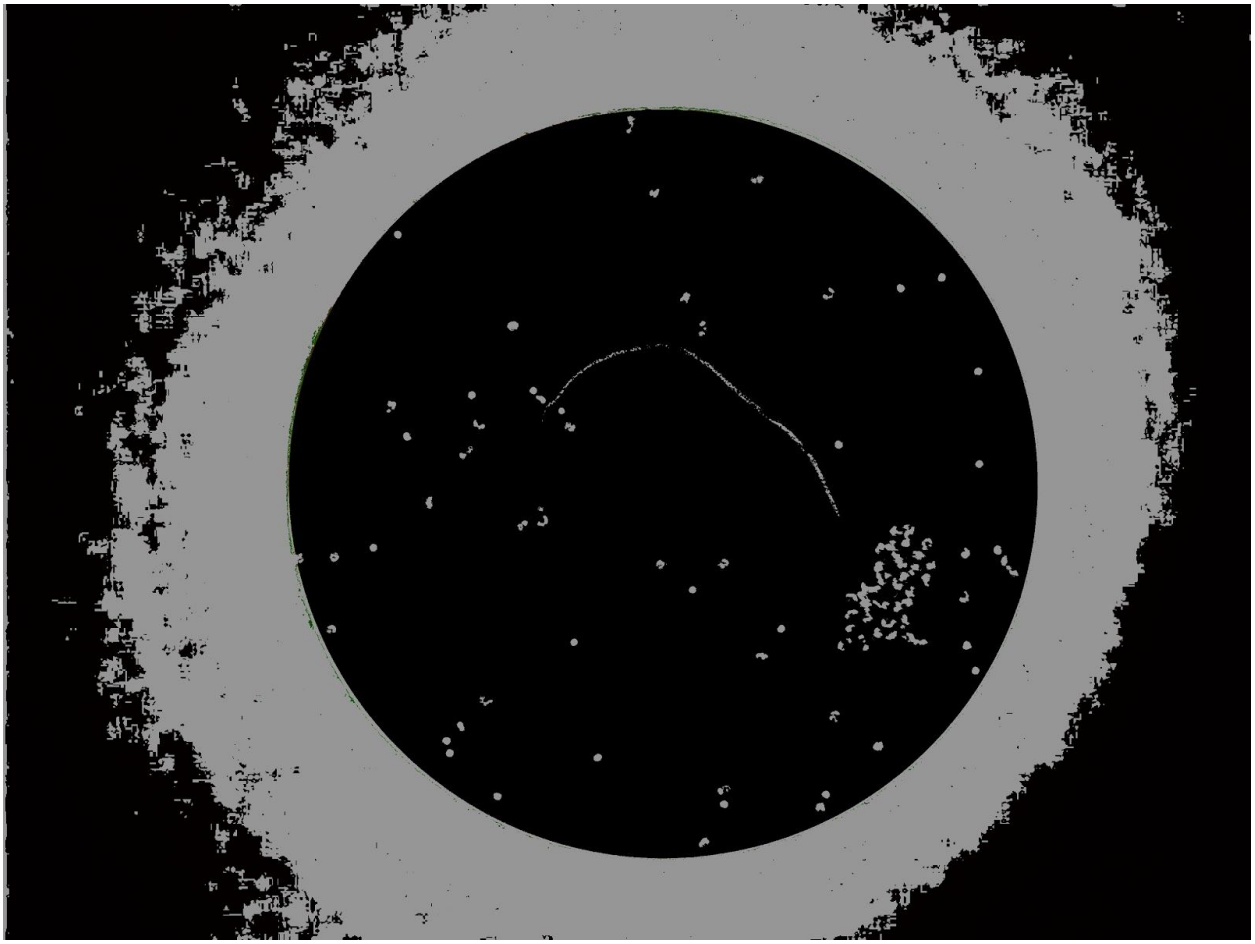

Figure 4.a.9 : Filaria9 in the HSV colorspace

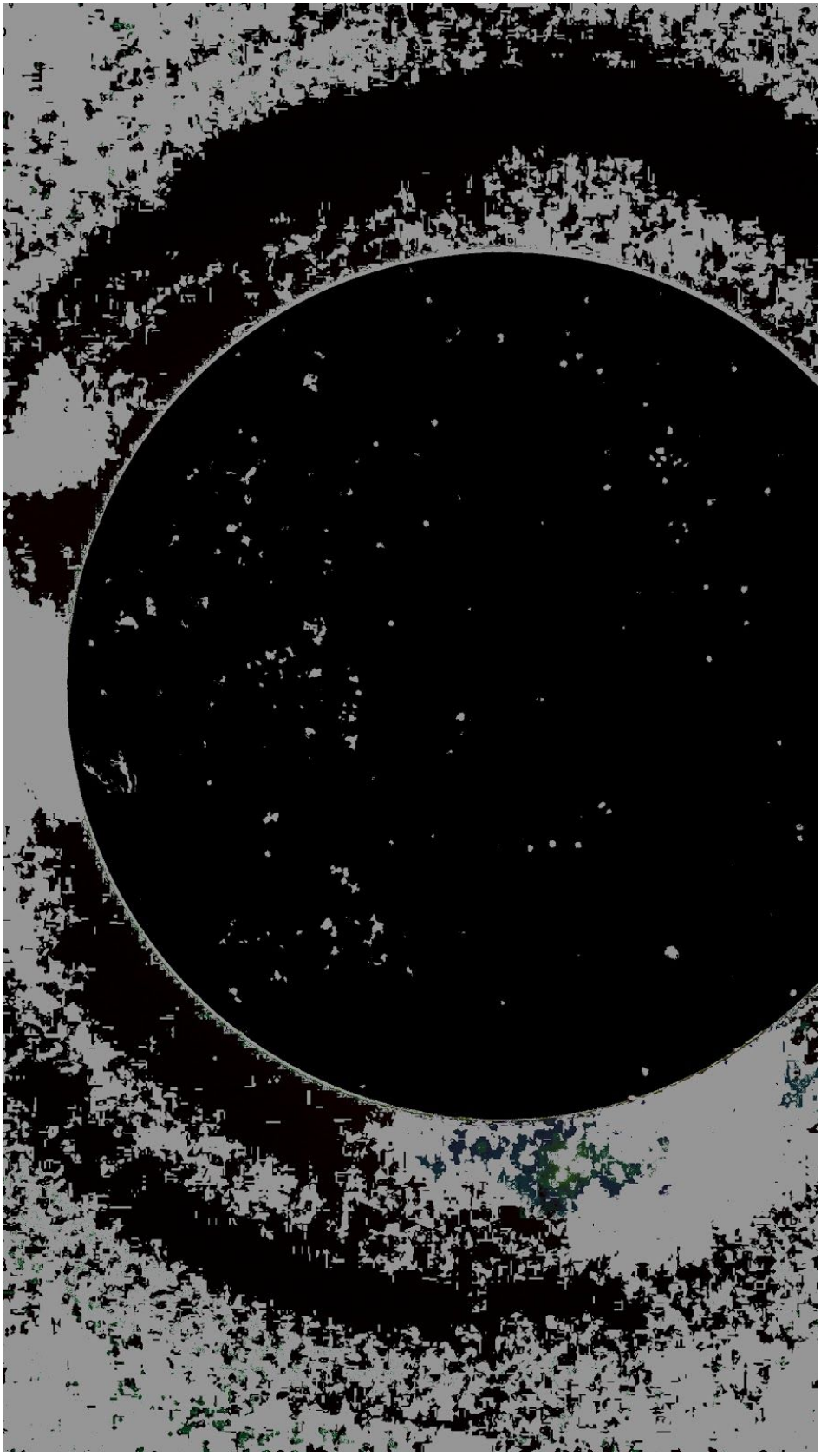

Figure 4.a.10 : Filaria10 in the HSV colorspace

Specimen : Plasmodium

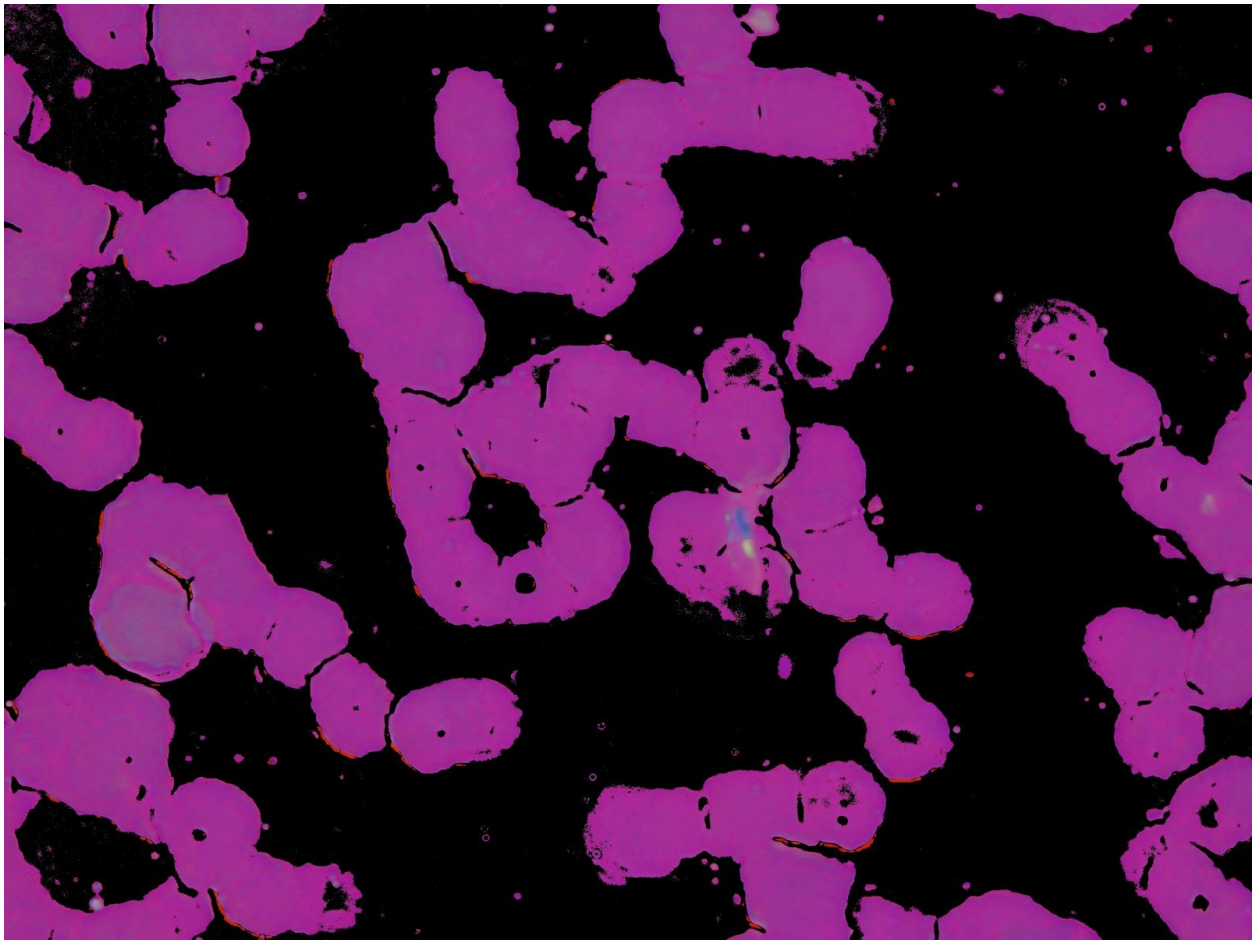

Figure 4.a.11 : Plasmodium1 in the HSV colorspace

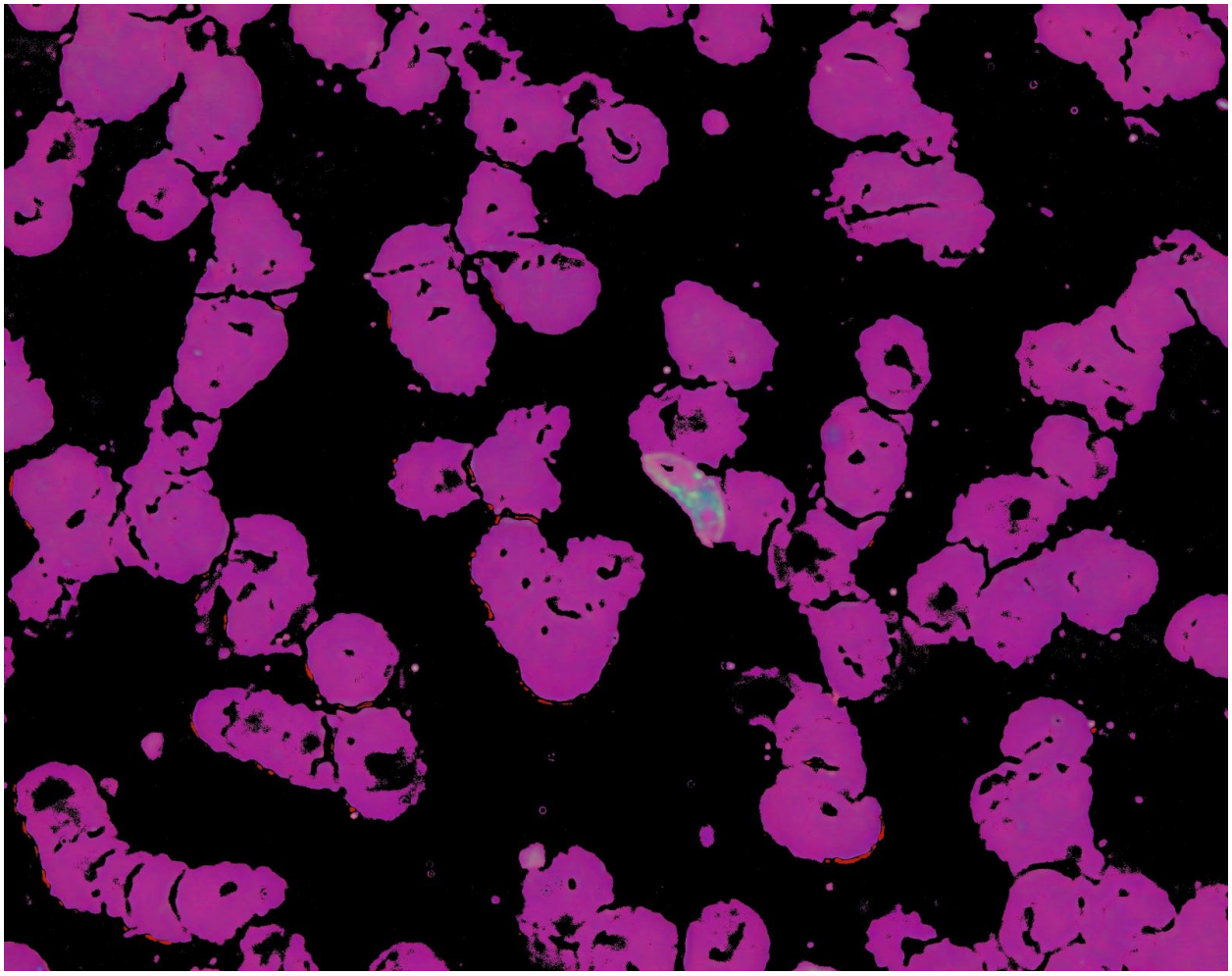

Figure 4.a.12 : Plasmodium2 in the HSV colorspace

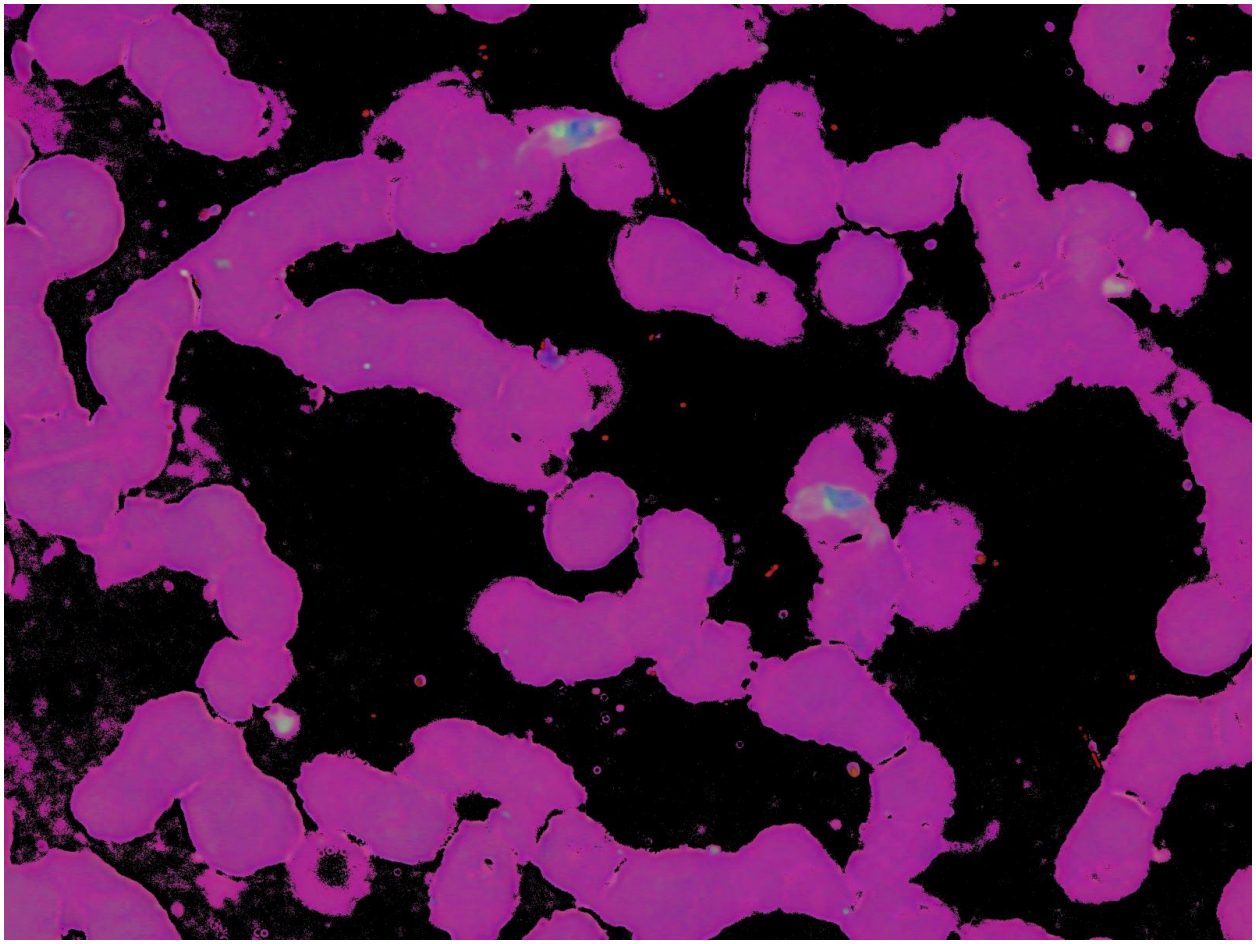

Figure 4.a.13 : Plasmodium3 in the HSV colorspace

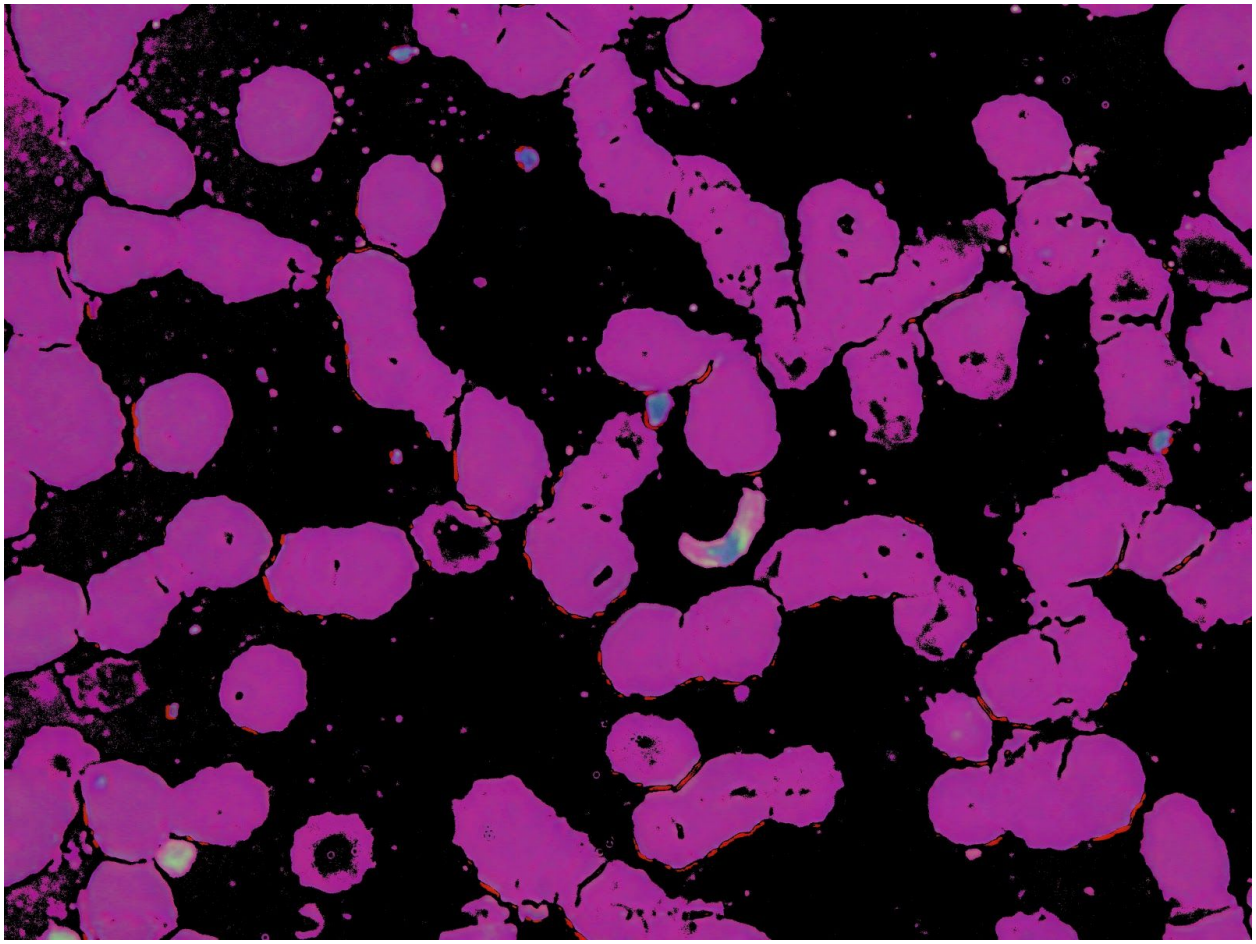

Figure 4.a.14 : Plasmodium4 in the HSV colorspace

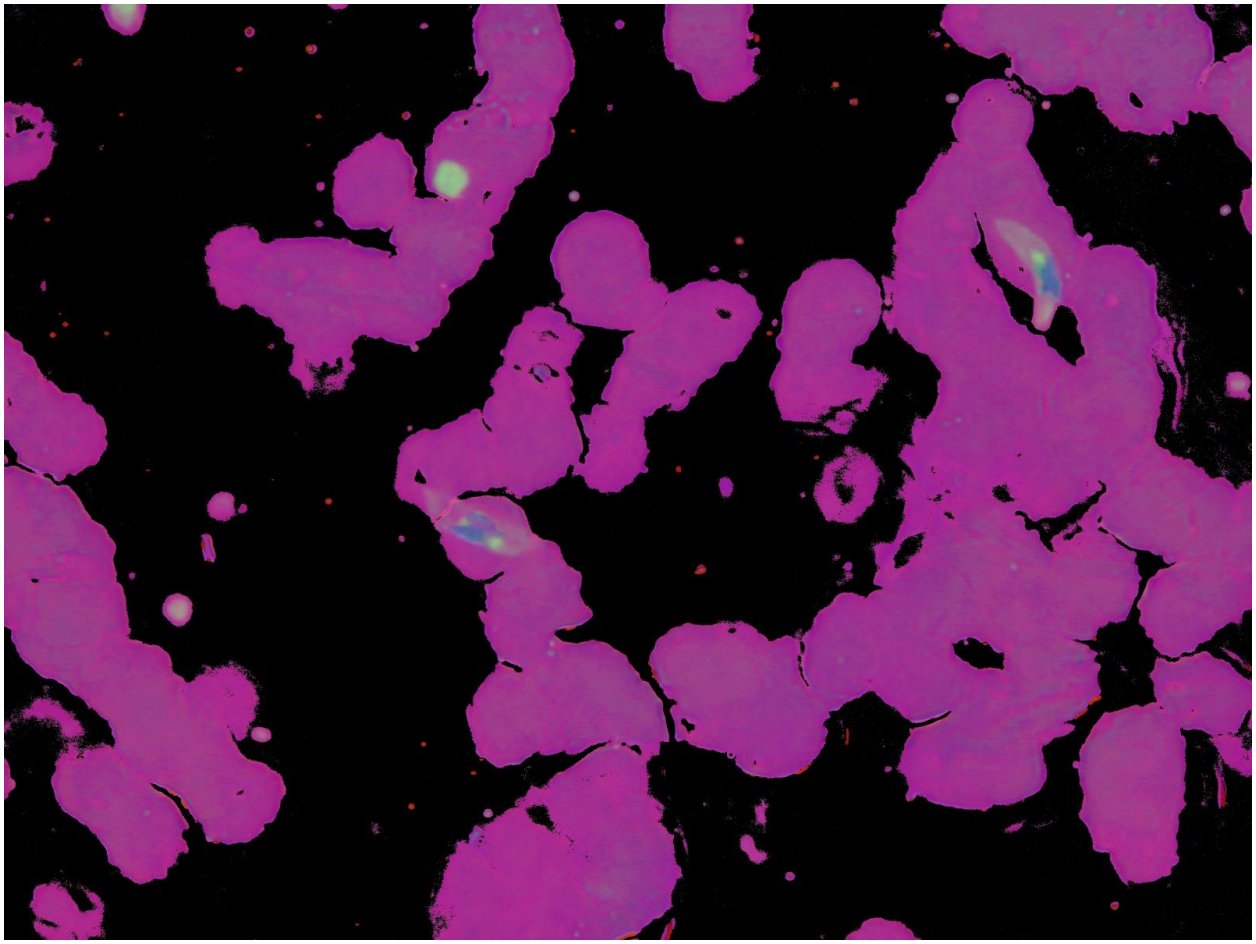

Figure 4.a.15 : Plasmodium5 in the HSV colorspace

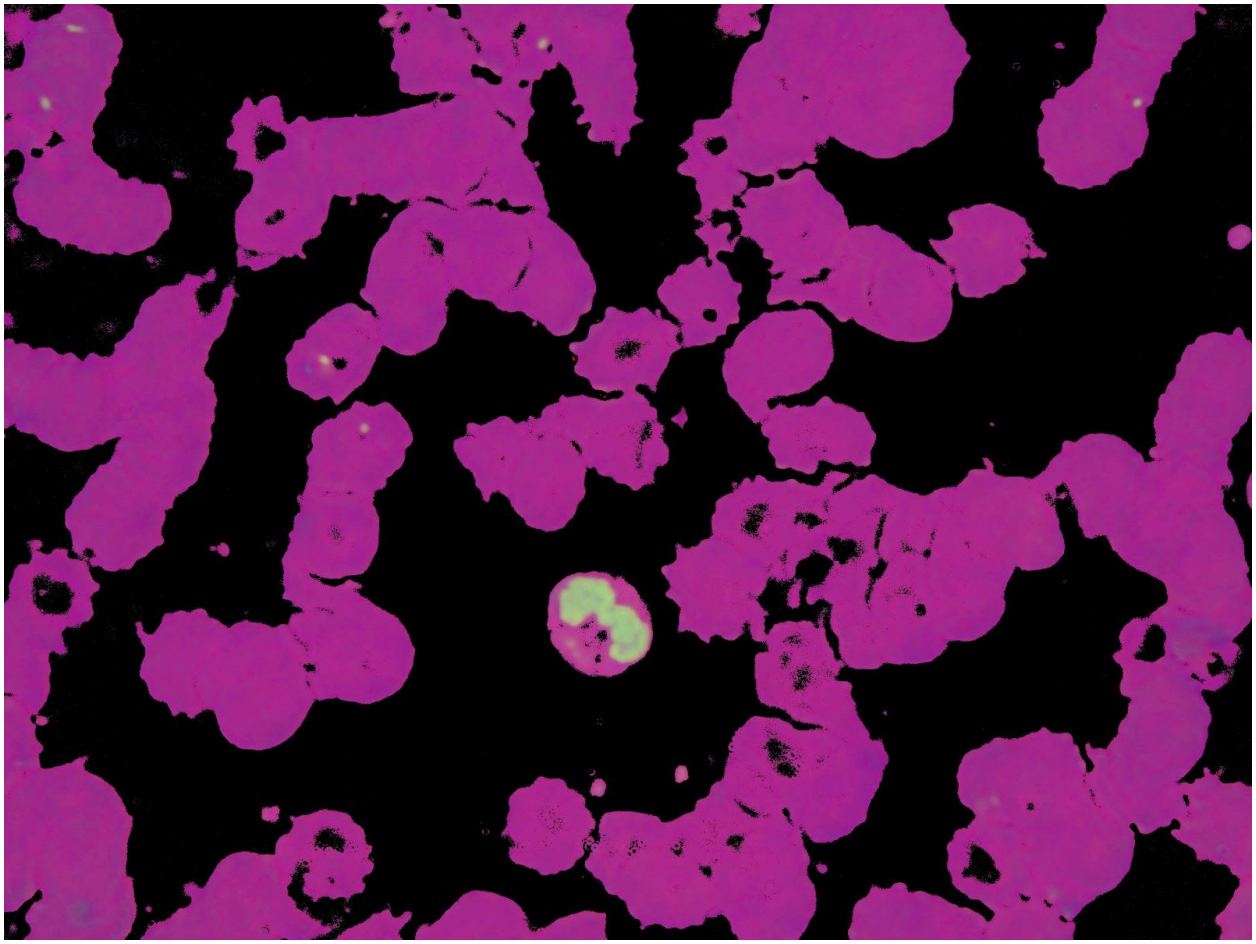

Figure 4.a.16 : Plasmodium6 in the HSV colorspace

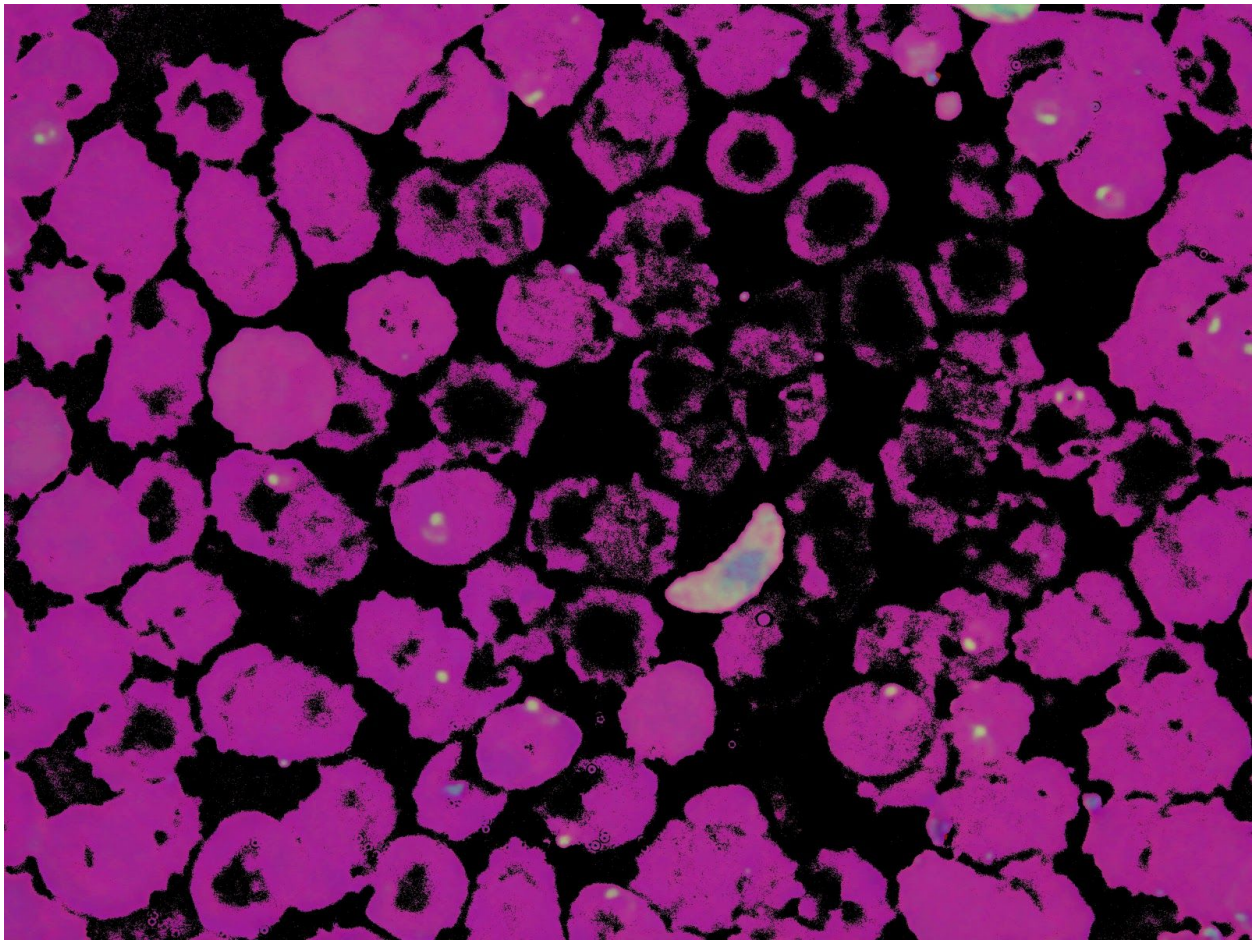

Figure 4.a.17 : Plasmodium7 in the HSV colorspace

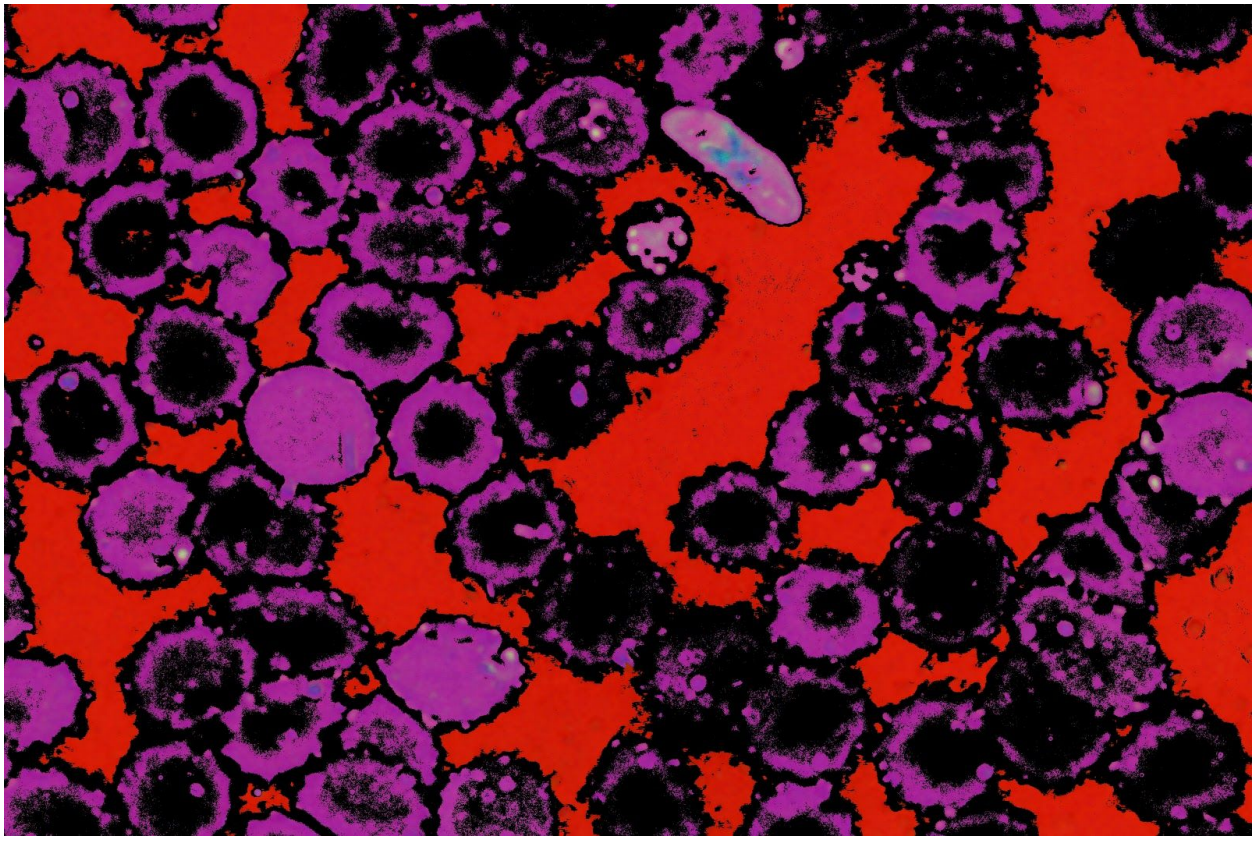

Figure 4.a.1 8: Plasmodium8 in the HSV colorspace

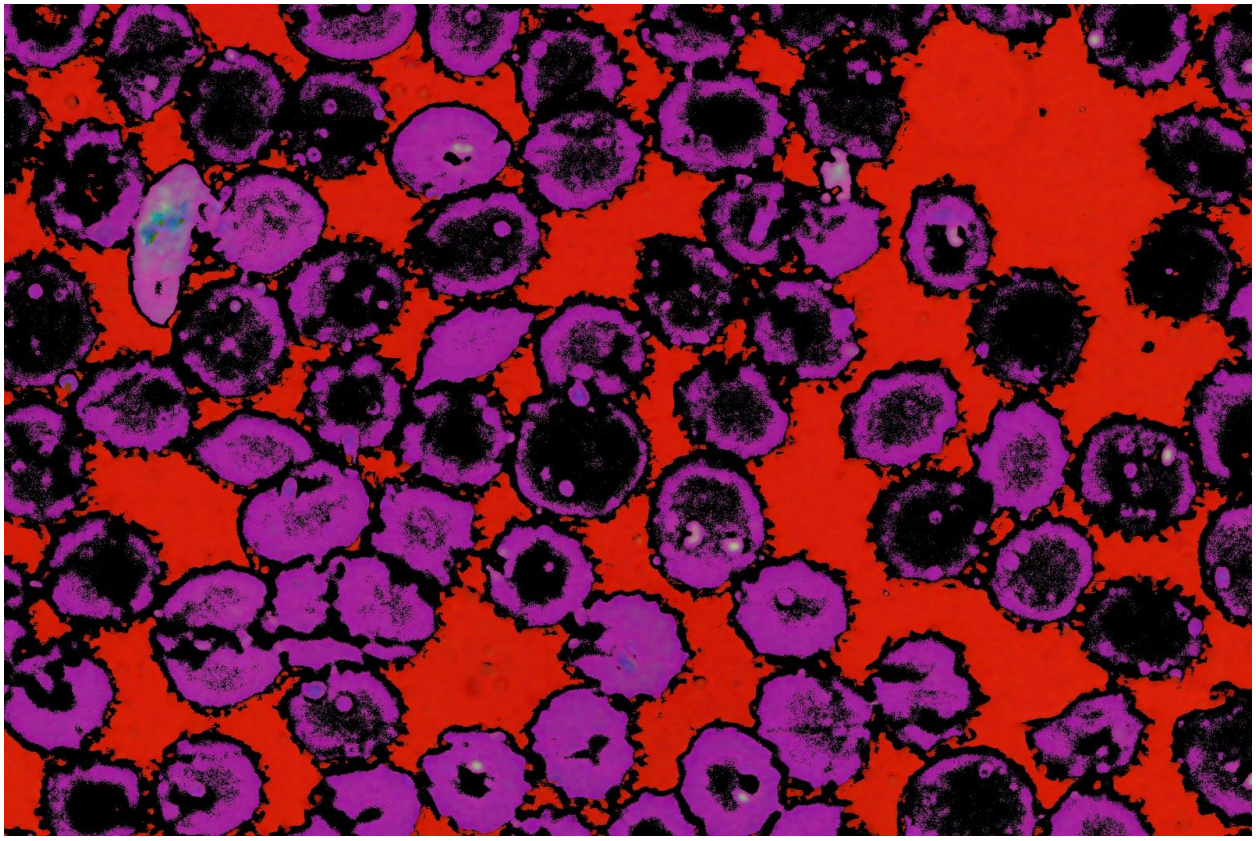

Figure 4.a.19 : Plasmodium9 in the HSV colorspace

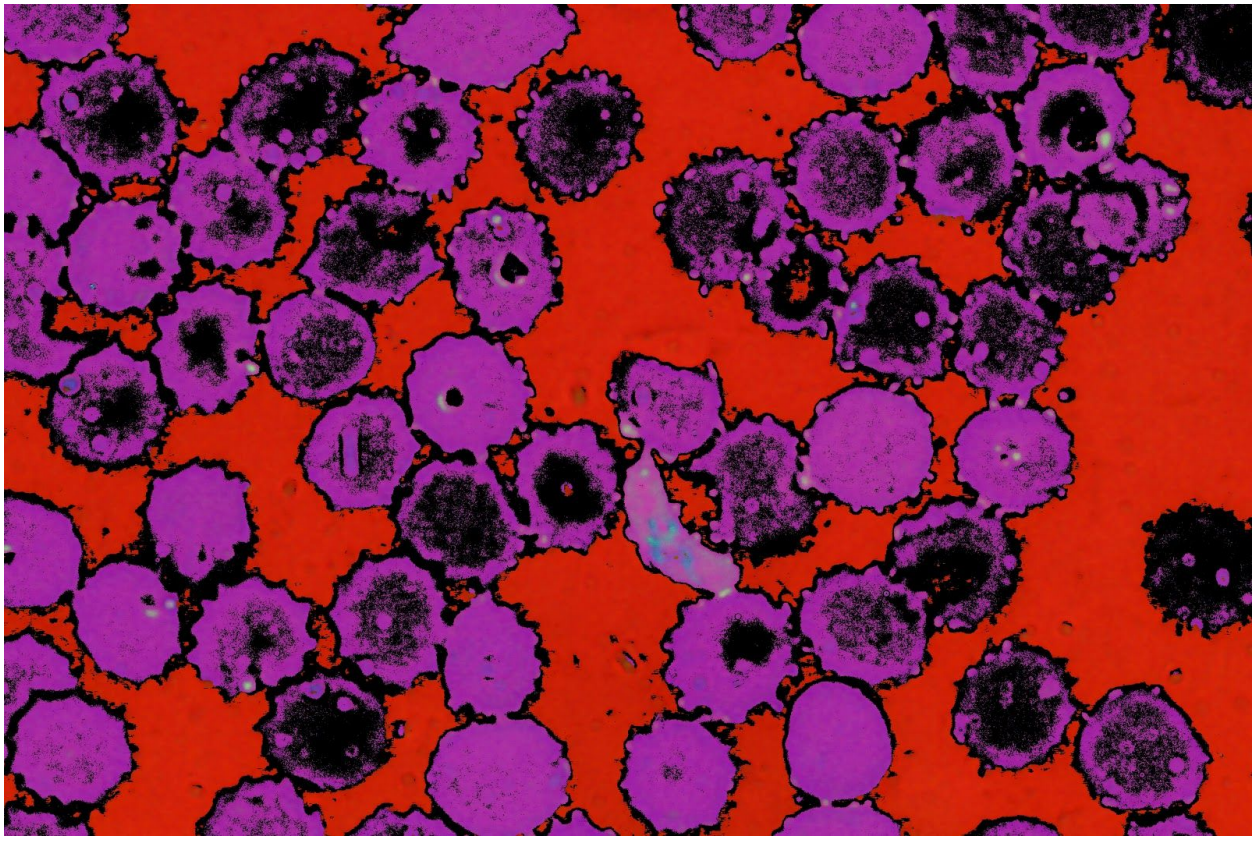

Figure 4.a.20 : Plasmodium10 in the HSV colorspace

Specimen : Schistosoma

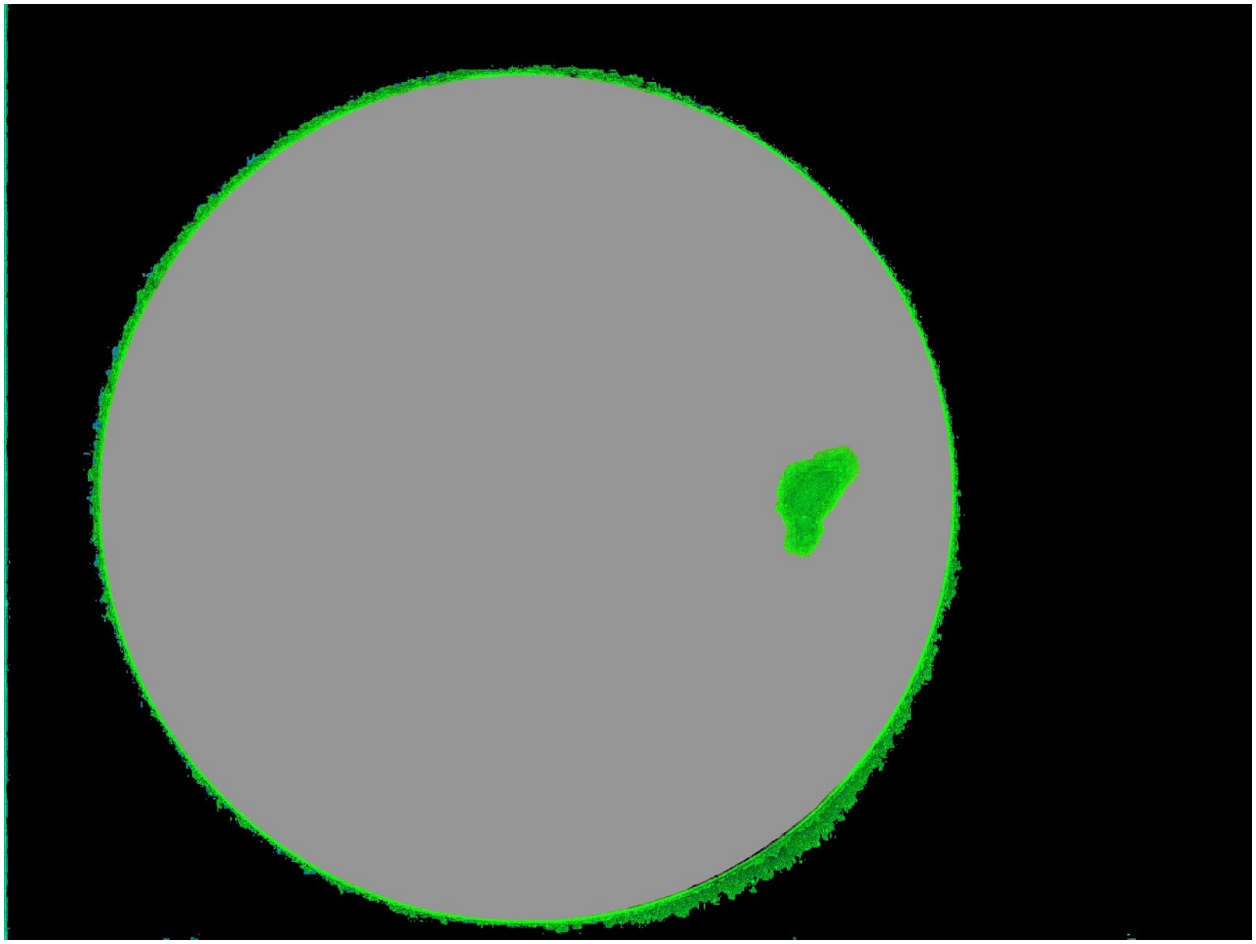

Figure 4.a.21 : Schistosoma1 in the HSV colorspace

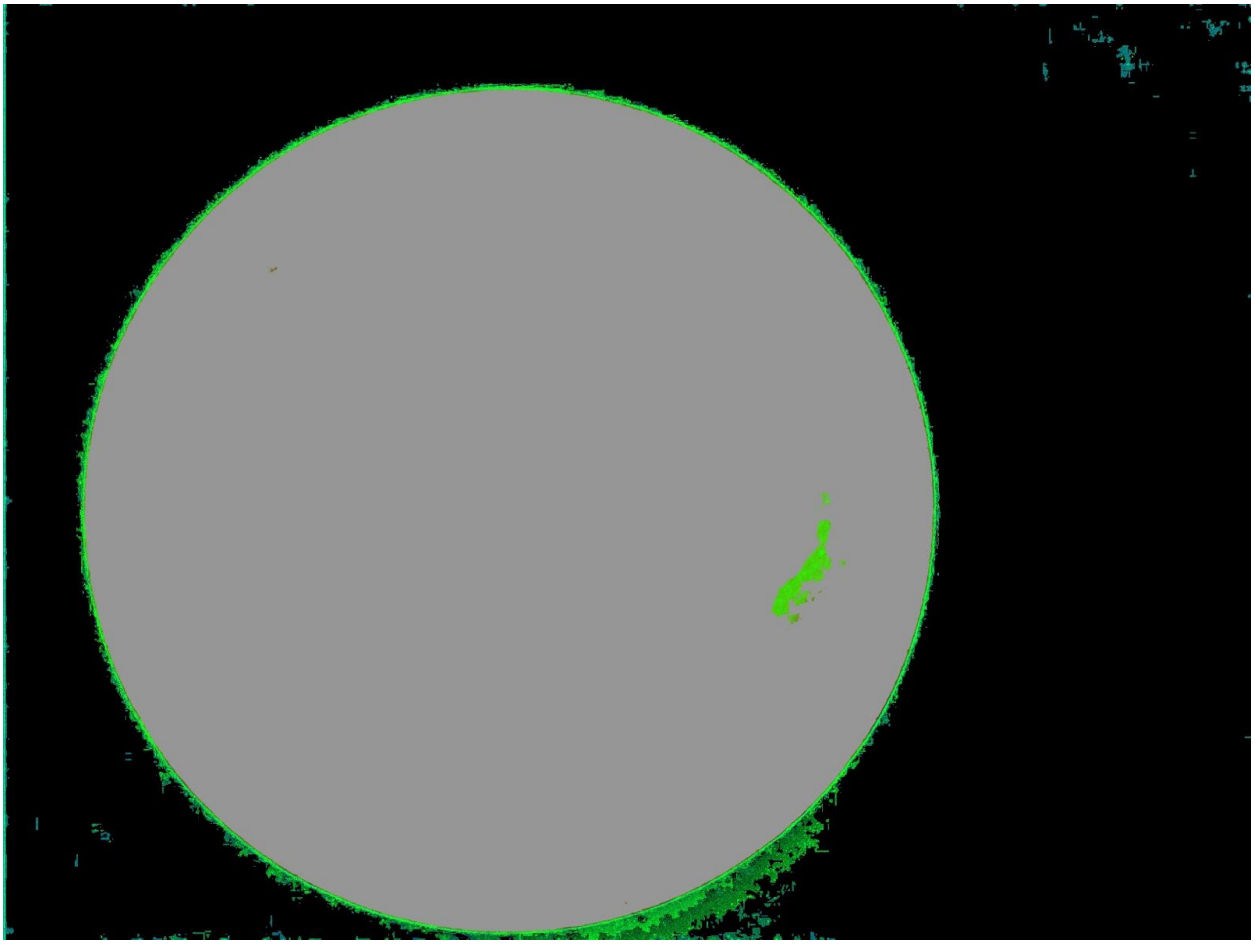

Figure 4.a.22 : Schistosoma2 in the HSV colorspace

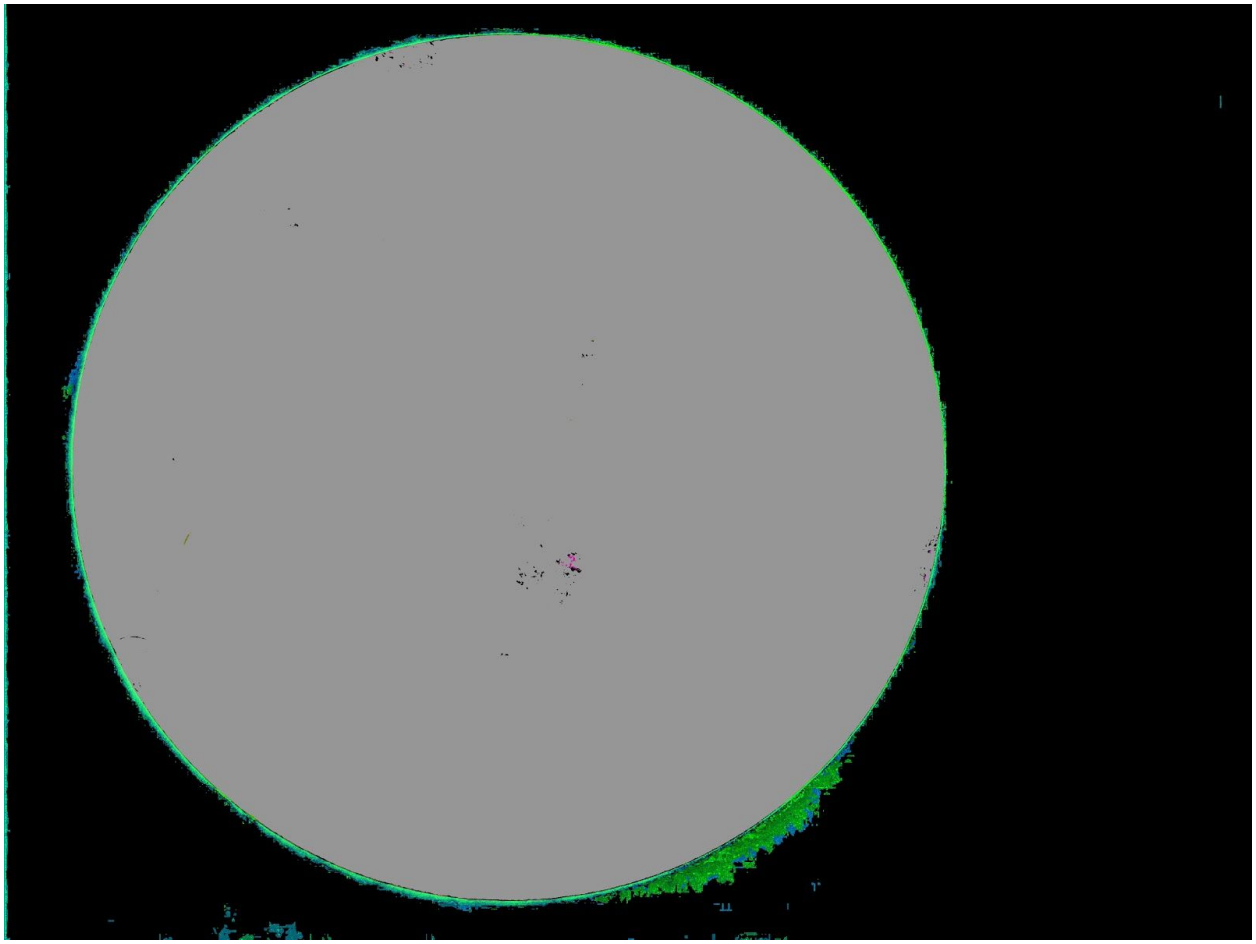

Figure 4.a.23 : Schistosoma3 in the HSV colorspace

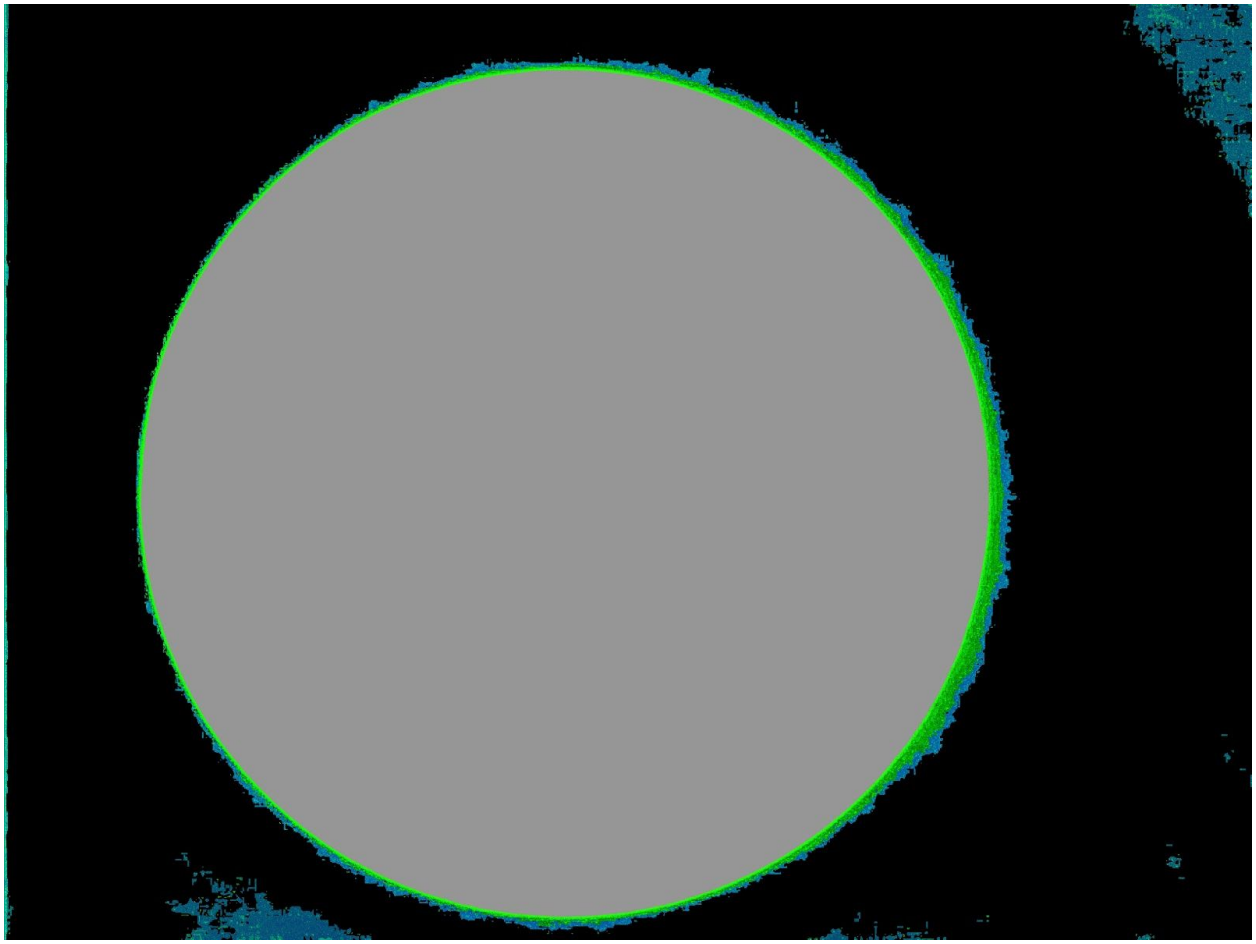

Figure 4.a.24 : Schistosoma4 in the HSV colorspace

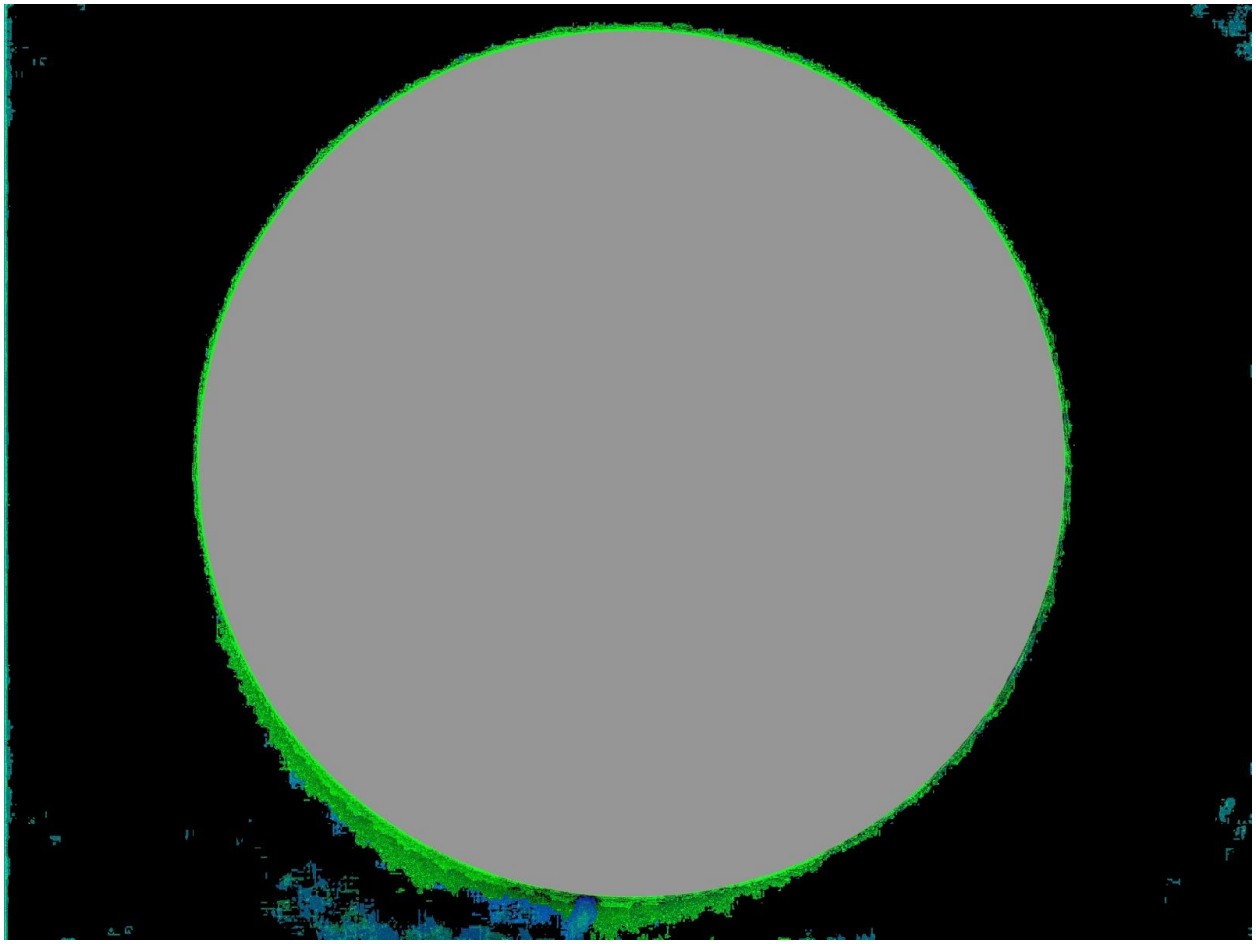

Figure 4.a.25 : Schistosoma5 in the HSV colorspace

Figure 4.a.26 : Schistosoma6 in the HSV colorspace

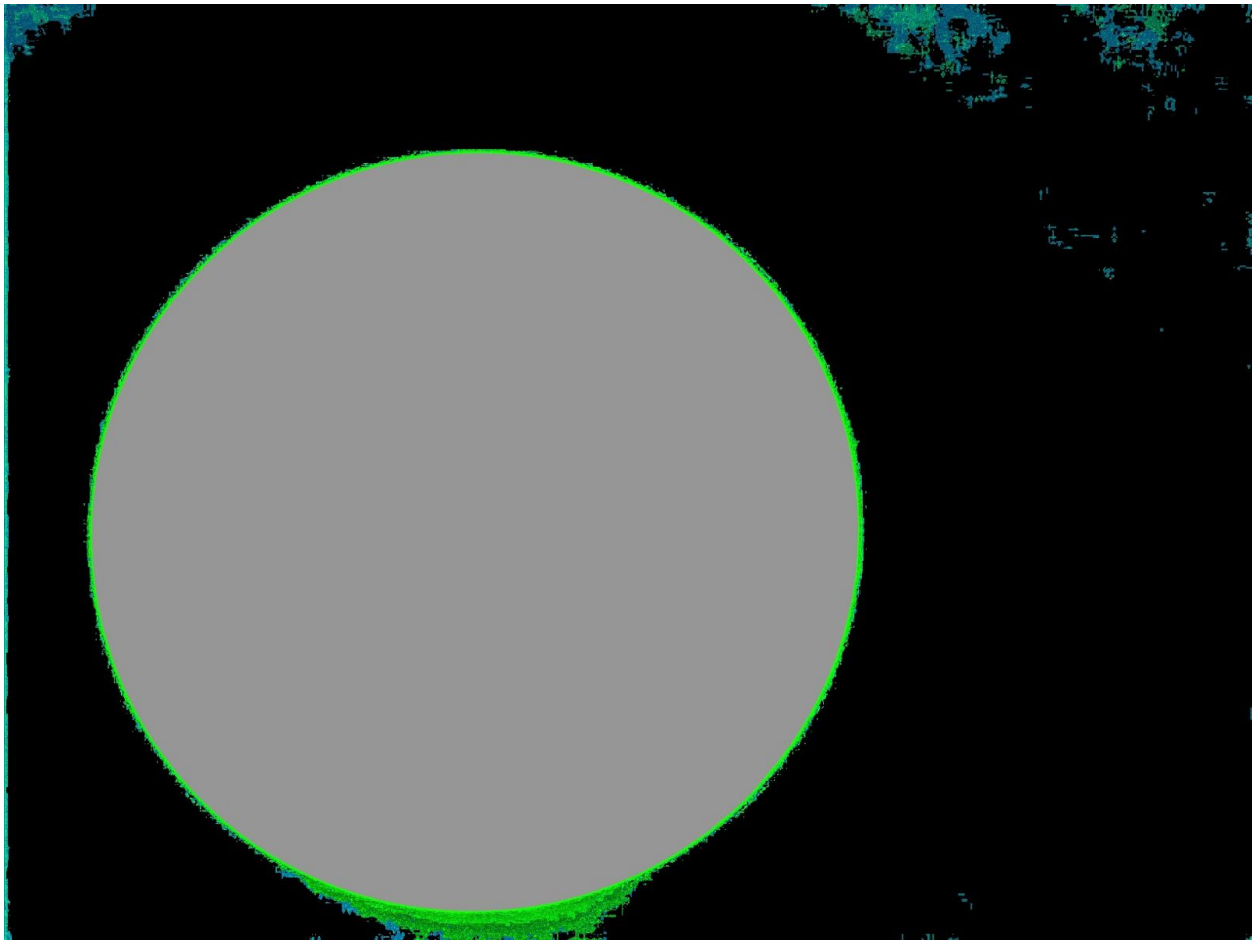

Figure 4.a.27 : Schistosoma7 in the HSV colorspace

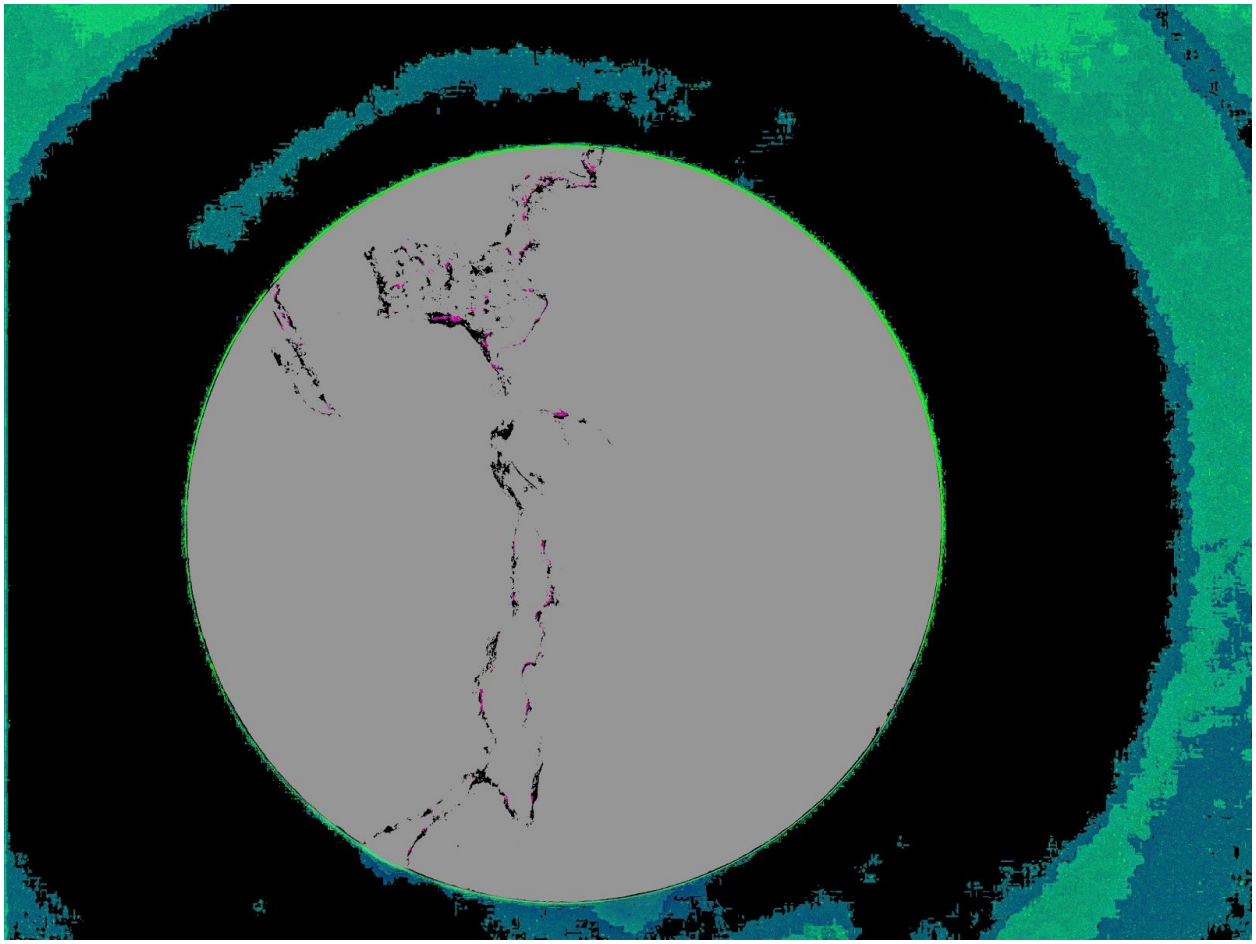

Figure 4.a.28 : Schistosoma8 in the HSV colorspace

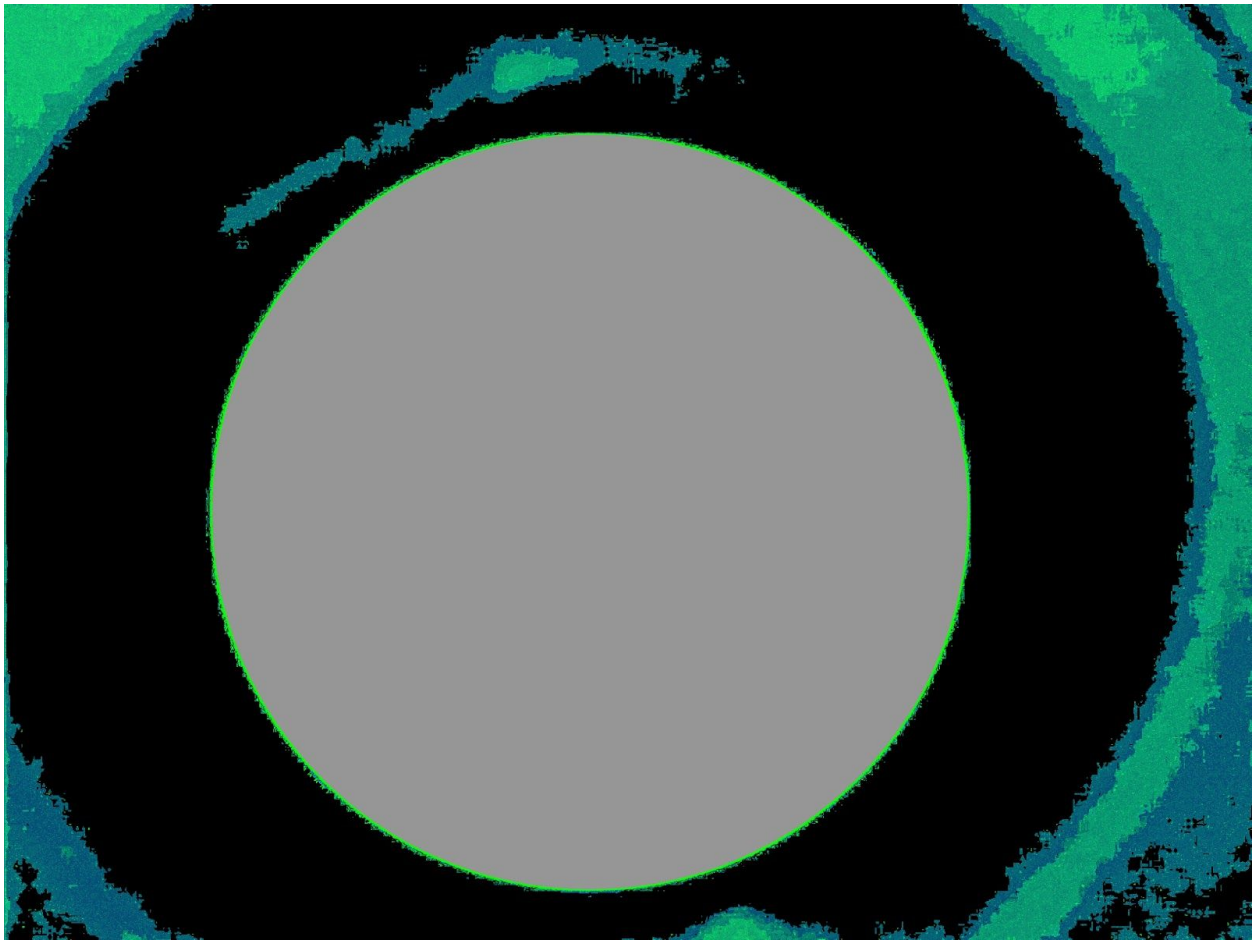

Figure 4.a.29 : Schistosoma9 in the HSV colorspace

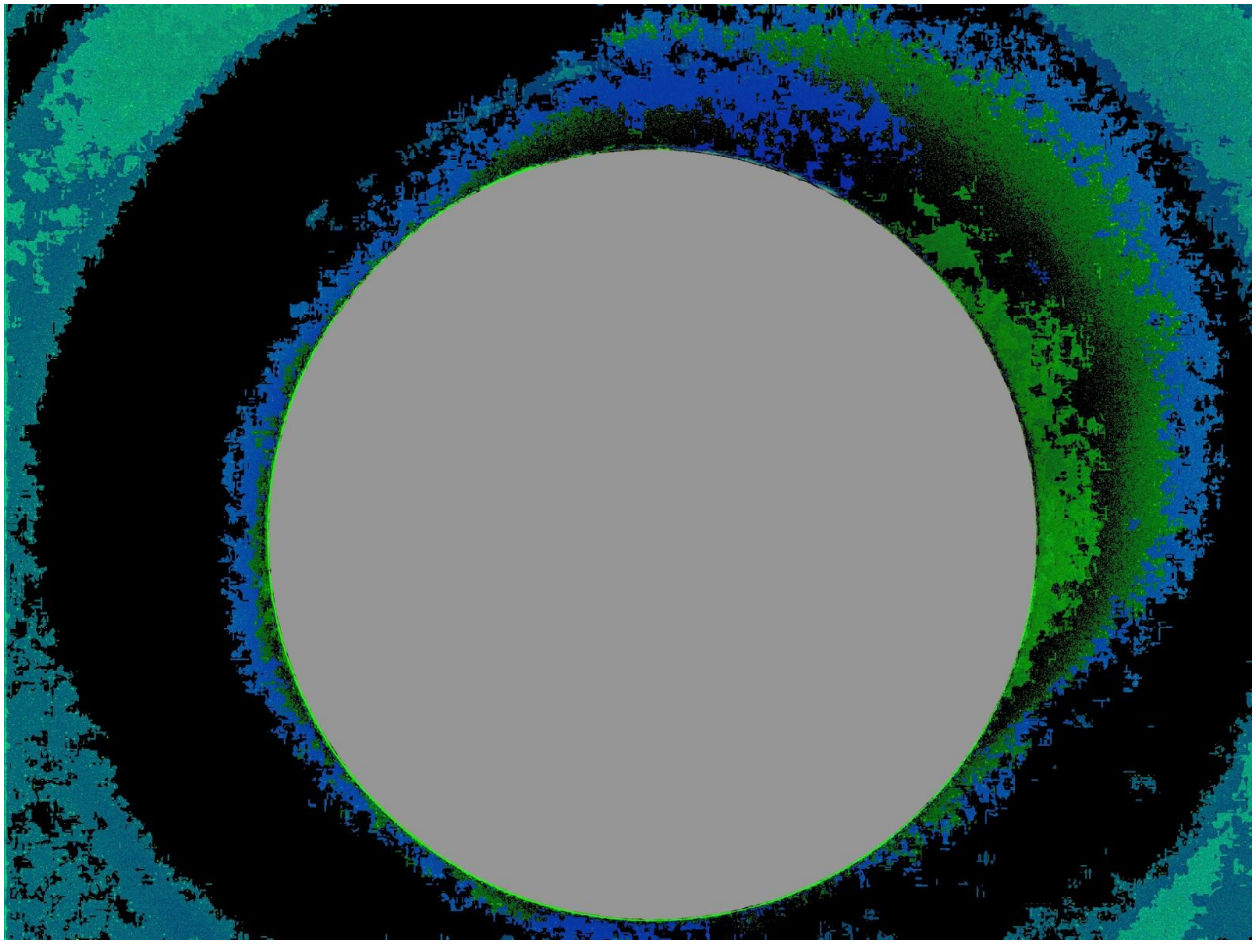

Figure 4.a.30 : Schistosoma10 in the HSV colorspace

B. Ciel Lab

Specimen : Filaria

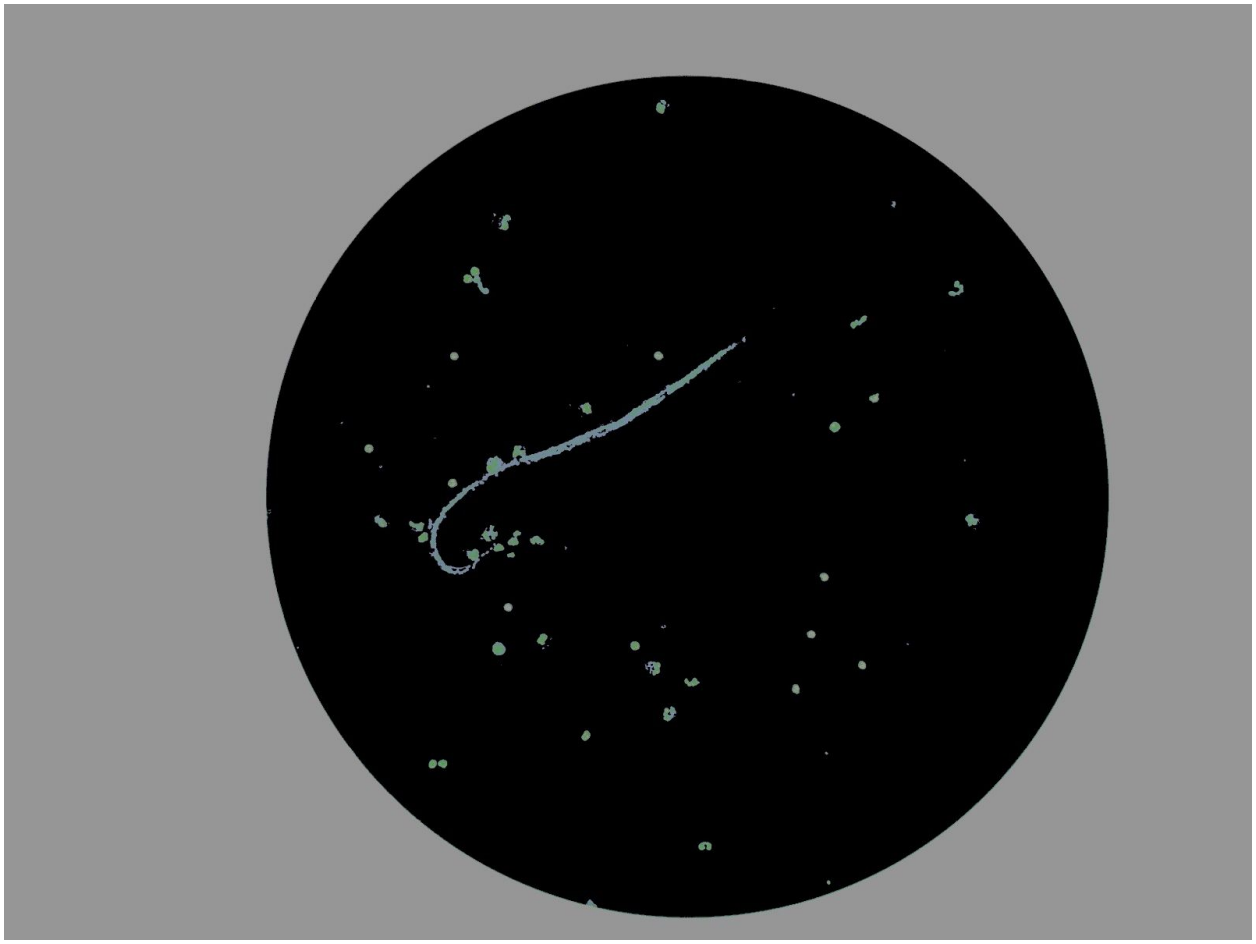

Figure 4.b.1 : Filaria1 in the Ciel Lab colorspace

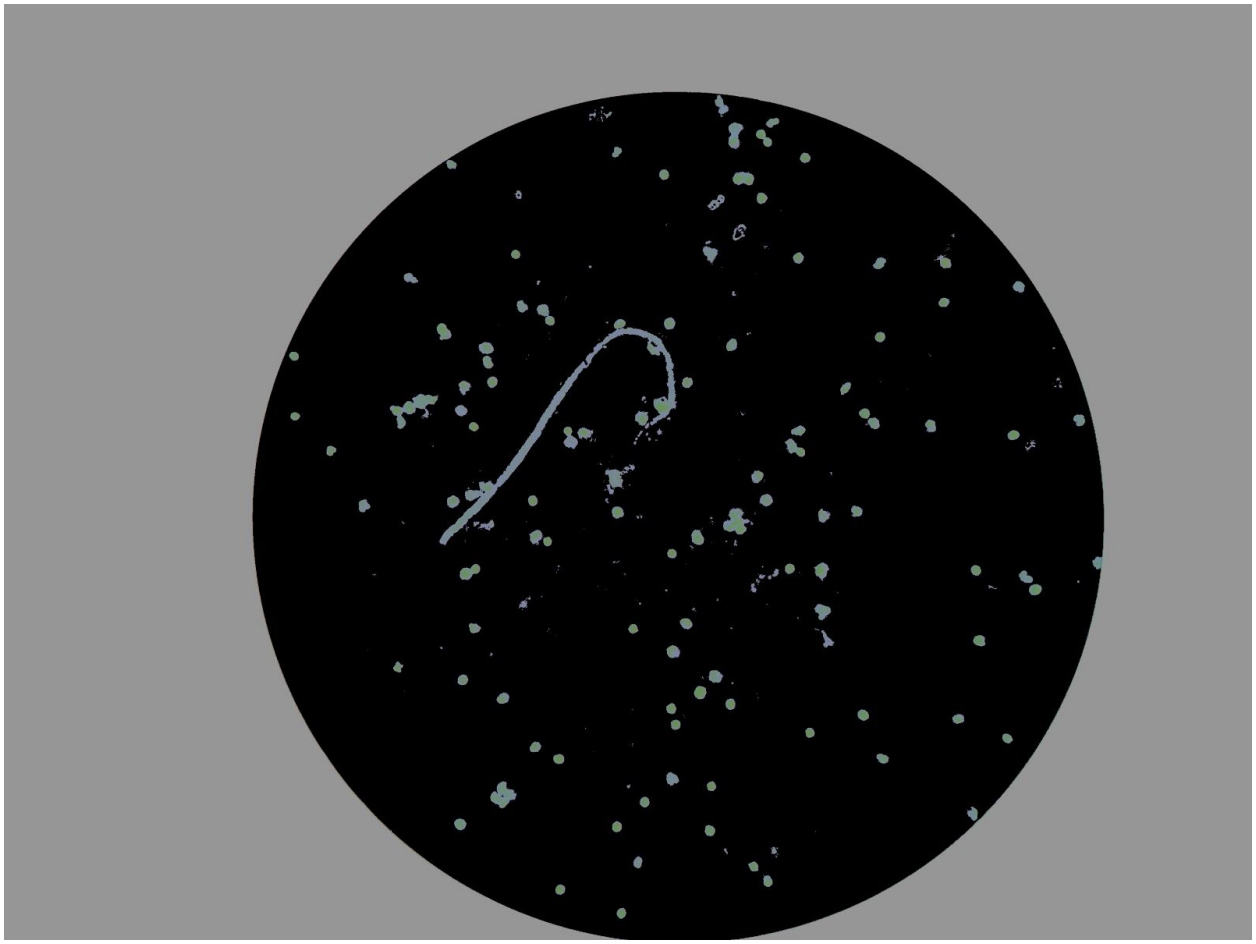

Figure 4.b.2 : Filaria2 in the Ciel Lab colorspace

Figure 4.b.3 : Filaria3 in the Ciel Lab colorspace

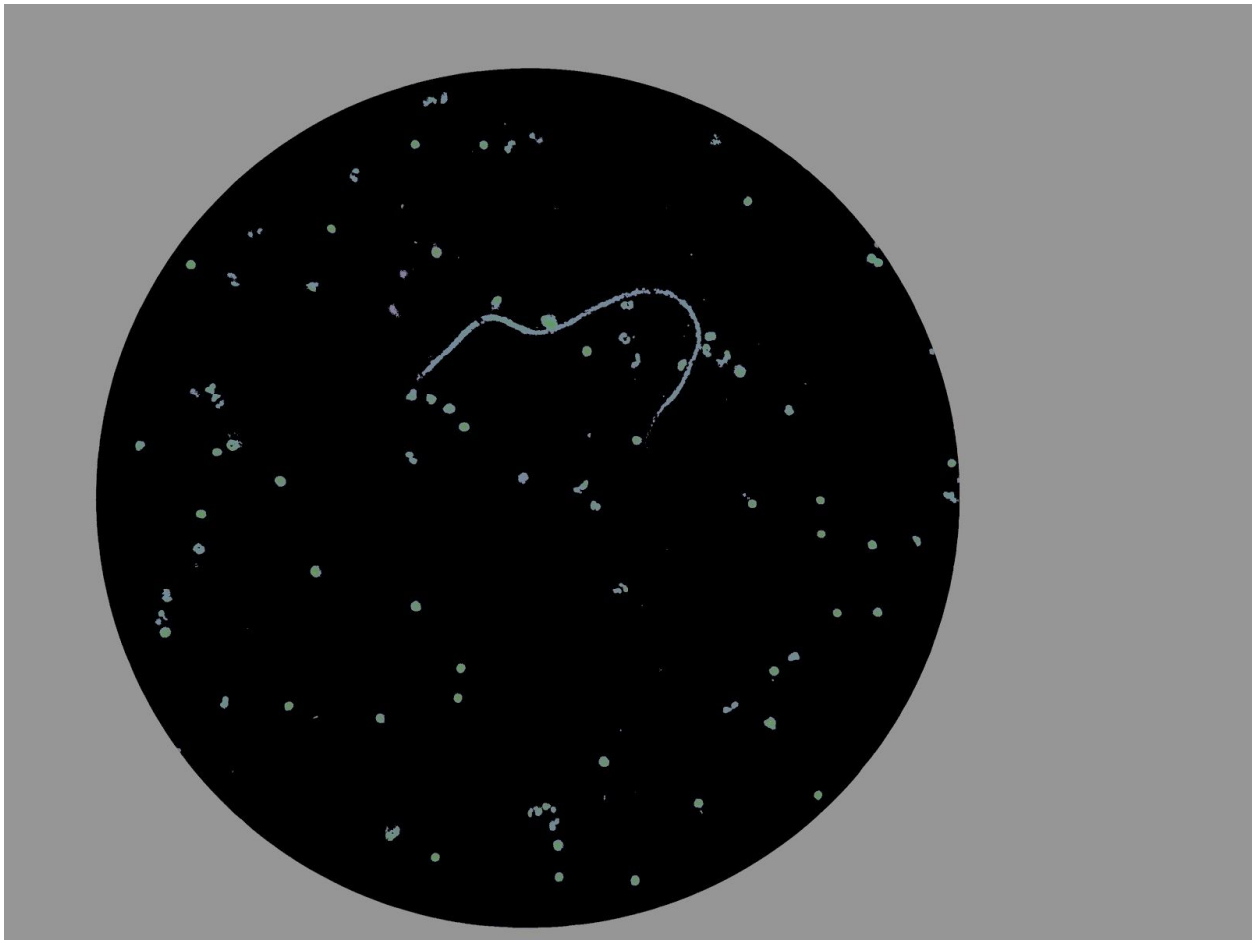

Figure 4.b.4 : Filaria4 in the Ciel Lab colorspace

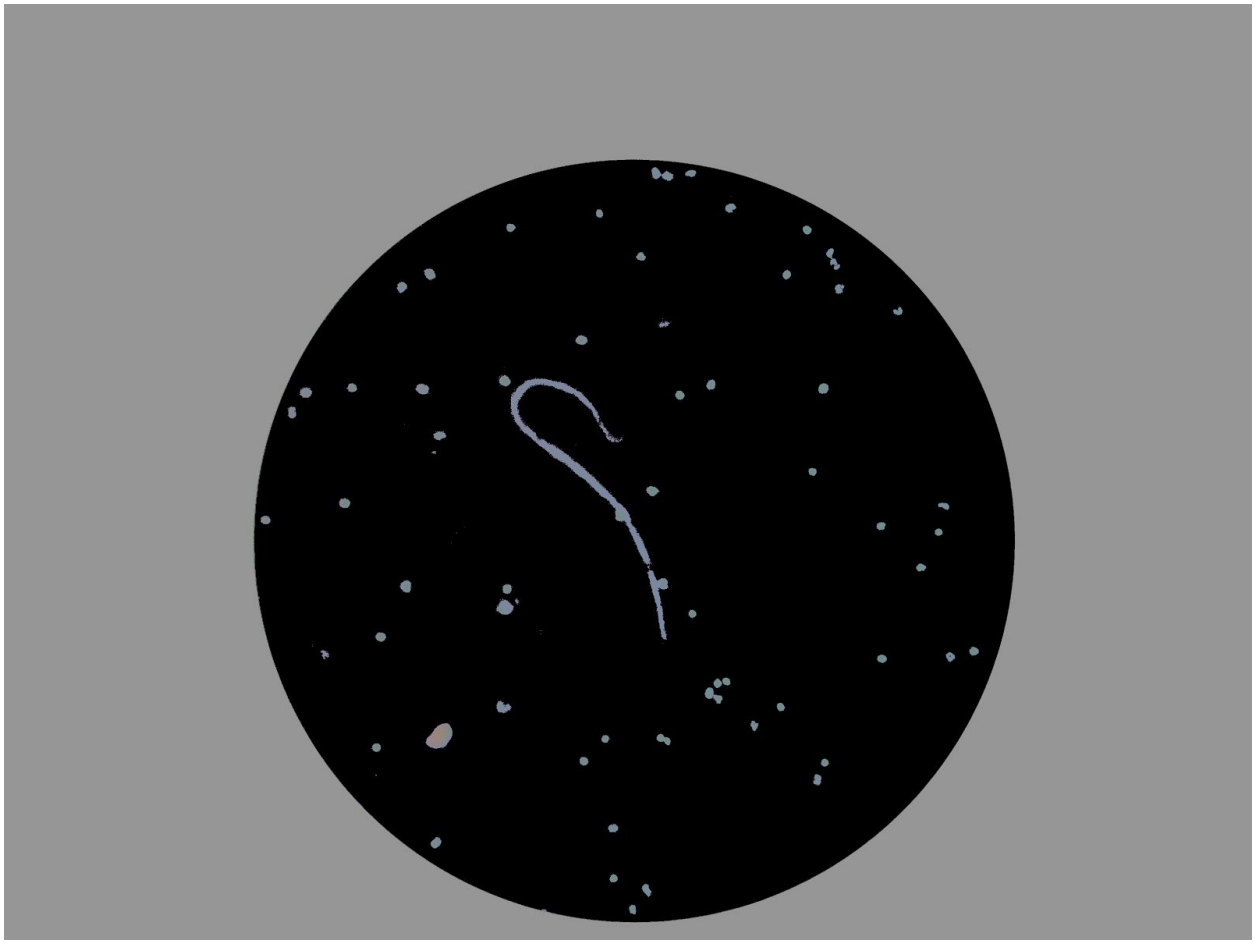

Figure 4.b.5 : Filaria5 in the Ciel Lab colorspace

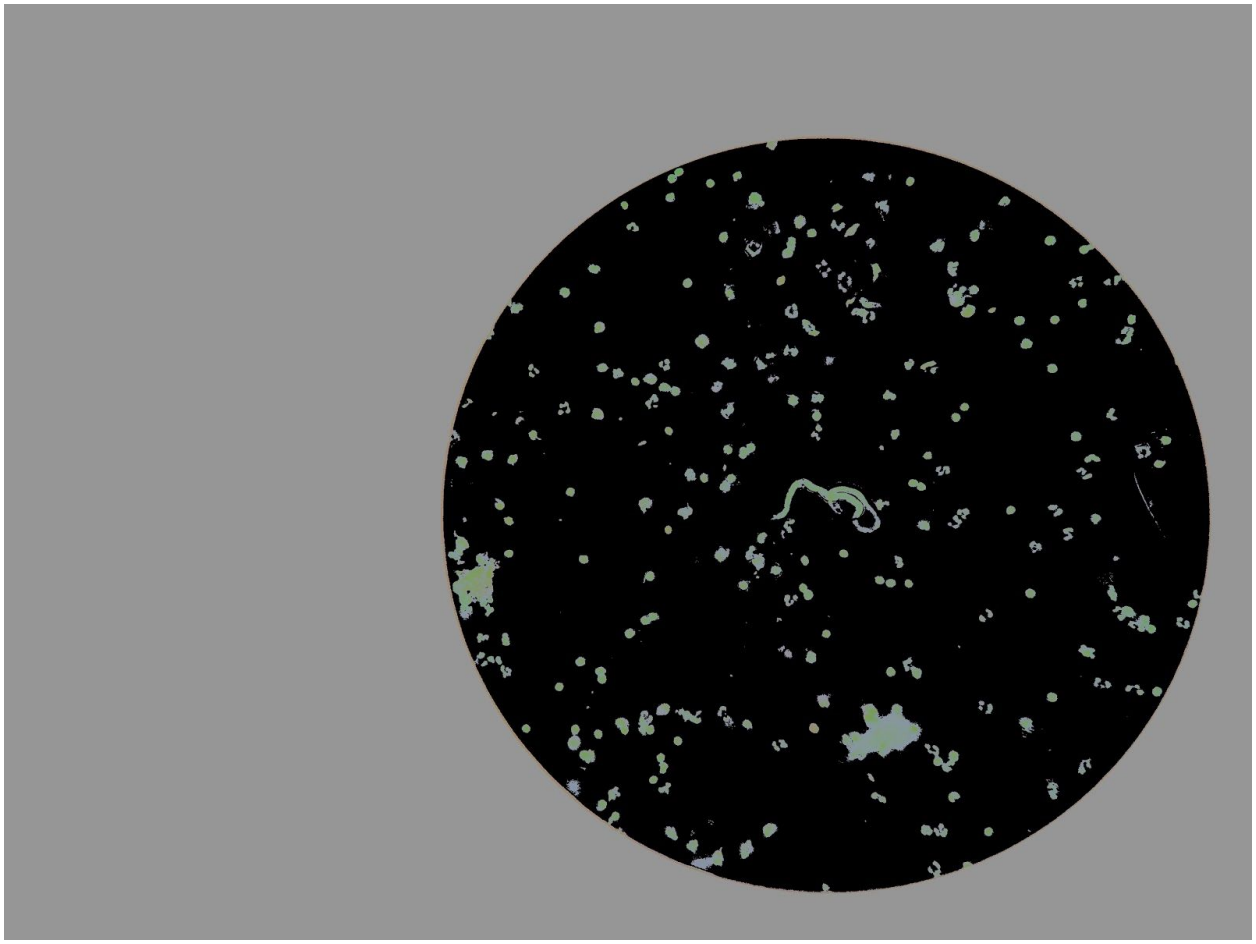

Figure 4.b.6 : Filaria6 in the Ciel Lab colorspace

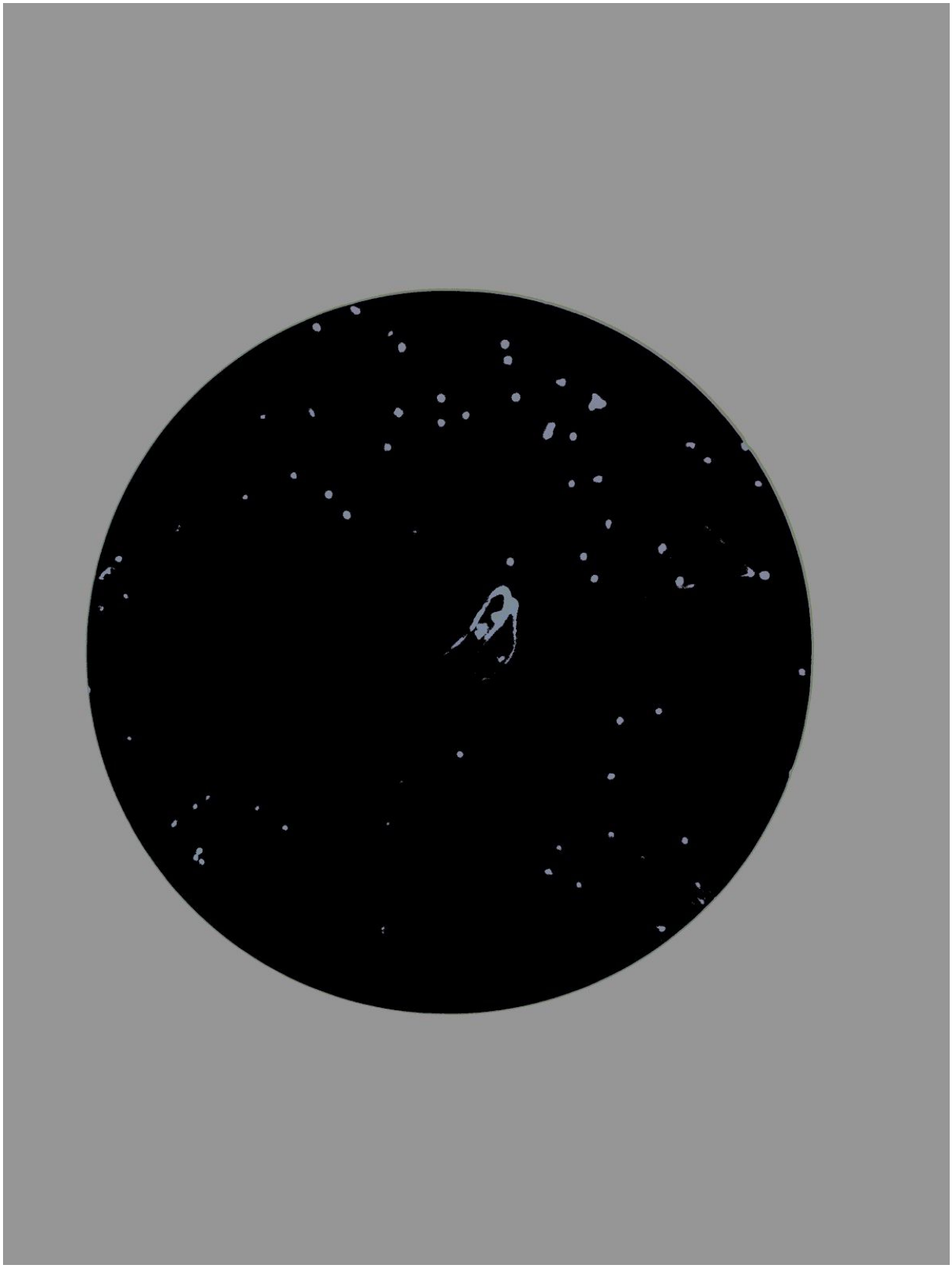

Figure 4.b.7 : Filaria7 in the Ciel Lab colorspace

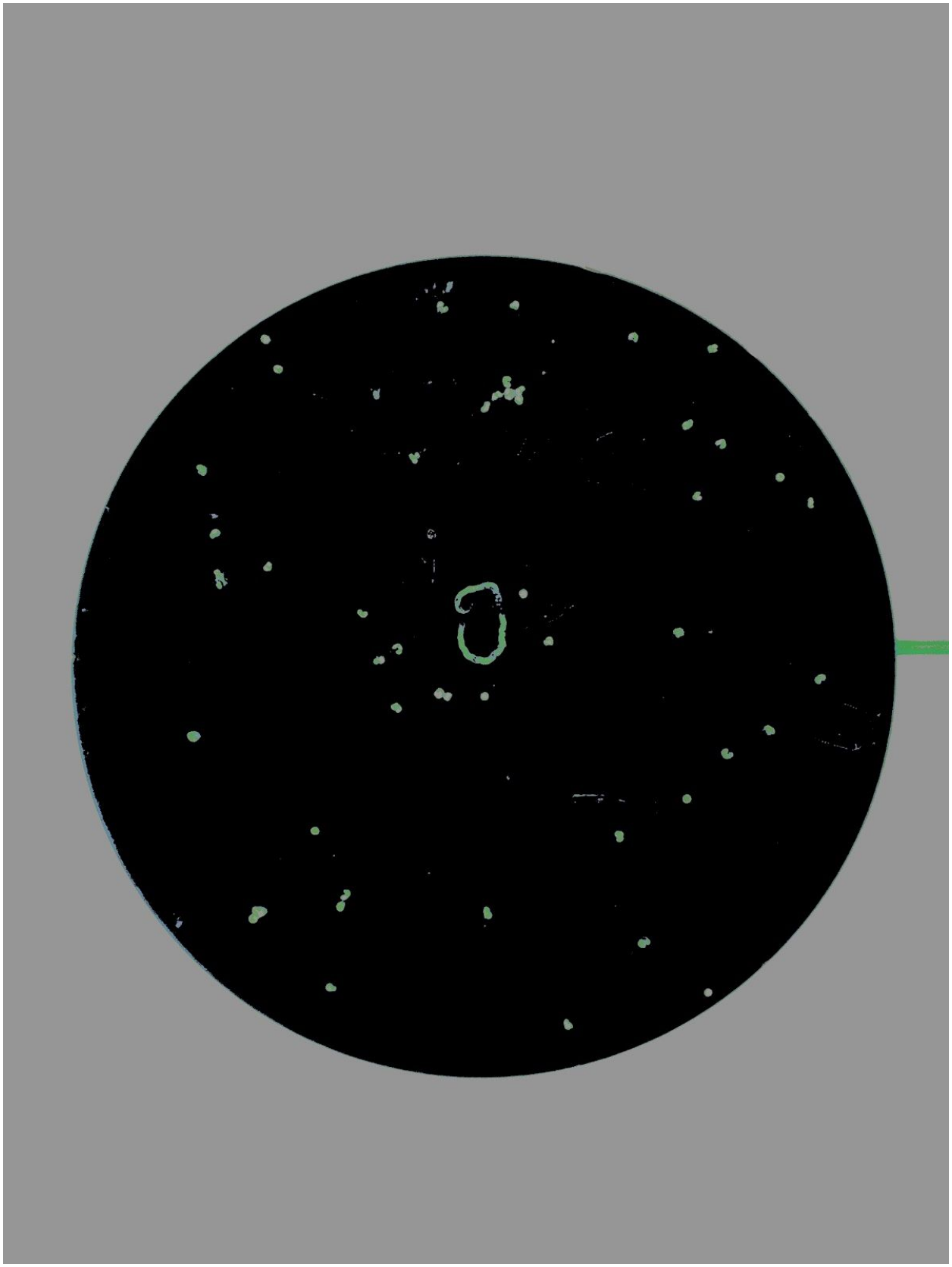

Figure 4.b.8 : Filaria8 in the Ciel Lab colorspace

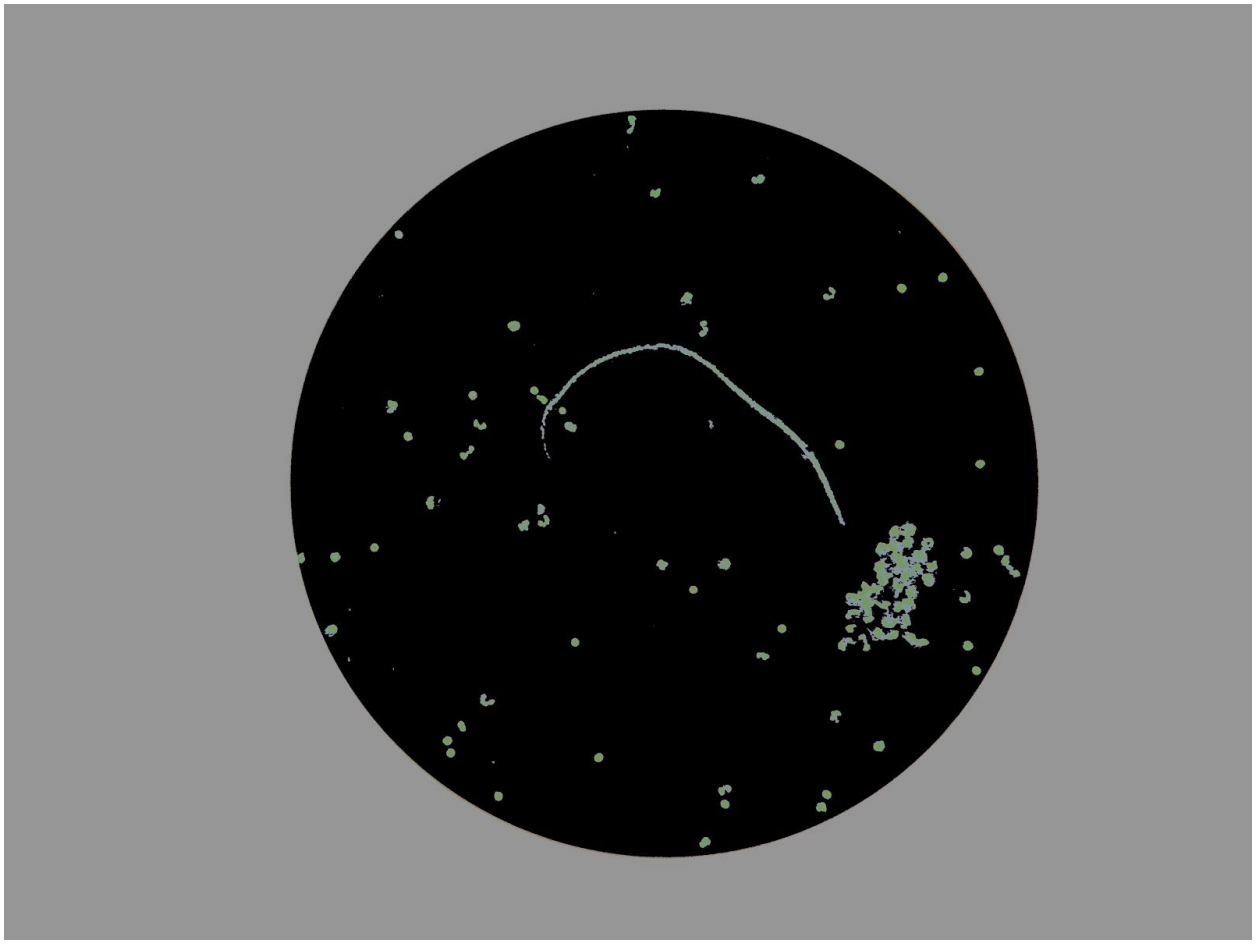

Figure 4.b.9 : Filaria9 in the Ciel Lab colorspace

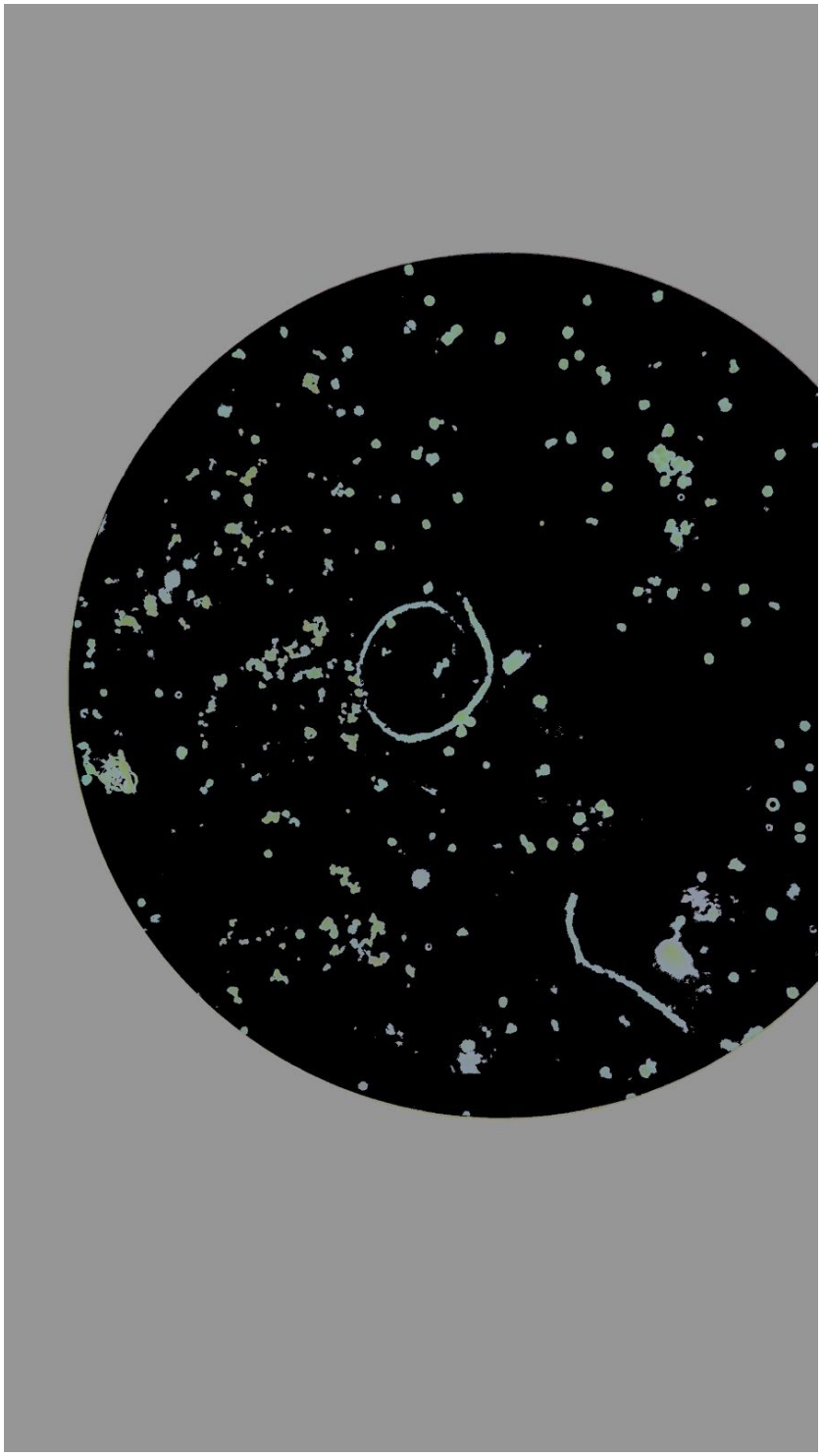

Figure 4.b.10 : Filaria10 in the Ciel Lab colorspace
Specimen : Plasmodium

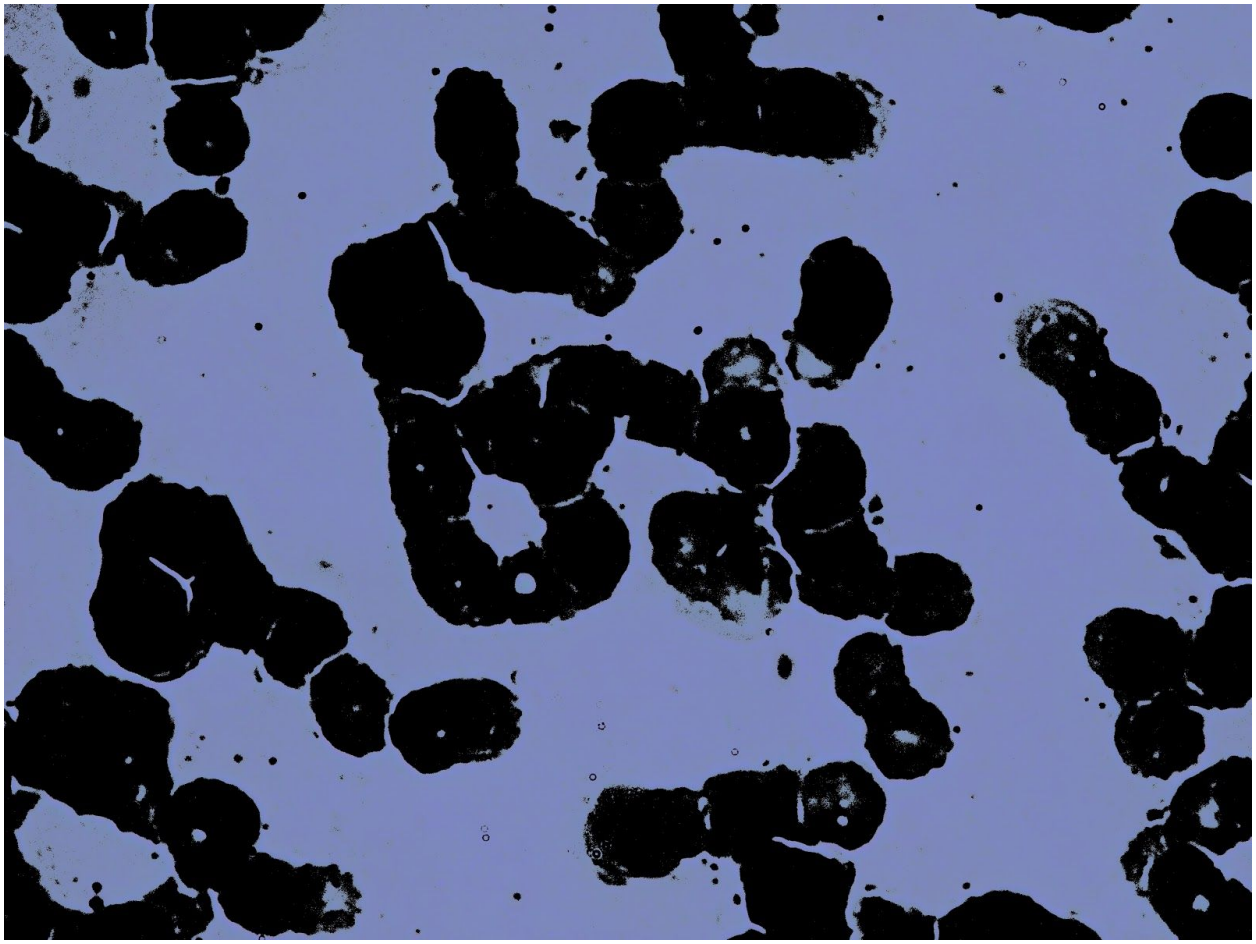

Figure 4.b.11 : Plasmodium1 in the Ciel Lab colorspace

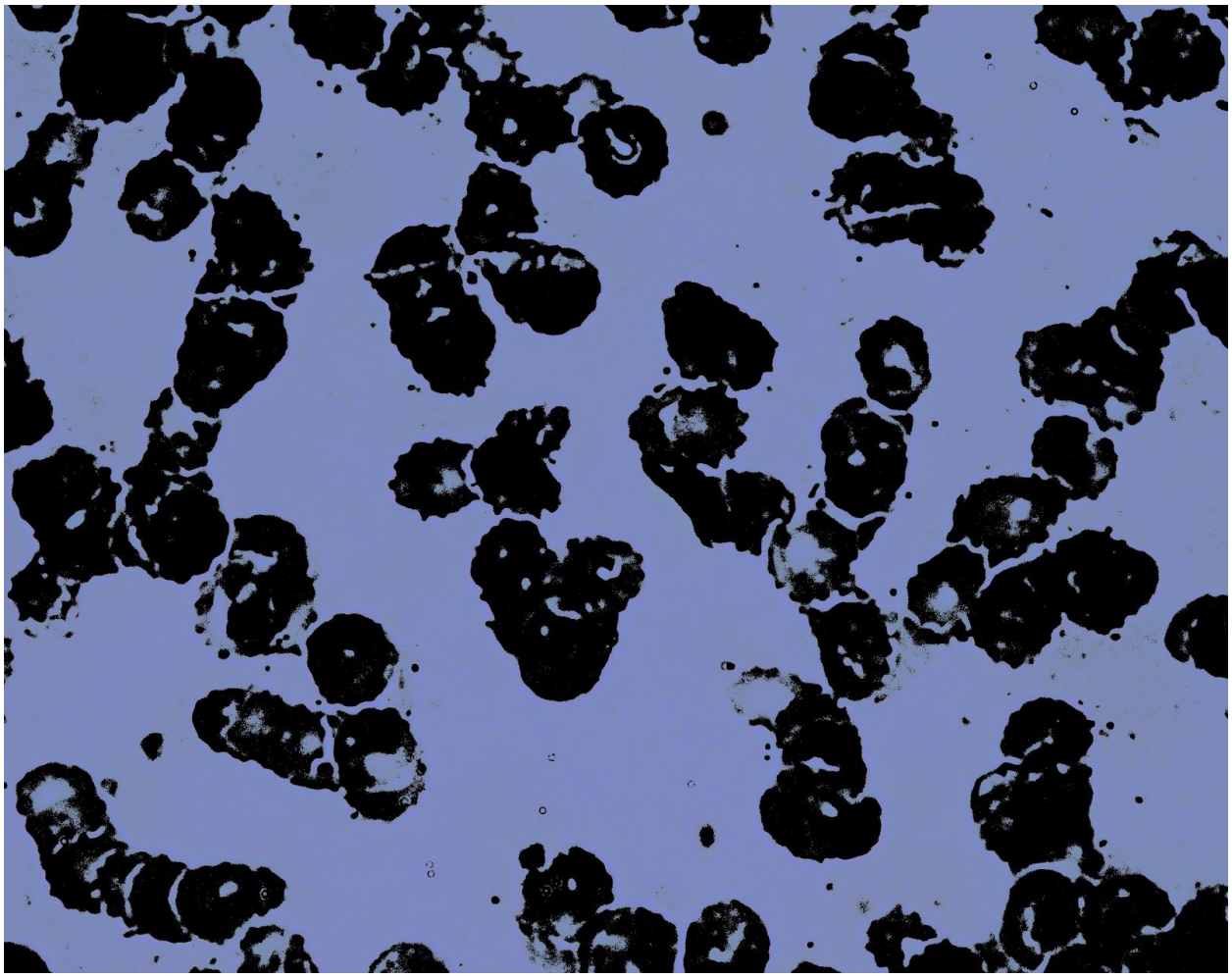

Figure 4.b.12 : Plasmodium2 in the Ciel Lab colorspace

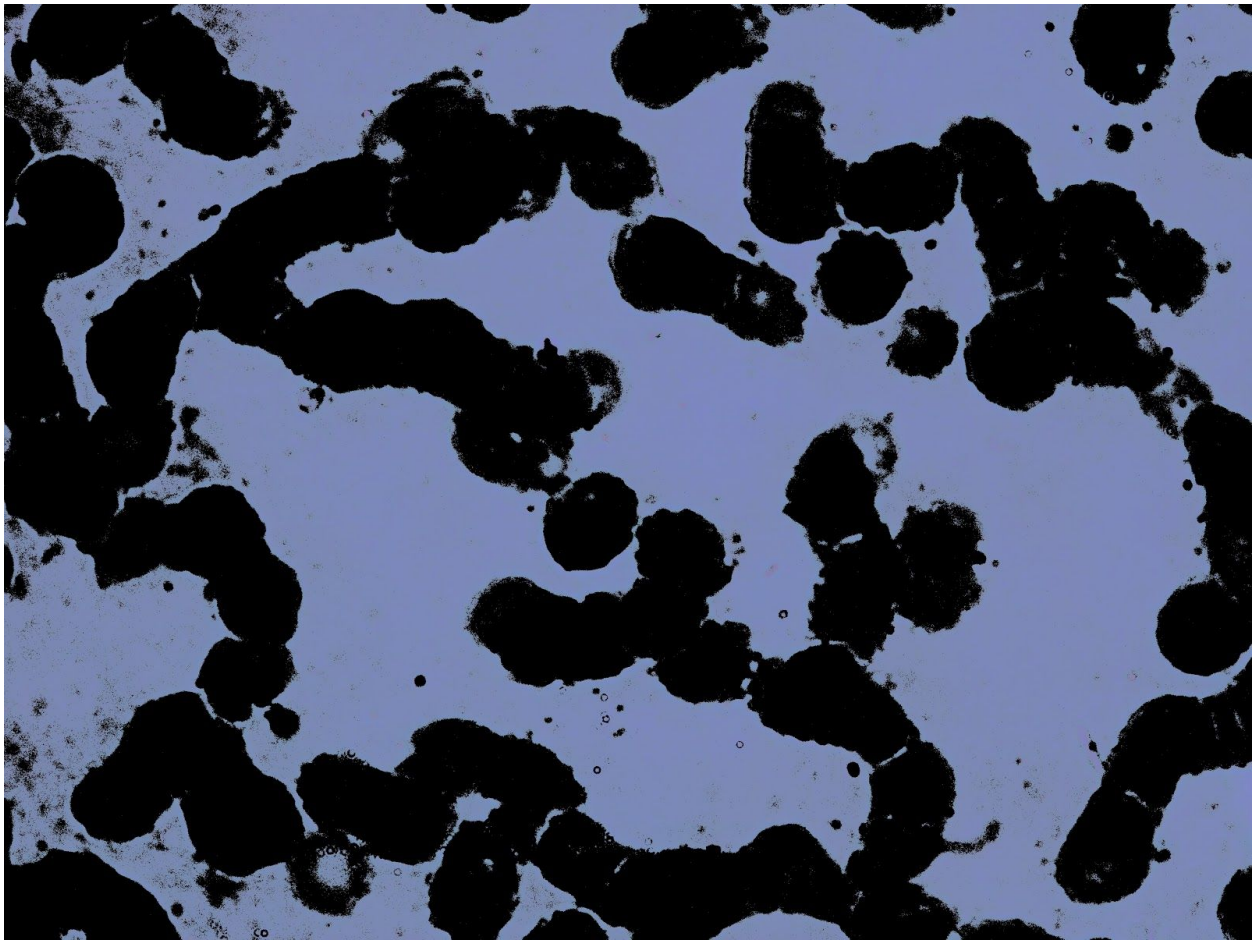

Figure 4.b.13 : Plasmodium3 in the Ciel Lab colorspace

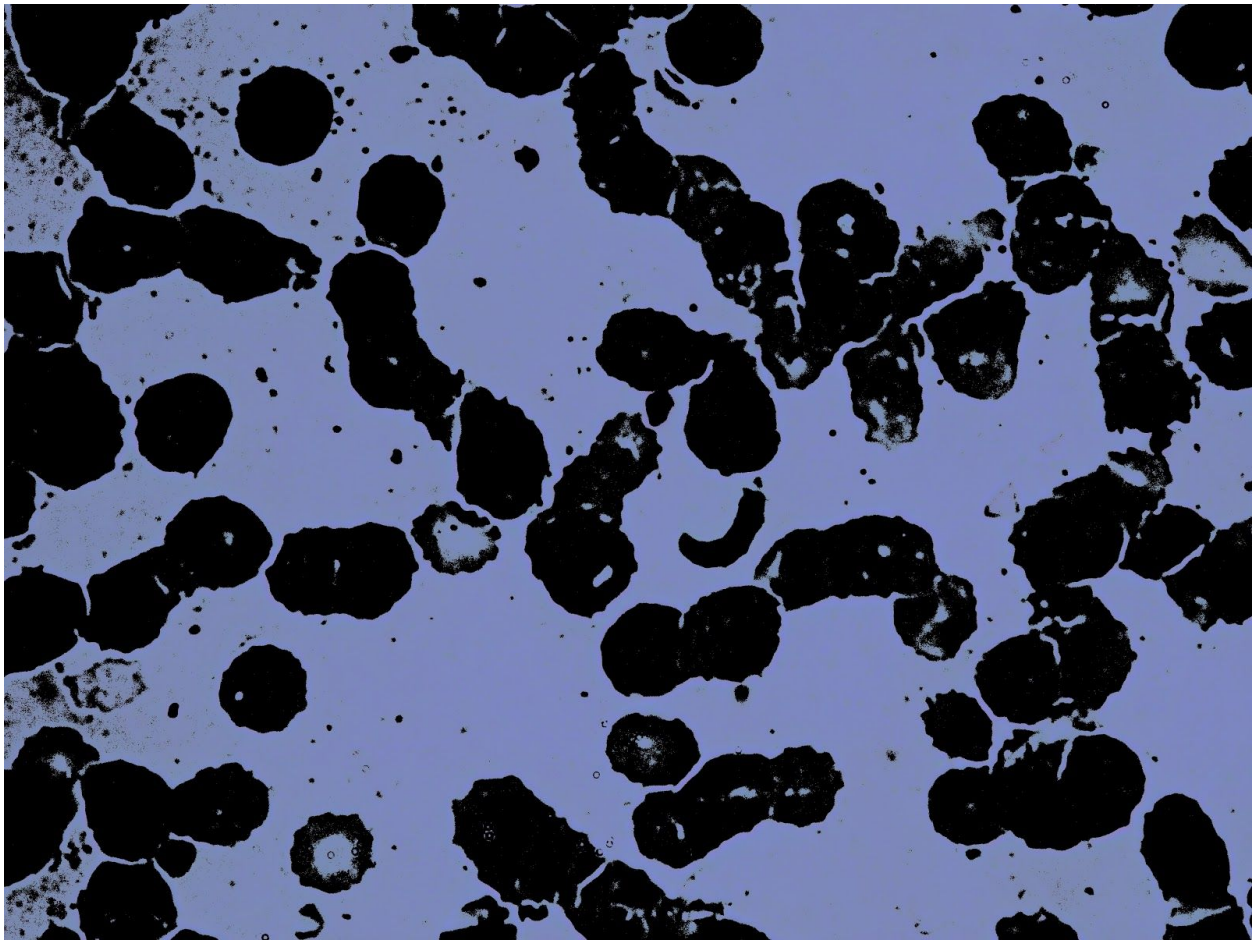

Figure 4.b.14 : Plasmodium4 in the Ciel Lab colorspace

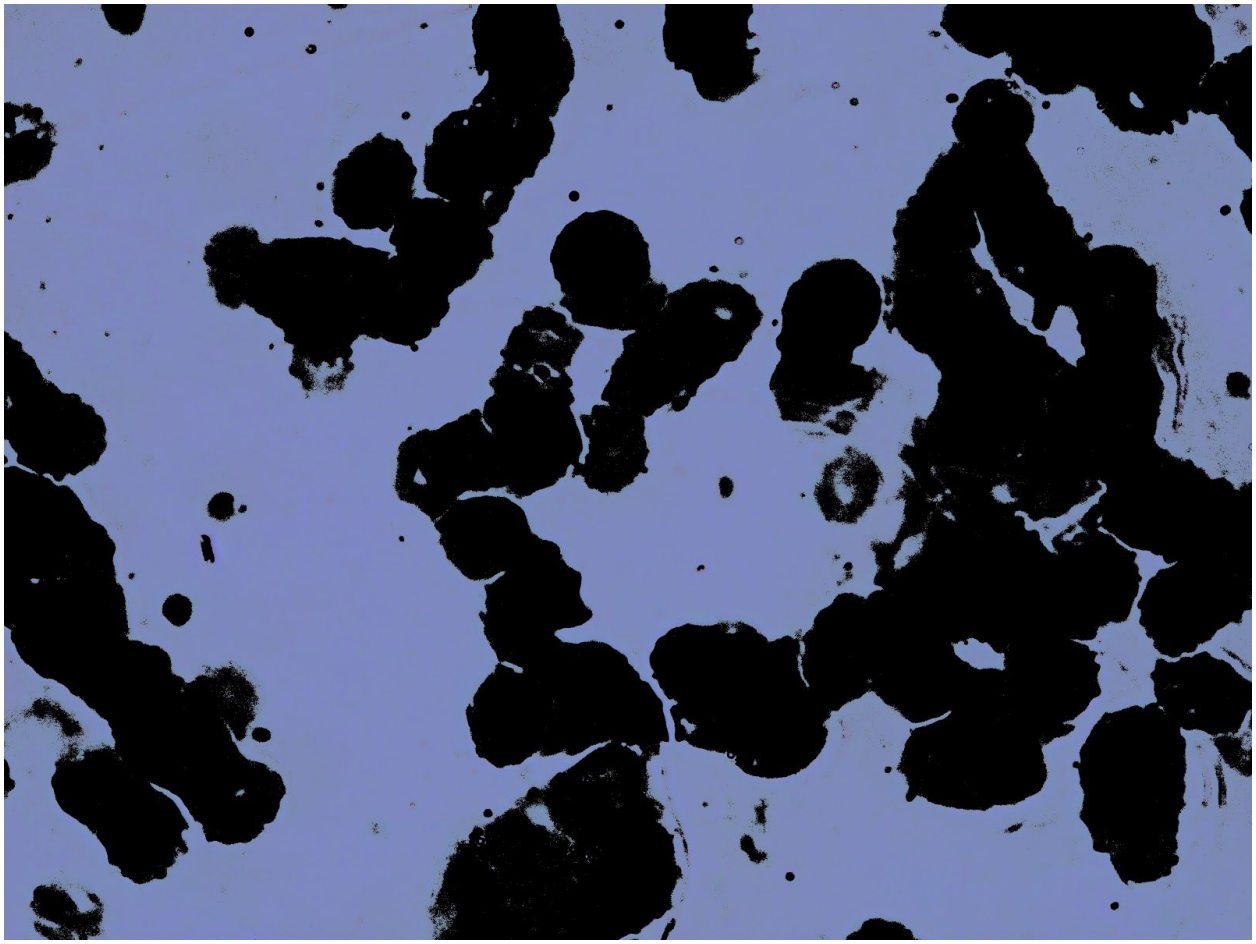

Figure 4.b.15 : Plasmodium5 in the Ciel Lab colorspace

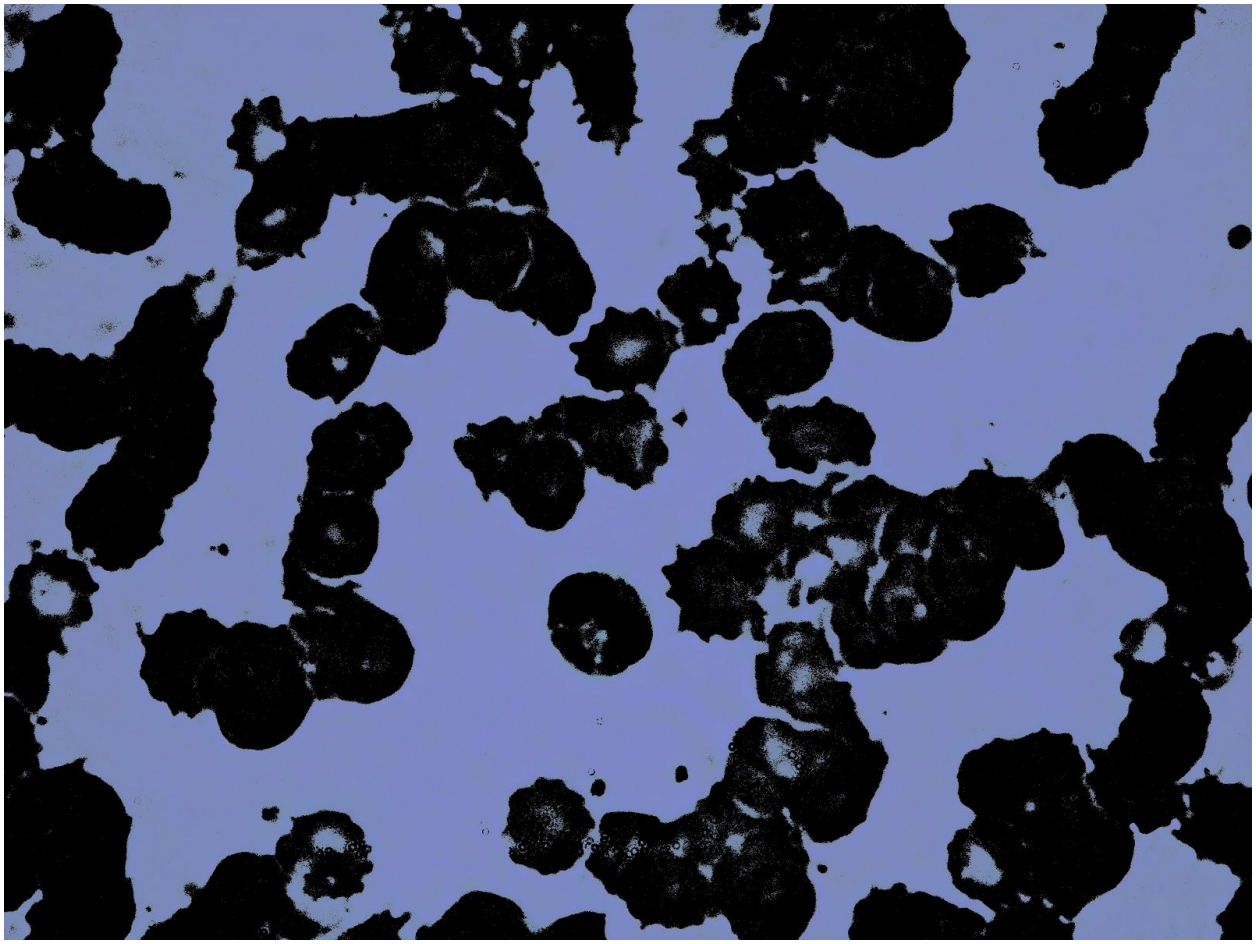

Figure 4.b.16 : Plasmodium6 in the Ciel Lab colorspace

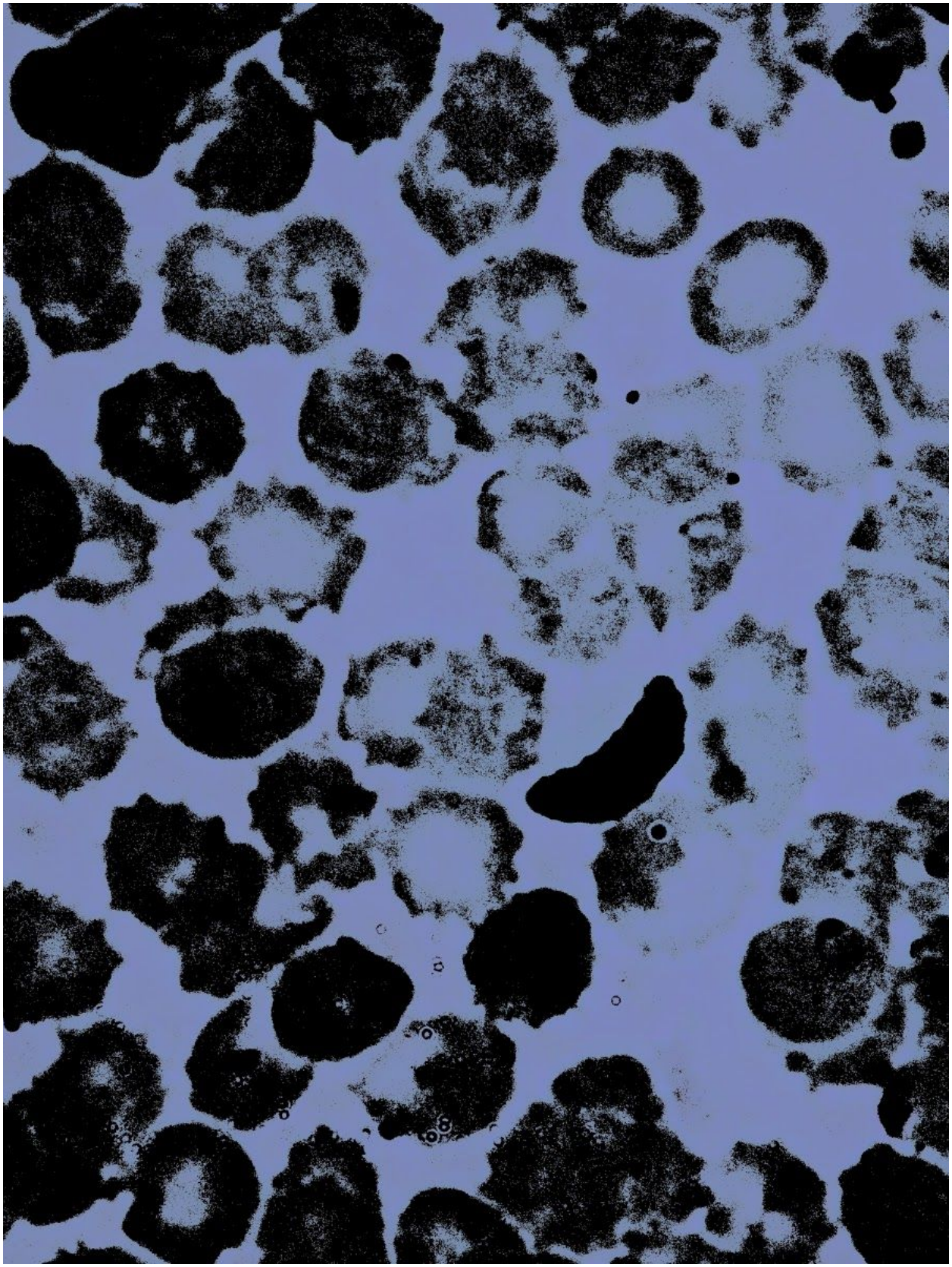

Figure 4.b.17 : Plasmodium7 in the Ciel Lab colorspace

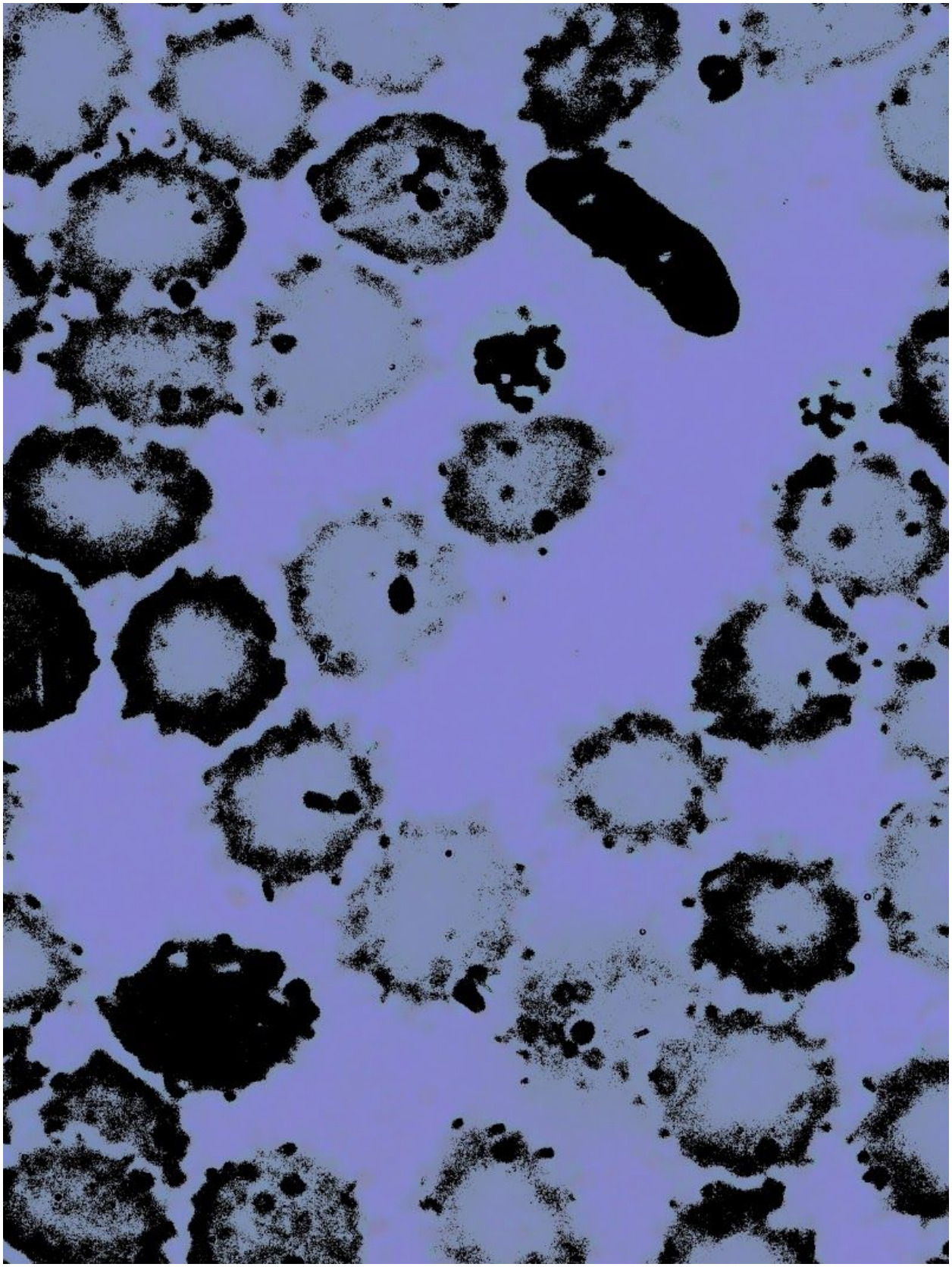

Figure 4.b.1 8: Plasmodium8 in the Ciel Lab colorspace

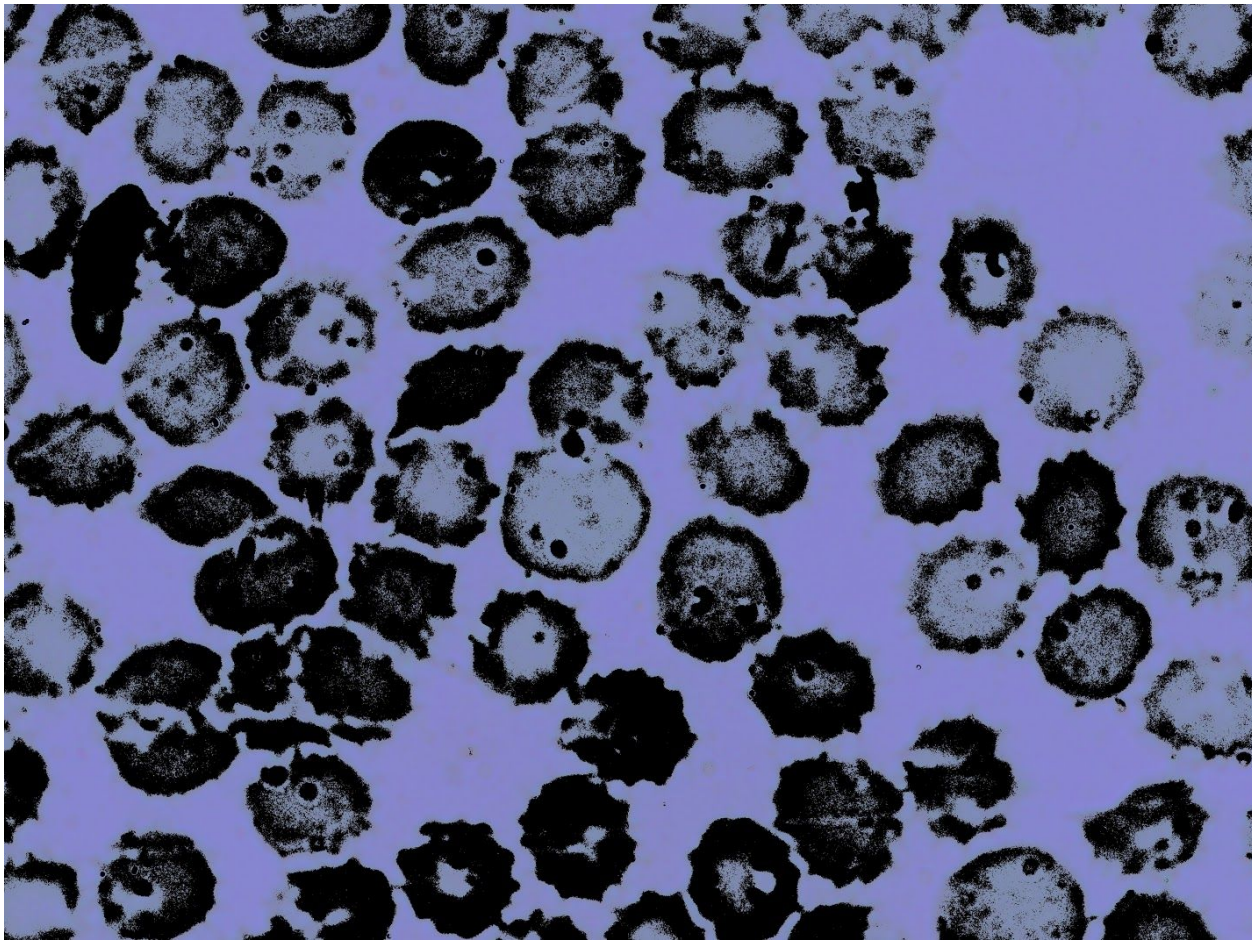

Figure 4.b.19 : Plasmodium9 in the Ciel Lab colorspace

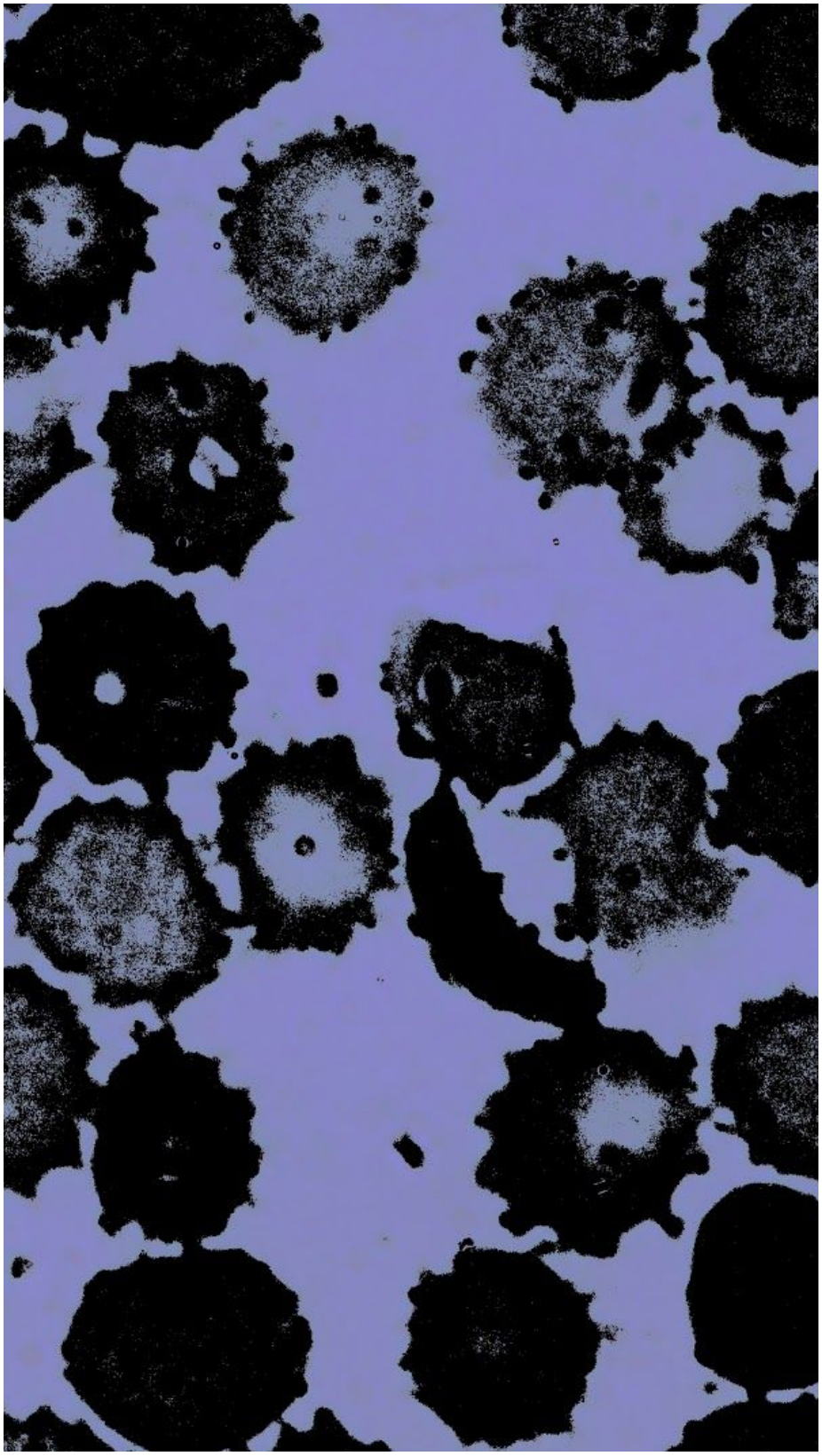

Figure 4.b.20 : Plasmodium10 in the Ciel Lab colorspace
Specimen : Schistosoma

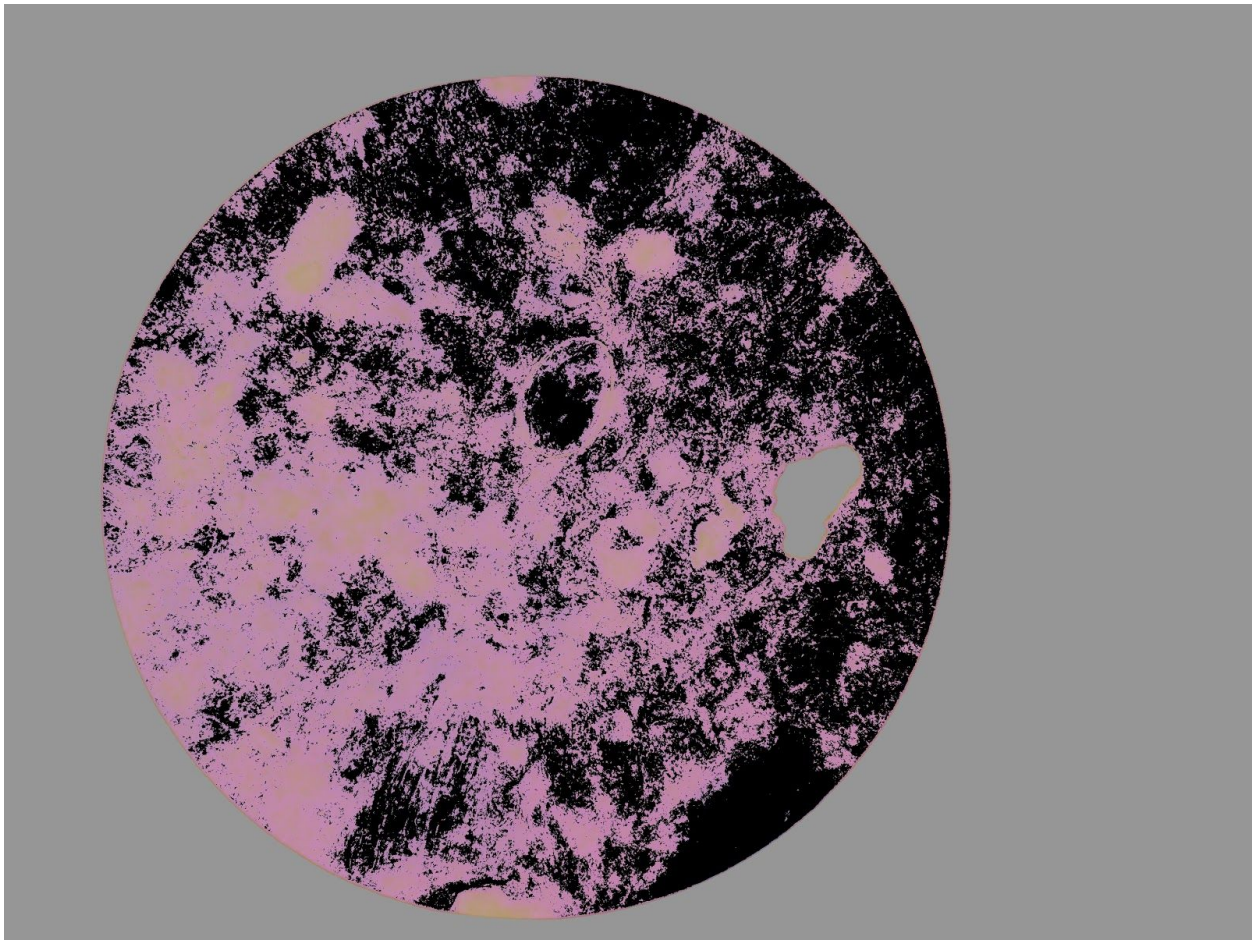

Figure 4.b.21 : Schistosoma1 in the Ciel Lab colorspace

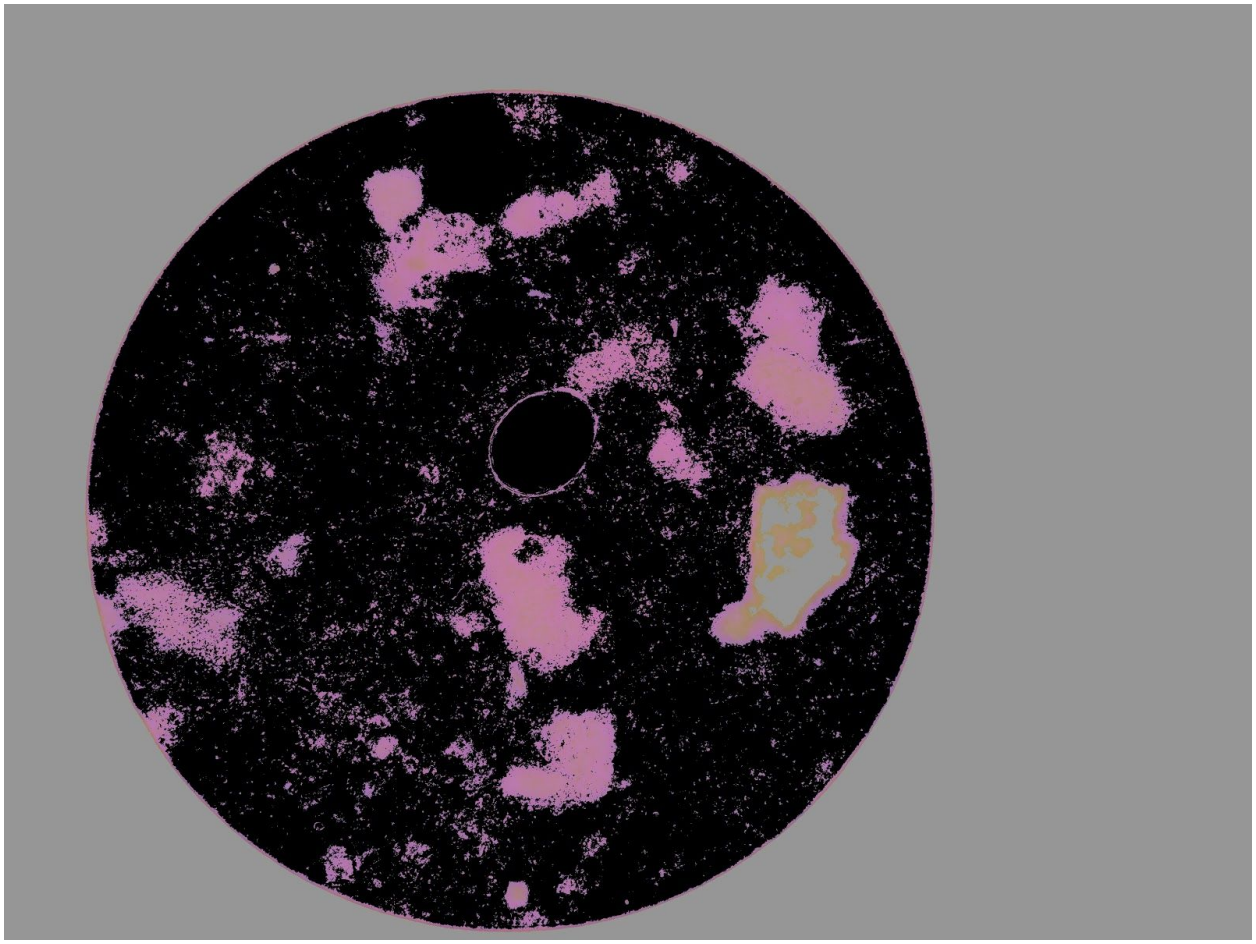

Figure 4.b.22 : Schistosoma2 in the Ciel Lab colorspace

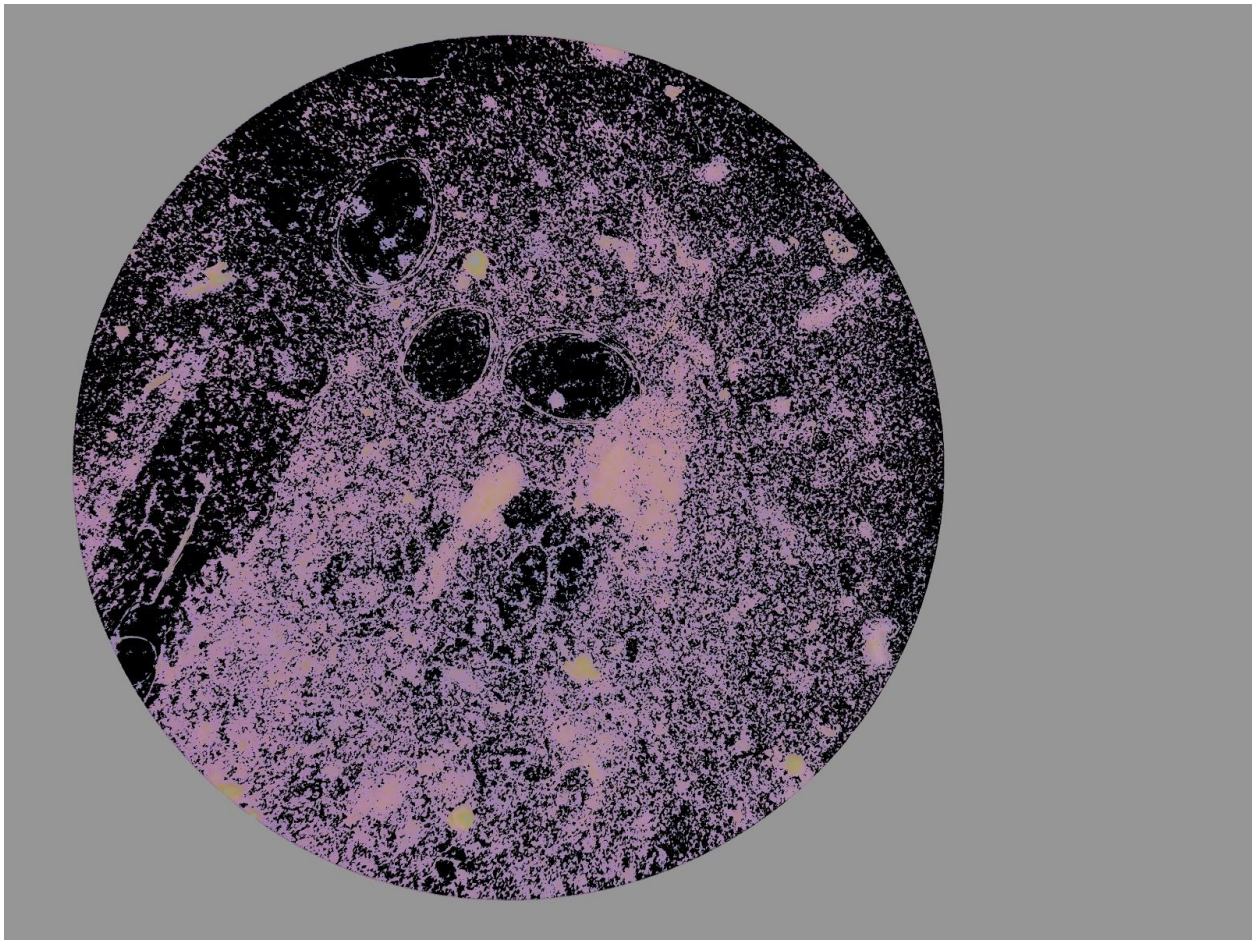

Figure 4.b.23 : Schistosoma3 in the Ciel Lab colorspace

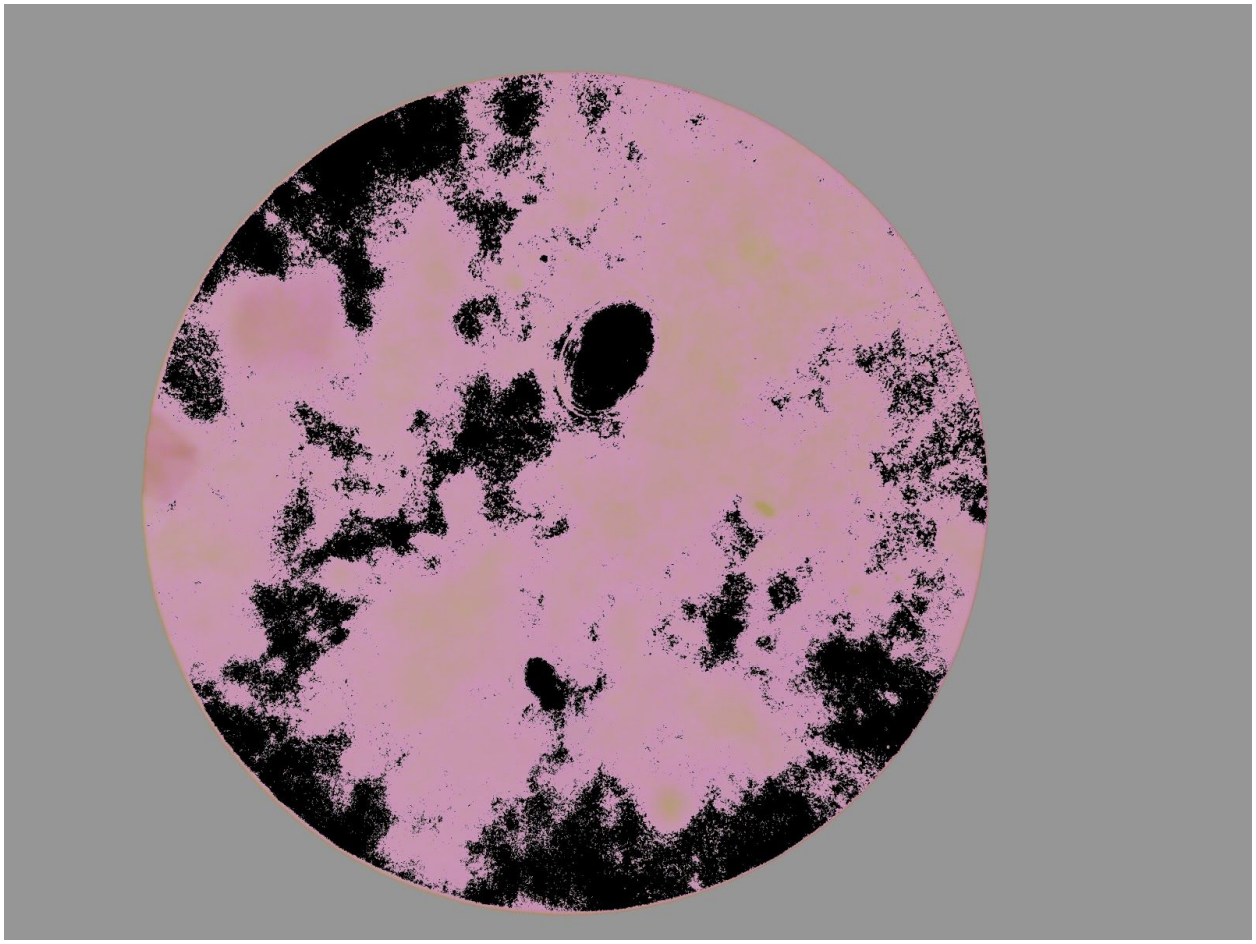

Figure 4.b.24 : Schistosoma4 in the Ciel Lab colorspace

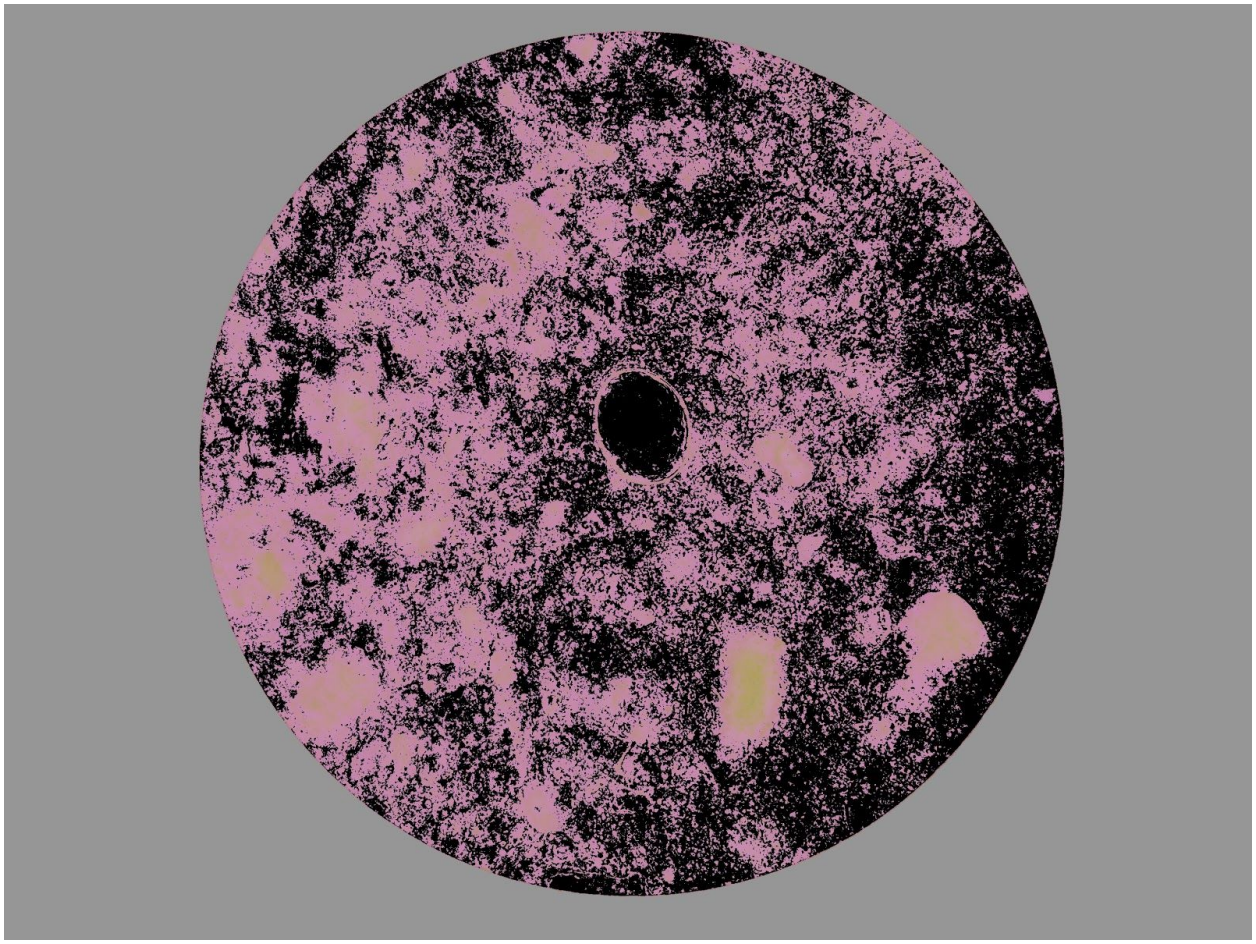

Figure 4.b.25 : Schistosoma5 in the Ciel Lab colorspace

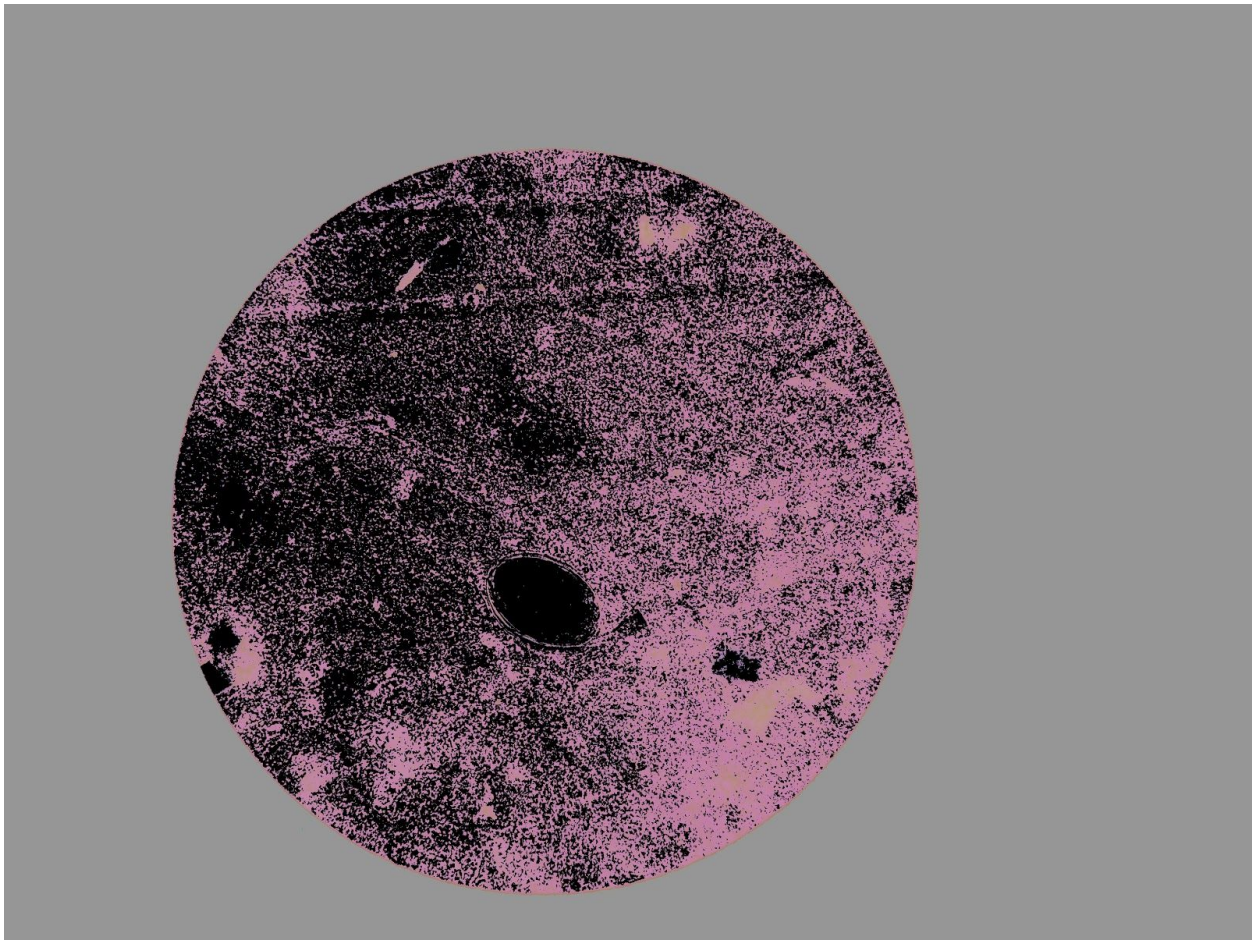

Figure 4.b.26 : Schistosoma6 in the Ciel Lab colorspace

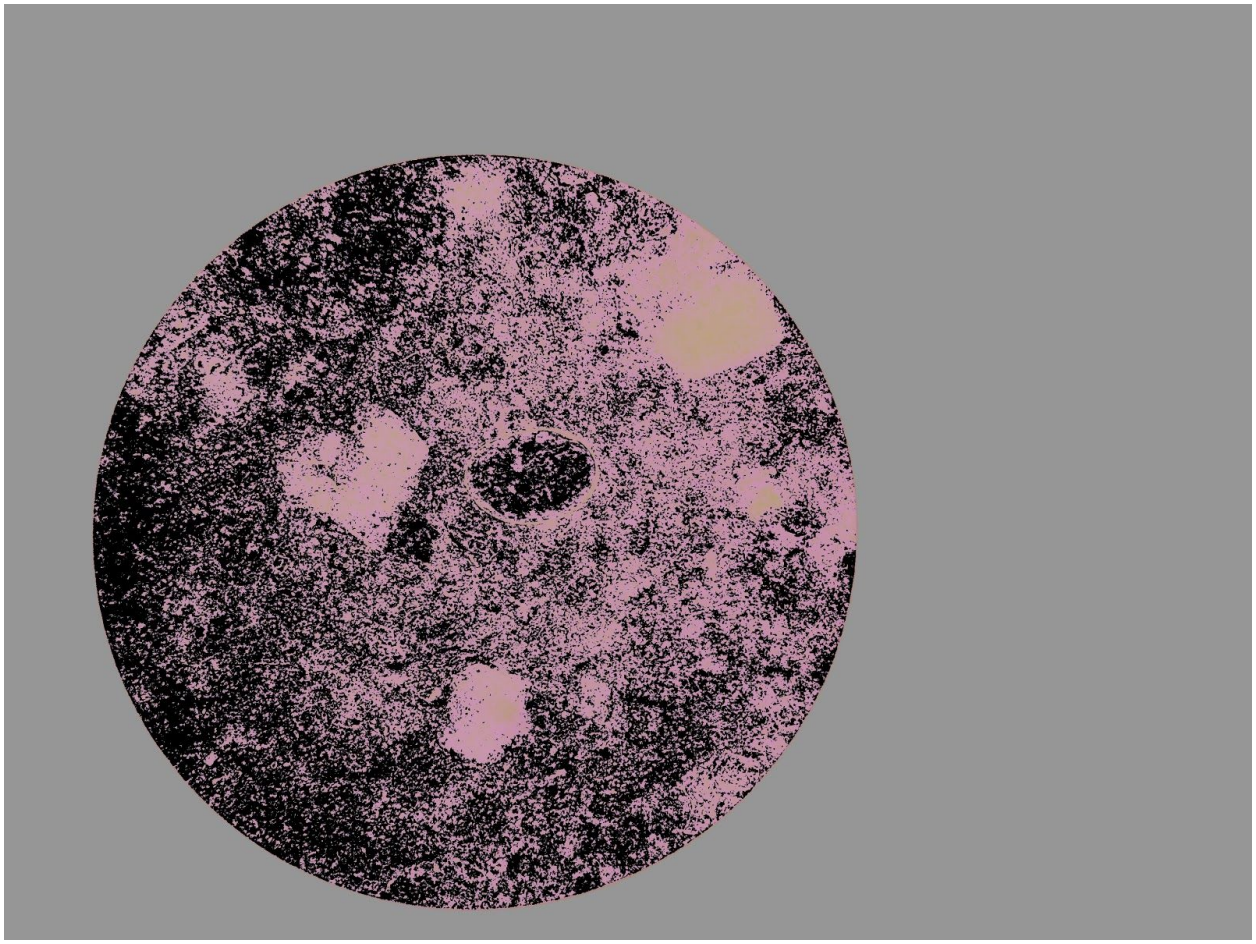

Figure 4.b.27 : Schistosoma7 in the Ciel Lab colorspace

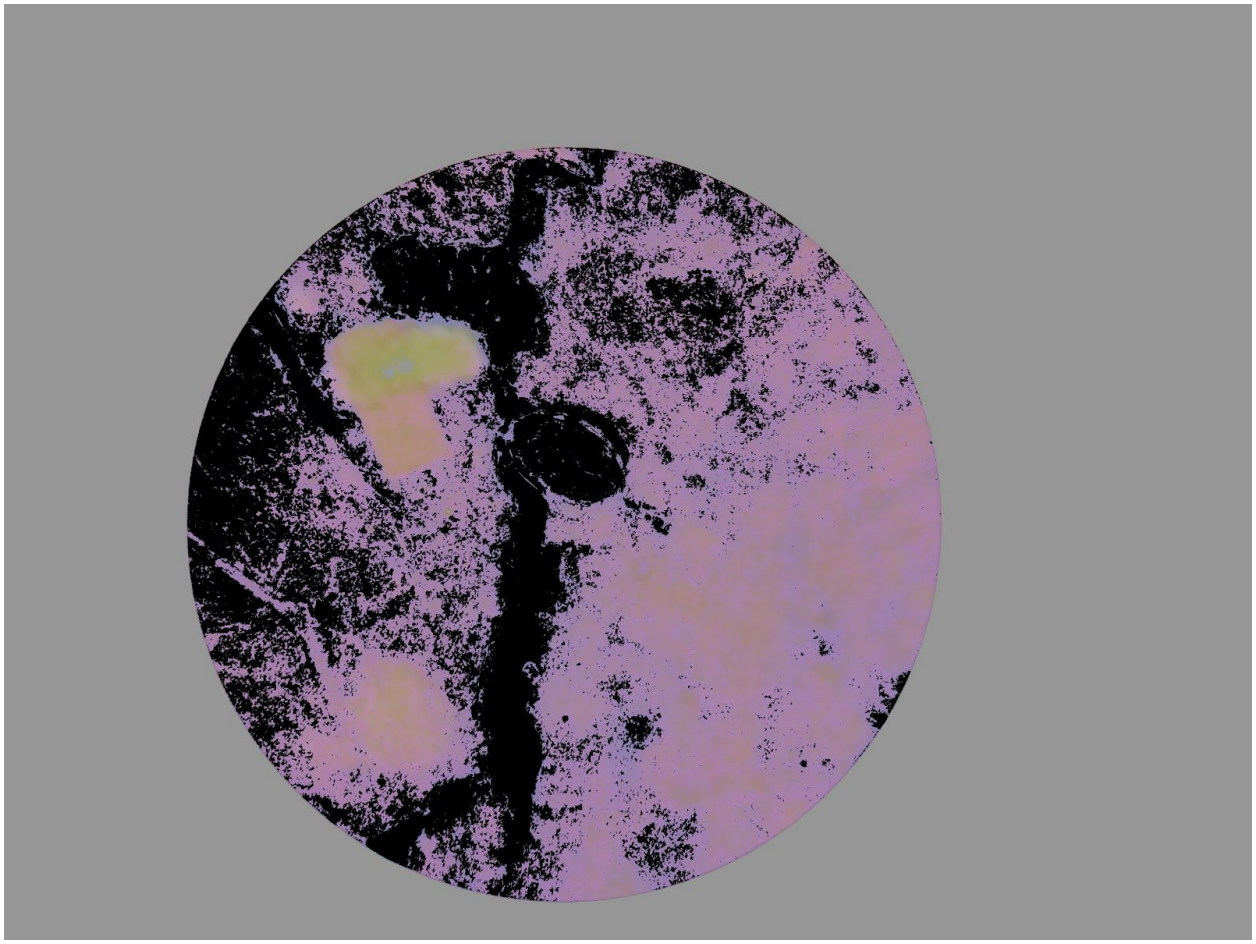

Figure 4.b.28 : Schistosoma8 in the Ciel Lab colorspace

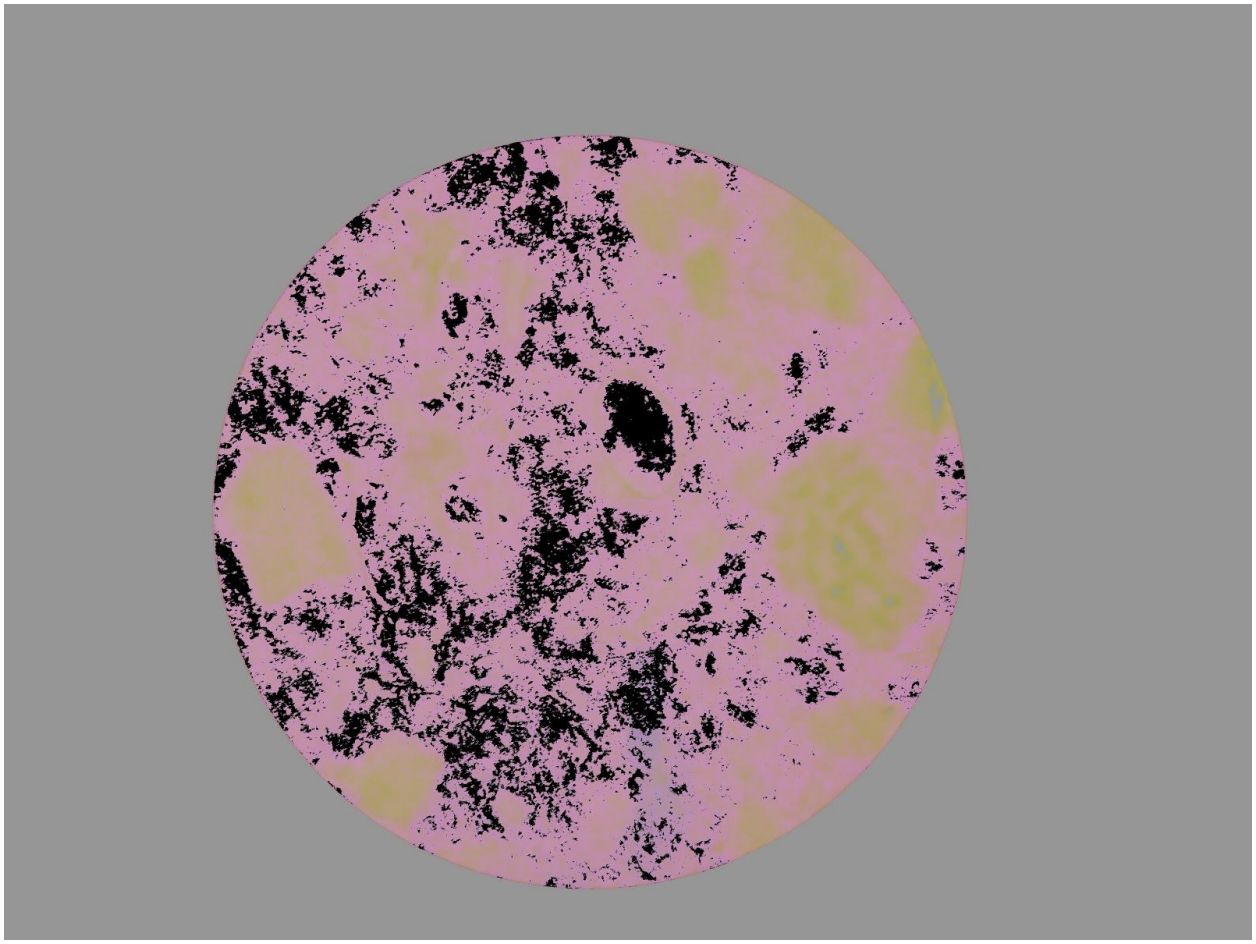

Figure 4.b.29 : Schistosoma9 in the Ciel Lab colorspace

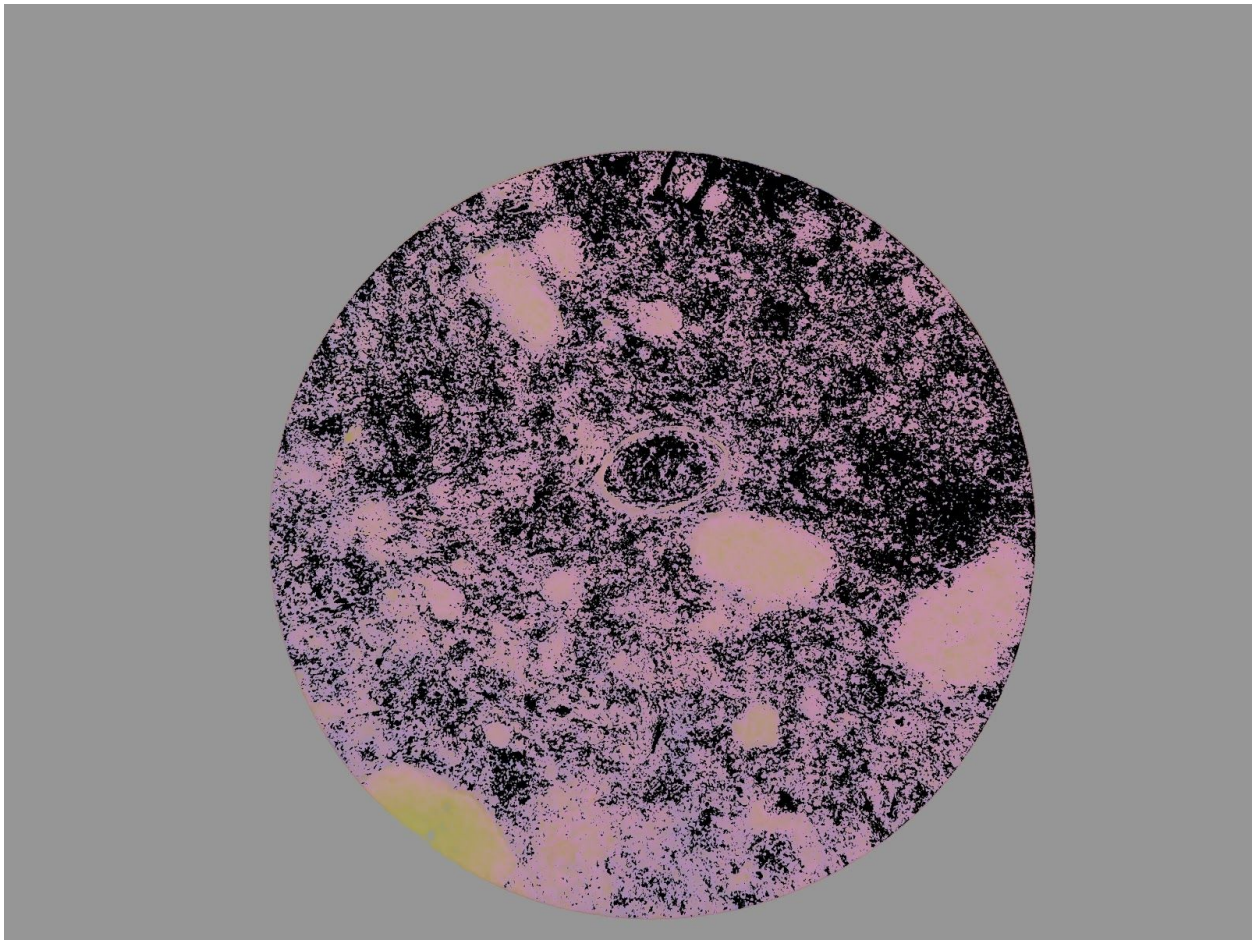

Figure 4.b.30 : Schistosoma10 in the Ciel Lab colorspace

Number 5

5. Which of the specimens is the easiest to segment? the hardest?

Filaria was the easiest to segment because the pixel locations of the images were very different from each other. The difference of the colors of both the parasite and the background is very noticeable and thus, the easiest to segment. The schistosoma specimen was the hardest specimen to segment because the parasite has the same color of the stool while having only its outline the only noticeable feature for the parasite. The image almost have the same color just different shades which is why it's hard to segment the image.